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PERSPECTIVES AND SUCCESS FACTORS FOR SMALL FIRMS OF THE FINNISH BUILDERS' CARPENTRY INDUSTRY

The article presents the state of the art and perspectives of the Finnish builders' carpentry Industry and the role of the small firms. It is identified that firms producing prefabricated components to BtoC markets do not supply their products to BtoB markets and vice versa. Domestic markets of single dwelling house construction have been growing during the recent years. There is a large demand potential opening up by the replacment of concrete by wood in the frame construction for multi storey dwelling buildings. The competitive structure of the industry as one determinant of business performance is evaluated with respect to suppliers (supply chain), entrants (entry barriers), buyers, rivals and substitutes. Despite of high cost, differentiation is used by firms in the industry as the major competitive strategy. Lack of knowledge and skills in strategic management, low innovativeness and low marketing competencies are common. Exports do not show any positive impact on business performance. Human capital rather than technology is a strategic but scarce resource. Subcontracting is common but partnerships in production and procurement are rare. There is large variation in the degree of process integration. Differentiation strategy, i.e. broadening competitive scope, implies flexible manufacturing systems with sufficient manufacturing capacity and a sufficient number of product variants. Small firms encounter restrictions with respect to the endowment of human and financial capital. At the end the article presents some factors of success for small firms in the Finnish builders' carpentry industry. Differentiation strategy hardly does provide a competitive advantage for small firms without extended networking. Business networking can allow small firms to compensate scale disadvantages when focusing into narrow demand segments. The preconditions for small firms to enter a BtoB partnership with a construction company are process automation and exploitation of IT-technologies, integrated information management and the implementation of an open construction system.
JEL: Q12, Q23, O33

1. Performance and Sustained Competitive Advantage of a Firm

The construct of sustainable competitive advantage (SCA) in an important issue in strategic management research (Barney 2001, Sande 2003). Rational entrepreneurs or firms are looking for structures that could contribute their business performance. The competitive structure of an industry indicates the intensity of competition firms are facing there and relative performance of individual firms. The opportunity set on the choices determining the performance of a firm is restricted by factors originating in the external environment not internally within a firm. The

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characteristics of an industry as the firm's business environment has five dimensions: (i) factor conditions (power of suppliers), (ii) demand conditions (power of buyers), (iii) threats of substitutes, (iv) threat of potential entrants and (v) rivalry among existing firms (Porter 1980). These five dimension formulation is an extension to the Structure – Conduct – Performance (S-C-P) specification of competitive structures. Firms meet exogenous industry structure and the intensity of competition inside the industry indicating the limited degree of choices towards supernormal profits. Industry-level profitability is determined (predicted) in the S-C-A approach through the attractiveness of an industry as a business environment. An industry's competitiveness is always conditional to the state of technological knowledge and macroeconomic policy of the country where it is located.

Entry for new entrepreneurs may be (and often is) difficult in industries, where potential profits are high. The barriers to entry may be erected by incumbent firms operating in the industry or are an outcome of the specific features of the industry (e.g. large positive scale economics). The competitive structure among the firms of an industry is normally reciprocally related to potential profits firms operating in the industry can achieve.

A firm adopts a business strategy out of a set of strategies to meet the opportunities and threats posed to the firm by its business environment. Consequently the conduct and strategy of a firm is formulated under these conditions. Firms as members of the same industry are not normally equal what concerns the competition with one another. There are however special structures of competition among firms, where equal competitive forces are accompanied by quasi competition (e.g. structures of oligopolistic competition). Firms with equal competitive resources compete with quasi differentiated products in this context.

Firms in a manufacturing industry usually produce a multitude of products and there is a competitive structure in the product markets of the industry with a various degree of mutual substitutability between products. This product differentiation implies segmented markets and can be based on cost differentials or quasi factors without cost differentials. Firms implementing high-performing strategies try to prevent other firms from implementing the same strategies by erecting mobility barriers (Caves and Porter 1977). Firms allocate their production/supply to different market segments and modify their competitive strategy to reduce competitive pressure from other firms. The business strategy view pays attention to performance variation across firms that do not exogenously originate from industry structure. There are differences between firms in their ability to devise competitive strategies and to command adequate resources. Industry effects, however, are always there.

A dominant approach to explain sustained competitive advantage (SCA) has been the resource-based view of the firm during the last decade (Sande 2003). Resources causing cost differentials should be separated from those relevant in quasi competition. The competitive advantages in the industry with oligopoly structure are on the industry level instead of individual firms. The internal strengths and weaknesses of the firm are here applied as the determinants of business performance as opposed to industry structure. Successful strategies of firms providing sustainable competitive advantage must be endowed with the ability to control resources that allow them to do so (Penrose 1959, Foss 1997). Differences in performance across firms of an industry are caused by differences in resource

endowment instead of the business environment they operate in. Resources, not equally available to all firms, constitute the precondition for a firm to yield a sustained superior rent as compared to rivals.
Resources forming the source of SCA can include:

- Physical input factors that are of homogenous quality across competing firms
- Qualitative properties of input factors
- Non-material inputs (R&D, codified knowledge base, non-codified knowledge, learning capacity)
- Joint business activities and networking

A resource providing a long-term sustained competitive advantage differs from the resources of other firms (heterogeneity) and there is limited access to the resource concerned, so called ex-ante and ex-post limits and imperfect tradability (Peteraf 1993).
The value of a resource providing SCA is based on the purposive creation, through investments in resources, or on the use of isolating mechanisms (Rumelt, 1984). These constitute the analogue of entry barriers at the industry level and mobility barriers at the industry group level. Intangible competencies and the dynamic capability of firms to create them are the most important resources in the competence-based management theory. However, a precise general definition of competitive advantage is missing as well as a common specification of necessary and sufficient conditions for SCA.
A resource providing SCA constitute the basis for the ability to do something superior with respect to the competitors. The identification on a resource behind SCA can also be done at the organisational level. The capability to create, transform and use knowledge into a new competence is often a prerequisite to SCA (Praest 1998, Kogut and Zander 1992).
Competencies are assumed as most important sources of SCA. Technological competence is the ability to transform technological knowledge into a new competence. A competence evolves out of the successful application of the underlying ability to use knowledge. Human skills includes all kind of formal training, whereas learning by doing and other tacit types of learning are elements in the competence building capacity of the firm. Learning capacity is an element of competence building. It is the ability to create and adopt new knowledge and the ability to start and continue the process of creating a new competence. Intangible asset as opposed to tangible assets are most potential rent-yielding resources in that they usually are difficult to imitate and trade. Competence evolves out of the successful application of the underlying ability to use knowledge. The process of competence accumulation requires basic competencies categorized as learning capacity, capabilities and organisational routines (Praest 1998).
The sources of SCA can extend beyond the firm itself. The identification of the value chain relevant to a firm often provide a basis to explain also the SCA of the firm (Hoffman, 2000). There are value chains related to primary and supporting activities respectively. Activities are distinct from each other with respect to technology and economics. The configuration of linkages and coordination of activities are crucial for competitive advantage. A firm can have internal value chains (complementarities) as well as linkages towards upstream (suppliers) and downstream (marketing channels) agents. Primary activities comprise the physical creation of the product, its sale and transfer to the buyer, and after sales service.

The scope of a firm has an impact on the competitive advantage of the firm. Broad scope allows a firm to exploit interrelationships between the value chains that serve a number of different product or buyer segments, while narrow scope can allow the tailoring of its chain to serve a particular target segment resulting in lower costs compared to competitors (Porter 1985).
The purpose of this study is to analyse the sources of SCA and the corresponding potentials for small firms in the manufacture of prefabricated wooden buildings in Finland. The relevant products are introduced in Chapter 3. The markets and business activities of firms are analysed in Chapter 4. The analysis is the first of its kind for home construction in Finland. The competitive structure and performance of the industry in the relevant demand segments are discussed in Chapter 5. The discussion in Chapter 6 about the factors behind SCA is based on the summary findings from interviews among firm managers. Perspectives and success factor are summarized in Chapter 7.

2. Products

According to the SIC classification scheme the builder's carpentry industry is a branch within the woodworking industry. It includes the fabrication of structural wood components, prefabricated wood buildings and other builder's carpentry and joinery. The woodworking industry comprise also sawmilling, planing and impregnation of wood, the manufacture of plywood, laminated board particle board and fibre board, the manufacture of furniture and other products of wood.
The production of prefabricated wooden buildings (SIC 20301) includes the fabrication of structural wood components and prefabricated wood buildings ready for assembling on-site. Assembly on-site is included, if accomplished by the manufacturer of the building. It is excluded, if accomplished by a separate building contractor (TOL 45211). House building activities are the major market also for the manufacture of builders' carpentry and joinery (SIC 20309) that includes the fabrication of wooden products as doors, windows and their casings, staircases, hand rails, round or square logs for log homes, beams, roof constructions and other carpentry and joinery for building structures.
The domain of wood frame construction covers detached and semi-detached single-family dwelling houses, secondary residential houses (chalets), gazebos, saunas and other yard and garden buildings. Wood frame is used to a significant extent also in row and linked dwelling houses and in industrial, in some extent in business office and public buildings. Large-sized wall panel systems are used besides in detached single-family houses in row houses and linked houses. The dominant framing systems used for wooden buildings with off-site prefabricated construction elements are (i) small- and large-sized load-bearing wall panel systems, (ii) balloon and platform framing from precut (mill-cut) constructional timber or logs and (iii) modular construction systems. A typical prefab home package comprises the outer and inner shell include roofing, siding, flooring as well as windows and doors. Structural components are made from massive timber, Glulam or LVL. Precut timbe is mainly used by professional builders. The manufacture of sawmilling products is excluded from this paper. Sawn products comprise standard and special sawn timber, engineered wood products, preforms and wood components for the carpentry, joinery and construction industry.

3. Markets

3.1. Market Volume

In 2002 the gross added value of the Finnish building construction markets was 13,3 billion euro and the value of constructing new buildings was 7,5 billion euro. The value of wood products used was 1,9 billion euros (14 % of gross value added) including 0,8 billion euro of other wood products in than prefab elements, windows, doors and parquette (1,1 billion Euro). In 2002 there was about 30 000 construction start-ups of new dwelling houses in the domestic markets. Half of the new buildings have wood frame (timber or logs) structures. Wood framing is most dominant in single (detached and semi-detached) houses and timber framing is also used for row and linked houses. Multiple storey residential buildings have almost exclusively been built by using concrete element techniques. Wood frame has been used only in reference context. The frame of 6 000 secondary residential – so called chalets – and about 6 000 sauna buildings are almost exclusively built with wood or alternatively with log frame.

The building renovation market is an important market segment especially to SME's in house construction (Table 1). Building renovation has been promoted in public re-employment programs as an opportunity for the reintegration of displaced persons in rural areas as well as a new demand segment for vertical forest – wood product chains of farm enterprises and small sawmills. Integration of production and marketing, product development for export markets to Baltic countries is provided as a second new market segment to wood construction chains of SME's in Finland.

Table 1

House Construction and Production of Wood Products Used in Building Construction and Renovation in Finland in 2002

	Gross output* (million euro)
New building construction	7 500 (56%)
Building renovation	5 800 (44%)
Constructional wood products	1 900 (14%)

*Figures include only building materials, when including building installation and completion the total value rises to 15,6 million euro.

In 2002 dwelling building construction had 30% market share when measured in space volume but 40% when measured in value share (Table 2). At the same time wooden frame dwelling buildings had a share of 52% of all completed new buildings. Their share of all buildings with a wooden frame was 40% measured in space volume and 54% of the total value.

Table 2

Wood Frame Building Construction Segments in Finland in 2003

Buildings completed in 2002	Total		Wooden frame				
	million m^3	million €	%*	million m^3	%	million €**	%
Dwelling buildings	10,6	3 068	52	5,5	40	1 595	54
Business and office buildings	3,9	1 150	20	0,8	6	230	8
Public buildings	2,8	929	25	0,7	5	232	8
Industrial buildings	11,6	1 442	17	2,0	14	245	8
Other***	7,0	959	66	4,6	34	633	22
Total	35,8	7 548	39	13,6	100	2 936	100

* estimate

** value of building not of wood frame

*** include agricultural and secondary residential buildings (chalets)

Single houses constitute the largest market share in the dwelling construction in Finland. The share of multi storey houses (39%) is among the highest inside EU. Wood frame is used in the construction of single houses whereas there are only reference solutions concerning the use of wood frame in multi storey construction (Table 3).

Table 3

Distribution of Dwelling Construction by House Types in Finland in 2003 and the Use of Wood Frame in These Construction Activities

Type of building	Start-ups in 2002 [1] units [2]	Wood frame buildings		
		%	units [3]	%
Multi storey*	11 500	39	230	2
Row and linked**	5 000	17	3 100	21
Single houses***	13 000	44	11 440	77
Residential total	29 500	100	14 770	100

* Multiple storey dwelling houses are more than two-storey houses with at least three dwelling units.
** Row and linked houses are one- or two-storey houses with at least three dwelling units.
*** Single houses are detached or semi-detached small houses with one- or two storey and one or two dwelling units.

Wood frame has widely been applied in the construction of dwelling houses, agricultural construction and in secondary residential buildings. Wood frame has not become common in the construction of business and public buildings. The share in the construction of industrial buildings has also remained low. Wood frame construction has been dominant in single dwelling house construction and the market share has been near a quarter in row and linked house construction.

4.2. BtoC – BtoB Market Dichotomy

There is firm logic behind the division of markets in house construction into business-to-business" (BtoB) and "business-to-customer" (BtoC) market segments.[3] This dichotomy between the segments of the markets in house construction can be stated concerning the customer relationship of firms operating in the structural wood component and wood building industry. On the basis of their main customer group two groups of firms can be separated here: those whose customers are private home builders and those whose customers are construction companies. These customer groups differ with respect to the nature of the customer relationship: in BtoC it is typically an arm's length transaction whereas contract manufacturing and strategic partnerships are dominating in BtoB transactions. We separate firms into two groups depending on whether they dominantly have BtoB or BtoC transactions. The importance of this market segmentation comes from the sharp division in dwelling house construction. The end consumers execute vast majority of single house construction and only construction companies produce a tiny annual volume. Construction companies have produced practically all multi storey houses as well as row and linked houses in Finland. The separation of market segments makes single house construction to

[3] It has become common in marketing research to separate "business-to-business" (BtoB) transactions from the more traditional "business-to-customer" (BtoC) commerce because of the differences in the rules of business applied (see eg. Kotler 1984).

be BtoB markets and multi storey and row and linked house construction to be BtoB markets.

Single House Construction (BtoC Demand)

This market segment in house construction can be characterised by the following specifications. Typical agent behind market demand is a single own home builder and the major products of demand consist of: a) home packages and shells including structural wall, floor panels and roof structures, b) turn-key packages including on-site assembling. Market supply comes mainly from domestic a) large firms operating nationwide, b) small firms in regional or local markets. Firms of a) type apply product differentiation with wide product range, branding, proprietary building systems (wood frame systems of pre cut timber or logs and structural panels). The most common supply chain architecture among firms are on a make-to-order or assemble-to-order basis production system. There are also piece production (modules and large-size structural panels) or continuous-flow (small-size structural panels), forward integration into markets for planning and contracting services.
Market demand for single houses is for the major volumes of the product made-to-order type. The private constructor in the market demand acts either as a self-building DIY-builder or as a self-managing builder. In the latter case the builder purchases construction materials and construction and management services. Professional construction made by construction companies has been about 10% of the total physical volume in single dwelling house construction.

Construction for Dwelling House Markets, Professional Investors and Institutional Agents (BtoB Demand)

This market segment in house construction can be characterised with the following specifications. Market demand is partly a) demand of intermediate products; prefabricated large-size structural wall, floor and roof elements for industrial, business office and public buildings, structural timber elements for multi storey dwelling houses, row and linked dwelling houses by professional construction firms (assemblers), and party b) demand of subcontracting, contract manufacturing; make-to-order or assemble-to-order by professional investors and institutional firms demanding houses for their (renting) business. Market supply of segment a) comes mainly from domestic markets, medium-sized firms operating nationwide. Market demand is related to the construction of multi storey and row houses for 1) commercial markets of apartments, 2) investors increasing their stock in rented apartment markets, and 3) institutional agents (typically cities) providing rented apartment to subsidized users.
The final demand of type 1) in the market of row and linked houses and multiple story dwelling houses is not identified a priori. The latter means BtoB construction of type 1) is provided to competitive markets where end customers differ with respect to their preferences and motives. Consequently the preferences and willingness to pay among the average end consumers are evaluated by specific preference profiles. Builders prioritize low risk and a predictable return for their investment to tailor-made solutions. In small domestic markets low risk involves low-cost standardized solutions.

The final demand of types 2) and 3) constitute private investors, governmental agencies, municipalities or public funds. They are typically cost minimizers having professionals available in their trade. The BtoB demand segments imply high overall cost efficiency in construction and the choice of frame material as well as other wood based semi products need cost competitiveness.

4.3. Demand Segments in the Market of Single Family Homes

The markets of residential house construction can be divided into demand segments by alternative criteria. The basic divisions in this chapter try to identify the market shares of wood frame houses in the market demand segments concerned.

First, the division of the construction of detached and semi-detached dwelling houses between BtoC and BtoB demand segments indicates the popularity of the former (Table 4).

Table 4

BtoC and BtoB Construction, Detached and Semi-Detached Dwelling Houses

Share in 2002	%
Private home builders (BtoC)	87
Professional home builders (BtoB)	13

Second, the types of house frames applied in detached and semi-detached dwelling house construction (Table 5).

Table 5

Type of Frame Delivery in Small-Size Residential and Non-Residential House Construction

	Detached & semi-detached	Wood frame	Non-residential*	Wood frame total
Total in 2002	13 000	88 %	12 200	23 601
Prefab off-site**	62 %	55 %	50 %	56 %
Fabricated on-site***	38 %	33 %	50 %	44 %

* secondary residential (chalets) and saunas, see KTM, Pientalobarometri no. 2/02,

** 62% includes wood and non-wood frames, the former comprising panel systems, balloon and platform frames from precut constructional timber and modular systems

*** includes balloon frames, log frames and non-wood frames).

Third, small-size residential and non-residential house construction can be divided according to the use of external entrepreneurs in construction (Table 6).

Table 6

Type of Small-Size Residential and Non-Residential House Construction Ordered according to the Use of External Entrepreneurs

Home builders and home building business in 2002	Number of homes	Share % of number of homes	Share % of home packages	
A. Private home builders				
A1. self-building (DIY)	5 000	46	55	42
A2. self-managing, self-contracting	3 400	31	75	39
A3. turn-key	1 000	9	75	11
B. Professional home builders	1 400	13	35	7
Total	10 800	100	61	100

The constructors in subgroup A1 are private builders who do most of the construction by themselves using standard-sized constructional timber bought from DIY-vendors or use own timber milled by sawmilling contractors. The independent purchase of roof, sides and floors (precut or prefabricated elements) as well as the assembling services are frequently subsidizing self-construction. The constructors in subgroup A2 apply external construction contractors. The owner manages the project by himself or delegates it to his agent, who calls for tenders, coordinates and controls the building process.
If prefabricated elements are used the assembling of the exterior shell is committed by the vendor. The builder either does the other construction work himself (case 1), or uses contractors to do the work on his behalf (case 2). The package vendor makes subcontracting arrangements with assembly contractors (long-term or spot contracts). But unless there is turn-key delivery agreed with the package vendor – usually it is the builder, not the package vendor – who signs the contracts with the other construction contractors (typically electricity, heating, water HVAC installation) and coordinates their work. Therefore case 3 is redundant.
The constructors in subgroup A3 demand on-site assembling from the supplier of the prefabricated house frame as well as all other on-site construction work and deliveries (except for the foundations and outdoor landscaping) as the main contractor of the private builder. This kind of turn-key contracts counted for about 5% of all home package deliveries in 1998.
Fourth, the use of frame systems is divided into: a) wood and non-wood frames respectively, and b) between different wood frame types respectively. Wood frame houses constitute the majority (88%) in this division (Table 7).

Table 7

Division of Small-Size Residential and Non-Residential House Construction according to the Frame Type

Home builders' frame system preferences	%
timber frame fabricated on-site	33
timber frame prefab panels & modules	35
timber frame precut	12
log frame	8
total wood frame systems	88
total non-wood frame systems	10

Prospects to increase the use of wood frame in small-size residential and non-residential house construction trough the transfer from BtoC to BtoB are fair. The latter is due to the current market share of wood frame in single house construction. There are market forecasts evaluating growth in the demand of single houses in Finland. A new type of construction for small-sized wood-frame two-storey apartment houses has been developed to open up BtoB markets for construction firms to compete with private builders in BtoC markets. The creation of a new submarket through supply side innovations can acquire part of the forecasted BtoC demand increase. There is no guess about how the share compared to DIY/self-contracting owner-builders will develop.

4. Competitive Structure and Performance

There are two grand sub segments in the dwelling construction markets in Finland. Our interest is focused on the demand of wood frame houses. The BtoC demand dominate single house construction and BtoB demand other dwelling house types. Market supply of wood frame solutions do not overlap in these submarkets. Firms supplying wood frame houses in BtoC markets do not participate in BtoB markets. On the other hand producers of wood frame elements in BtoB markets do not supply to BtoC markets. There is, however, one important exception, producers of precut frame components. These firms provide these components both in the BtoC and BtoB submarket. The domestic statistics covering the industry of prefabricated wooden buildings (SIC 20301) and builders' carpentry and joinery (SIC 20309) do not separate firms into BtoC and BtoB markets. The total number of production units (and also firms) is high in all these industries (Table 8).

Table 8

Number and Size of Firms (Measured by Employment) in Prefabricated Production of Wood Houses, Builder's Carpentry and Joinery in Finland in 2001

	Prefabricated wooden buildings* SIC 20301	Other builders' carpentry and joinery SIC 20309	Production units TOTAL
Number of production	260	750	1 010
Number of employees	5 500	7 000	12 500

* manufacturers of prefab home packages (panel, modular and precut timber frames, excl. log frame)

The competitive structure among the firms supplying in BtoC and BtoB submarkets differ. The competitive structure is discussed with respect to: a) barriers to entry, b) vertical integration within firms, c) potential non-timber substitutes, and d) competition from import. Discussion is based on qualitative evaluation because of the lack of relevant empirical data.

House construction has been a growing industry in Finland almost a decade. In Finnish builders' carpentry industry 40% of firms operate in growing markets, 60% in saturated markets. Operating in mature product markets as such does not explain profitability of the branch: there is inter-firm profitability differentials although firms operate under equal market conditions with respect to the maturity stage of their markets. Nevertheless low growth markets intensifies rivalry according to theory (Mäntymäki1998).

High entry barriers imply low new entrance irrespective the potential profits available to the firms operating in the industry. The BtoC submarkets (prefabricated wood houses) are dominated by a few large companies (Table 9) . Barriers to enter this market are high for small firms. It is easier for small firms to settle themselves into small local niche markets. Small producers of timber frame houses focus on the manufacture of customized products, where the labour-intensive on-site handcraft production system can compete with the continuous-flow capital-intensive industrial production systems of large home package manufacturers. The proximity of customers help to save cost.

Table 9
Supply Concentration of Wood Products in Finland Measured by Share of Sales in 2001, Vallin 2003

	at least 80 % of total sales of the branch		
Product group	Wooden buildings*	Windows	Doors**
Number of firms	9	8	3

* manufacturers of prefab home packages (panel, modular and precut timber frames, excl. log frame)
** over 90%

Producers of wooden buildings to BtoB markets are SME's implying low mobility barriers to entry. However, high competition comes from concrete element production. This production mode has competitive advantages in BtoB markets based on well developed ude of positive scale economics. The latter is an efficient barrier to entry to the producers of wood frame house components in BtoB markets. The dominance of large producers in windows and doors cause high barriers to entry among new SME's both in BtoC and BtoB markets.
The competitive advantages based on backward vertical integration are available to large companies, because modern sawmill technology implies expensive investments and large production volumes. Cost advantage through economies of scale requires capital-intensive high-capacity further processing technology, timber drying kilns, planing lines, finger jointing lines, strength grading systems, etc. There is few attempts of entry by sawmills through forward (downstream) integration into their buyers' industry. There is one case in the BtoC-market for timber frame single-family houses (Koskisen Oy). Entry barriers are construction technology, competencies (project management), size and market share with respect to financial assets, economies of scale and customer relationships. There is few evidence of sawmills increasing customer value by making prefabricated building elements. Notwithstanding the excess capacity in the markets for sawn timber, family-owned mills, however, have shown a high threshold to exit the industry.
The low price elasticity related to private builders in BtoC markets do not explain price differences between the major suppliers in BtoC markets because the comparability of offers and accessibility to market information are low. There are brands but weak brand identity of buyers. Price competition is high in the BtoB market segment mainly because of the cost efficiency of elements produced from concrete. Wood products compete with non-wood substitutes mainly because of the large substitution elasticity between wood and concrete elements. A call for tenders is the usual way to place an order. Decisions on subcontracting in the construction companies are based on price and quality. The profitability of the construction industry as the main customer is low. There is no distinct product differentiation. Price, quality and JOT delivery are the main arguments.
Bargaining leverage of buyers in BtoB markets can be expected high. Three most important construction companies dominate in BtoB market implying low switching cost between suppliers. Fairly strong seasonal fluctuation in the utilization of production capacities typical in firms supplying in BtoB market. The in-house production costs of the construction companies are as the reference price for subcontracting in BtoB markets. On-site building construction costs including

transaction cost are used as the benchmark for prefabricated home packages in BtoC markets .
The threat of substitute materials is high in BtoB markets because non-wood substitutes are cost efficient and costs are used in the evaluation whereas substitution possibility is low in BtoC market due to inferior preferences to non wood solutions among buyers. Timber frame constructions are the low-cost solution for family dwelling houses.
Current and potential competition from import is an important challenge to domestic supply in the dwelling construction markets. International competition has traditionally been low in construction and related industries because of the country specific norms, regulations and business cultures. Current share of import supply is 10% in product subgroups except in windows where import share is lower (Table 10). The potentials to competing import is currently increasing especially from Sweden and the Baltic countries.

Table 10

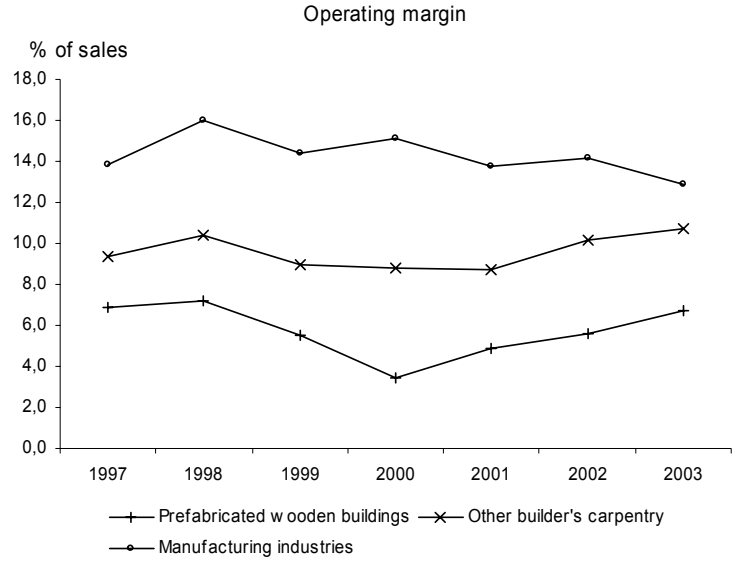
Market Size and Import Competition in Wood Related Building Products, Mäntymäki, 1998

milj. € e2003	Domestic consumption, mill. €	Total sales of domestic firms, mill. €	Exports, mill. €	Imports, mill. €	Imports % of consumption	Domestic sales % of total sales
Total	1 106	1 425	386	67	6	78
Prefab elements*	307	437	160	30	10	70
Windows	339	340	8	7	2	100
Doors	104	151	57	10	10	69
Parquette	111	180	80	11	10	61

*Include wall panel and modular timber and log frame systems.

Handicraft production applied by SME's prefabricated wood house production constitute the competritive advantage against to industrial manufacturing processes of the 20 biggest companies. There is a widely varying degree of process integration (in-house sawmilling, planing, fabrication and assembling versus outsourcing and subcontracting).
The business performance in the builder's carpentry industry has been weaker than in the Finnish manufacturing industries on average (Figure 1). The performance of the prefabricated wood frame house industry has been improving during the last years and has nearly reached the 1998 level. The business performance of other builder's carpentry manufactures (windows, doors, parquet, roof structures) have been superior and less volatile compared to the performance of building manufacturers during the last years.
Petäjistö et al. (2001) investigated especially the business performance of small firms in the industry with less than 100 employees. The performance of these firms has showed a positive trend for the last years, but in the longer term the situation has been characterised by poor profitability and shortage of equity capital. During the years 1981-1999 the median for net profits was negative (Vallin 2004).

Figure 1
Business Performance in the Prefabricated Wooden Buildings (Excluding Log Frame Buildings) and Other Builder's Carpentry Compared to the Manufacturing Industries' Average



5. Resources, Capabilities and Strategies of Small Firms

About 40% of firms apply market segmentation by focusing on a small group of primary customers, and most firms differentiate marketing by target groups (Mäntymäki 1998). In addition, the outperformers have been able to charge a price premium in their customer value. Firms determined their own prices on the basis of cost, demand and competitors' pricing. Cooperation in export sales had not been important and in the same survey 60% of firms have had direct exports. Only few firms have used own local distributors and the majority have used external export agents as their distribution channel. Business performance among collaborating firms was observed better than that without collaborative activities. One fifth of the companies did not practice any marketing for their products and one third of the companies rely on their steady customer base Petäjistö et al. (2001).
The 19 enterprises included it the survey by Mäntymäki (1998) spent 1% of turn-over on research & development. Firms also mainly looked for application of a known technology to new markets. Customer contacts were the most important source of innovation. There was some collaboration between firms (about 60% of firms), but in-house activities were of major importance. Market information deficiencies were common among the firms: only 5% had sufficient customer and market related information. Resources were primarily allocated into machinery and equipment in the firms of the survey and marketing was not considered a strategic asset. Small firms typically suffer from insufficient competencies in business

accounting (Enroth 1995). The lack of strategic plans was a threat for business and succession management in many small companies. Sawmills have faced information insufficiencies due to increasingly passive selling behaviour and geographically scatteredness of private forest owners. The structural change in NIPF-ownership has added transaction cost to SME sawmills' timber procurement. Sawmills applying focusing strategies operate in roundwood market segments, which are small but information-intensive in terms of tree species, log dimensions, quality and volumes requested Petäjistö et al. (2001).

Only 30% of firms had good command of knowledge and skills in strategic management and they did not commonly apply strategic planning routines: only 25% prepared literary business plans. The use of strategic management techniques was not very common (frequency in SWOT analysis 65% and in benchmarking or ABC-analysis less than 20%) but on the other hand no correlation with business performance was identified in the study. Human capital commonly restricted business development and every third firm suffered from scarce financial resources (Mäntymäki 1998). Small firms did not dispose of marketing competencies to be implemented into differentiation or focusing strategies and had insufficient competencies in marketing leadership and business accounting (Enroth 1995). 80% of the owners of small companies had received vocational training, most frequently on a professional or college-level in wood engineering in the fields of carpentry or joinery. Companies assessed themselves active in training their manpower and computer assisted arrangements were more frequently used in these companies (Petäjistö et al. 2001). Holm et al. (2002) views on-the-job training of their staff as a challenge to small and medium-sized companies in general.

60% of firms were satisfied with the current level of flexibility in their production technology and 20% considered good abilities to radical change production set-up (Mäntymäki 1998). There was no remarkable scale economics in the production of builders' carpentry and non-automatized labour-intensive production technology had turned out to be competitive in the manufacture of structural wall panels. Production process automation was considered justified only in the precut and log frame production irrespective the size of volumes (Vallin 2003). Scale economics could not be identified as source of superior performance, particularly in the case of differentiation strategy (Mäntymäki 1998). Firms implementing an differentiation strategy outperformed those striving for price competitiveness through low cost strategies. Differences in product quality were due to differences in human capital rather than technology. A spearhead company provided opportunities for joint activities with small firms only in rare cases. Sawmills looking for downstream cooperation with wood processing partners faced frequently troubles in finding qualified candidates with knowledge in building and operating business networks (Vanhanen 1995). Mäntymäki (1998) found that although there is variation in the vertical depth of production, the rate of outsourcing: 30% of firms restricted their production to main components, 15% did subcontracting and 15% did only assembling of components. About 60% of firms in the survey did run joint production in some degree. Joint input procurement activities were found in 50% of firms. The degree of cooperation was generally low, but no clear correlation with performance was found. Also Vallin (2003) states that there was wide variation in the degree of process integration. There were companies whose activities cover

sawing, planing and fabrication of components. Some companies did focus on assembling components and buy the product components from subcontractors. Saarikivi et al. (2003) state that the dominating operating model consisted of one business unit organised as a single company and did localise in a single production site. Petäjistö et al. (2001) found few who are members in a corporate or marketing network among small companies with less than 100 employed. About one half of these companies operate as subcontractors or use subcontractors itself.
In Mäntymäki (1998) survey the quality of services was among the most important means to improve competitiveness for 60 percent of firms. Human capital and managerial capabilities were considered key factors. The major competitive strategy of firms was to reduce price sensibility by differentiation primarily through service but also through product quality. Here only a low differentiation potential was noticed. Firms generally prefer multi-product strategy. Motives for product diversification have traditionally become from risk management and the exploitation of economies of scale and scope. According to Mäntymäki (1998) the number of product groups correlated positively with business success. Risk dispersion was assumed to compensate for efficiency losses. The large majority of the firms (90%) in the survey had 30% share of their total sales to export markets. However, export activities did not show up positive impacts in business performance. In looking for business opportunities firms mainly focus on domestic markets.

6. Summary: Perspectives and Success Factors for Small Firms in the Finnish Builders' Carpentry Industry

Domestic markets have been slowly but constantly growing during the recent years. Timber frame buildings already occupy a dominant share of the market for single-family houses. There has been a perceivable shift from multiple dwelling houses to single-family houses. The domestic market will stay the most important in the years to come but the export market has preserved their importance for the Finnish log home industry. The share of prefabricated homes will continue to increase at the expense of on-site construction. There are new markets emerging for timber frame systems in up to four storey multiple dwelling houses, but it is too early to predict how fast these markets will develop. Up to now these houses, which cover half of the annual production of multiple storey dwelling buildings, have almost exclusively been built with concrete frames. Wood frame construction has preserved competitiveness in small residential building construction. At the same time the overall trend has been declining in wood frame constructions of other building types (industrial, office and public buildings). Timber frame construction technology has been dominant in the BtoC market for single-family dwelling houses. There exist only fair practices for the supply chain management and business concepts for joint ventures between SME contractors and construction companies as their client industry making the emergence to BtoB market for multiple storey dwelling houses slow. Business experience has been limited only to reference projects up to now. In addition firms engaged in the BtoC market supply have not made initials to enter the BtoB market for multiple storey dwelling houses.
Cost efficiency, necessary for firms to operate in BtoB markets, requires extensive use of prefabricated construction components but until now fair market supply (small production capacity as well as underdeveloped supply chain management

know-how there behind) have been a restrictive issue. Extensive public subsidy programs to proceed wood frame construction technologies and corresponding production have focused on fostering technological competencies but disregarding supportive actions to proceed supply and demand conditions in BtoB markets. Progressive public policy cover supporting actions to: a) wood-based urban housing construction activities, b) more intensive cooperation between construction companies and SME-vendors of wooden constructions, and c) promotion to new network-based business models. Growing market demand shall become a natural pushing factor for the cooperation between small producers of prefabricated wooden elements and construction companies. There are some small industrial concentrations among SME's involved in BtoB transactions in wood frame house construction but the connections to the rural labour demand are unclear. More information is needed on demand preferences over urban housing, residential milieus and modern wood architecture to evaluate the demand factors behind BtoB wood frame house demand

Needs for parallel production technologies and resources needed for the capacity are major bottleneck factors to SME's in wood frame house component production to follow a differentiation strategy. Customers are attracted if a firm is known to be flexible. This calls for sufficient manufacturing capacity and a sufficient number of product variants, i.e. depth and width in their product porfolio. Flexible manufacturing equipment allows a high responsiveness to customers' demand but broad scope of differentiated products implies flexible manufacturing technology. The lack of skilled labour in design and production planning is a bottleneck in flexible manufacturing systems. Labour endowment and costs inhibit firms to enlarge their product range. Competitive advantages in the production of the components for prefabricated timber frame houses for BtoB market imply effective use of the positive economies of scale and the endowment of unskilled labour in rural areas. Flexible manufacturing systems and minimum profitable scale on production imply large capital investments that in turn imply existing demand in BtoB market. Capital cost might be reduced by jointly producing several products or components that are used in each product. Flexible production systems do not imply integrated firm structure, but are applicable also inside short-term contracts between independent suppliers.

SMEs can compensate scale disadvantages by focusing into narrow demand segments. Continuous automation and exploitation of IT-technologies are needed to maintain competitive advantages based on low cost and high quality. Small firms, however, typically face a shortage in human and financial capital. Expanded value networking through value chain adjustment are key success factors for SME's in the woodworking industry. Small firms can find core competencies by focusing to narrow demand segments downstream or producing some components in a value chain. There are success examples in the Finnish furniture industry in BtoB market of firms focusing on product quality, low cost and efficient logistics and successfully using the merchant's marketing channels and brand name. Construction companies have adopted integrated information management systems into the development and implementation of construction projects. They cover also architecture and construction planning processes. System compatibility with these planning systems will be among the preconditions for partnerships in BtoB construction in the future. The latter imply the intake of computer-aided

product development and manufacturing systems (CAD/CAM) also in SME's to be able to join into the vertical and horizontal integration business chains with other partners in addition with the large integrated companies.
Factor conditions with respect to timber procurement can be argued to be a most important supportive activity within the wood processing value chain and a vital part of business strategy. Although small buyers can usually utilize only specific wood input assortments, roundwood is usually offered by forest stand comprising a multitude of log and pulpwood dimensions. New solutions for the forest industries to develop their wood input procurement activities are emerging, which hopefully will favour also small-size wood processing activities. Forest industry corporations and sawmilling industry are looking for models how to outsource their wood procurement activities to small-sized service providers. The availability of their services might improve the economies of small-scale wood-processing activities (Mäkinen et al. 1997).
Flexible production planning is expected to favour short-term contracting with independent suppliers. Open vis à vis proprietary standards for wooden-based construction systems would further support new opportunities to widen contracting base with independent suppliers. The concrete building industry has a competitive advantage by using an open concrete element building construction system already introduced in the 1970's (Hämäläinen, 2004). Cost competitiveness of wood-frame construction in BtoB market can be improved by the use of a platform building system in multiple storey building construction and by the learning effects and quality improvements from standardized technical solutions and routines in manufacturing and logistics (Viljakainen & Määttänen, 1998).

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