

**HIDDEN CHAMPIONS OF THE B.C. FOREST INDUSTRY:
ARE SMALL FIRMS AT THE
CUTTING EDGE OF VALUE CHAIN INNOVATION?**

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ABSTRACT

British Columbia's once formidable commodity based forest industry has undergone profound economic restructuring. "Value-added" (secondary) manufacturing is a key component of contemporary production, and is widely recommended in theory and industrial strategy for achieving higher value and overcoming high costs and wood fibre constraints. High value production anticipates the role of small and medium sized enterprises (SMEs) operating within flexibly specialized networks. My thesis addresses this promise. An extended case study research methodology underpins this investigation of local development, growth and networking strategies of 14 BC firms. Conceptually, the research integrates flexible specialization and value chain literatures within the specific contingencies of forest resource production. The results indicate that advanced networking and communication synergies anchor firms to the home milieu and connect them to export markets. Flexible specialization production shows potential in the current restructuring of BC's forest economy. Yet, the long-term prospects for sustaining value-added production remain unclear.

DEDICATION

I dedicate this thesis to my family and four children, to my granddaughter Alicia, and to the forests that sustain us. You children are the future, and I thank you for your gifts of inspiration and love: Tammy: joy and compassion, hope and horsy friendship; Andrew: wisdom, loyalty, creativity, JH and hockey; Michael: kindness and laughter, intelligence and thoughtfulness; Jamie: inspiration, artistry, entrepreneurship and generosity of spirit. Alicia - thank you for holding my hand at the beach and for being my reading, arts, Ceramica and BP buddy. My wonderful parents Constance and William and my wise, fun-loving grandparents Day and Jamie, I see you are standing nearby and I thank you for your lives of unfailing love and support.



ARBUTUS RIDGE - GAMBIER ISLAND BC

Special thanks to Jamie, my son, for permission to quote a part of his beautiful poem 'Holocaust' (written as a young teen) that has so often inspired my art and work:

Imagine a lively little spheroid in
the endless frigid reaches of time and space

Where oceans flourish, flowers bloom,
Where creatures thrive and children play,
Rivers flow and jungles grow,
A place where the rooster wakes,
A robin sings,
And swallows dive among cherry blossoms.

Imagine the call of a loon
echoing off the first rays of the sun.
And were you touched by
the gentle dew that sparkled about the overgrown path?
Or supported by supple pillows of moss
as you traced a rainbow into a damp forest?
Have you ever smelled the scent of pine needles
carried on an autumn breeze?
This is a sanctuary...

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I gratefully acknowledge the generosity of owners, managers and staff of the fourteen wood manufacturing firms I visited in many BC communities. These people were extremely busy, yet welcoming. They loaned documents and later inquired about my progress. Their genuine interest and forthright replies (on and off the record) to dozens of questions made this research possible. Information of a personal and business nature revealed part of a complex forestry story that seems to connect the tree huggers, manufacturers and researchers to the real subjects of my study, the forests.

During my studies I also depended on a host of wonderful students and knowledgeable staff at the Geography Department, among them Marcia, Dianne, Hilary, Ravinder, Catherine, Taskin, Lydia, Don, Vikki, B-Jae and Kenji. Beyond SFU Geography there are so many learned friends and family members from universities and other learning venues who offered encouragement and support. I particularly thank Michael, Tammy, Simone, Harold, Vic, Louise, Patsy, Anne, Ray, Irene, Shilo, Margaret and Danielle.

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LIST OF ABBREVIATIONS

CADCAM.....	Computer aided design, computer aided manufacturing
CAWP	Centre for Advanced Wood Processing
CFS.....	Canadian Forest Service
CNC	Computer Numeric Control
CSA.....	Canadian Standards Association
CWC	Canadian Wood Council
CWH	Coast western hemlock
CWMC	Canadian wood Manufacturing Council
D. Fir	Douglas fir
FRBC	Forest Renewal of BC
FSC.....	Forest Stewardship Council
FSC COC	Forest Stewardship Council Chain of Custody certified
FTE	Full Time Employment
HR.....	Human resources
HRD	Human resources development
HRM.....	Human resources management
ILRA.....	Independent Lumber Remanufacturers Association
IT.....	Information technology
IVAWA	Interior Value-added Wood Association
IWA.....	International Woodworkers of America
KD.....	Kiln dried
MDF	Medium density fibre board
MSR.....	Machine stress rated
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
OSB	Oriented strand board
OTJ	On-the-job
Q-base	Quality base wood manufacturing certified trademark
QM	Quality management
R&D	Research and development
RTA.....	Ready to assemble
SME	Small to medium sized enterprise
Spf	Spruce pine fir
TSA.....	Timber supply area
UBC	University of British Columbia
WRC	Western red cedar
YRV.....	Vancouver International Airport

CHAPTER ONE INTRODUCTION AND APPROACH

This thesis explores creative intersections between local knowledge and production processes among relatively small and medium sized firms (SMEs) in the British Columbia forest economy. Traditionally, the forest industry has been the central strength and driver of regional development throughout British Columbia. The forest industry enjoyed a particularly strong boom from the late 1940s to the 1970s based around the export of large-scale commodities, notably lumber, pulp, newsprint and plywood. During this period, the industry was dominated by a so-called 'Fordist' production philosophy that extolled the virtues of large volume mass production in large-scale factories controlled by vertically integrated corporations and operated by unionized labor organized around principles of job demarcation and seniority. However, for over 20 years, profound changes in technological, market and competitive conditions have combined with trade, environmental and First Nations' conflicts to create a deeply troubled provincial forest economy (Barnes and Hayter 1998; Hayter 2000; M'Gonigle and Parfitt 1994). Job loss and unemployment, softwood import tariffs imposed by the USA, environmental and aboriginal blockades, and declining incomes in rural BC are inter-related signs of these troubles.

As the problems of BC's forest economy have deepened, there have been insistent pleas for the industry to diversify toward more varied, higher value production in which small and medium sized enterprises (SMEs) play a stronger role (M'Gonigle and Parfitt 1994; Hayter 2000). Such diversification, it is claimed, would provide jobs with fewer timber inputs and so permit environmental goals to be met as well. A few studies have explored the nature, extent and economic geography of such a trend (Rees 1993; M'Gonigle and Parfitt 1994; Rees and Hayter 1996; Reiffenstein 1999; Reiffenstein et al 2002). This thesis seeks to complement these surveys of BC wood value-added firms by focusing on locally important SMEs considered by industry experts to be leading edge contributors in terms of sales and local employment (Forest Renewal BC 2003; Canadian Forest Service 2003).

These leading SMEs offer considerable potential in relation to the industrial diversification of BC's forest economy. This study intensively investigates the

strategies and structures of 14 selected BC value-added (secondary manufacturing) firms, two or more from each of six industry sub-groups or sectors, to assess their potential for local economic development. All manufacturing, it should be noted, is value-adding. However, in BC's forest sector, value-added is often used in a more narrow sense, specifically associated with SMEs that are secondary manufacturers, or firms that add value to already processed lumber. Markets for these value-added wood products are mostly industrial end-users that purchase diverse products used in structural, ultra-light and engineered wood systems; prefabricated structures; composite wood construction; interior and exterior furniture, cabinetry and millwork; and acoustical and industrial applications. In recent times, these types of manufactured wood products from BC continue to supply material and aesthetic needs across the built environments of industrialized and developing nations. My research explores the production and location dynamics of specialized BC value-added wood products manufacturers that help to create local supply and human resource linkages as well as diverse export market niches. Conceptually, the point of departure for this study is provided by Piore and Sabel's (1984) flexible specialization theory. This model anticipates an emerging local knowledge based mode of production led by market information (knowledge of specialized export market requirements), skilled labor and innovative product research and development.

1.1 FLEXIBLE SPECIALIZATION

The idea of flexible specialization describes an overarching system of industrial production that recreates specialized local knowledge and innovation within networks of small firms. At the heart of the flexibly specialized industrial locale are human resources, "the nature and quality of the local labor market ... internal to the district and highly flexible" (Markusen 1996: 299). Furthermore, flexible specialization relies on "permanent innovation: accommodation to ceaseless change ... strategy based on flexible - multi-use - equipment; skilled workers; and the creation, through politics, of an industrial community that restricts the forms of competition to those favoring innovation" (Piore and Sabel 1984: 17).

Flexible specialization imagines a vibrant local business community as a set of networked SMEs and suppliers loosely bound by competitive and cooperative social and labor relations within related industries (Storper and Salais 1997). During post-

1970 global restructuring events, Piore and Sabel (1984) proposed a 'second industrial divide' that was based on a revival of flexible specialization, that they also termed 'craft production'. Interactions among many small firms characterizes contemporary flexible specialization, and regional competitive advantage develops within proximate collections of interdependent rival and cooperating SMEs, each highly specialized within similar or related industries. Such localized production systems achieve flexibility through continuous labor and technological skills innovation advanced by the group of firms (Piore and Sabel 1984).

A related idea is provided by Porter's (1990) value chain theory which also explains the industrial clustering of related firms in terms of ties to locale and local networking. His research explains business agglomeration tendencies and local competitive advantage by examining internal activities, structures and innovative behavior of firms, as well as their value chains, or research, supply, market, community and institutional relationships. Value chains are seen as sets of functions and endowments that link activities within and among firms within specialized and dynamic industrial regions. Value chains are thus enterprise-specific and location-specific, yet focused on the processes of ongoing innovation developed internally by firms and within related industries (Porter 1990; Martin and Porter 2000). Porter's (1985, 1990, 2000) value chain and firm innovation studies capture geographical aspects of firm decision-making by considering a set of relevant local assets that he calls 'factor conditions': these factor conditions are knowledge and skills; natural resources; institutional advantages; and physical infrastructures. Porter's value chain model readily connects to the literatures of flexible specialization, local industrial development and inter-firm networking (Maskell et al 1998; Hayter 1997; Piore and Sabel 1984; Malmberg and Maskell 2002). These literatures all incorporate the dynamics of local knowledge in relation to SME organization, networking strategies and agglomeration tendencies.

The potential of new and small local firms for local development and employment within regional economies is widely recognized (Johnson 2004; Jones and Tilley 2003). Indeed, studies in Canada (Britton 1991; Steed 1982; Hayter et al 1998) and elsewhere have identified some SMEs that are unusually dynamic and are, collectively, locally important in terms of sales, employment and innovative behavior, often conducting their own research and development (R&D) (Freeman and Soete 1997). In Canada, Steed (1982) termed such SMEs as 'threshold firms'.

For Steed, these firms were relatively large for SMEs, typically employing at least 100 people, innovative, and had the potential to become much larger (Freeman and Soete 1997). Among SMEs, these threshold firms provide indicators of best practices and reveal potentials for growth for other SMEs. A more recent study in Germany by Simon (1992) has referred to similar firms as 'champion firms' that he also refers to as 'hidden' in the sense that they are generally not well known outside of their particular industrial and locational niches (Hayter et al 1998). For the purposes of this thesis, dynamic, larger than average SMEs are defined as champion firms; such SMEs may be regarded as champions among their peer group of SMEs and possibly have the potential to become much larger themselves.

In general, economic geographic explorations of flexible specialization and SME dynamics have focused on agglomerations of secondary manufacturing. The studies by Rees (1996) and Reiffenstein (1999) on flexible specialization within BC's forest economy are already noted exceptions to this bias in the literature. There are other interesting value-added wood industry agglomerations comprised of diverse groups of SMEs in Europe, especially Denmark, Italy, Germany and the UK (Poyry 2002). Locales within these regions offer sophisticated and highly specialized examples of advanced, highly engineered knowledge-based wood industry clusters that remain attached to local places and local sources of knowledge. Wood value-added firms in these locations use regional agglomeration advantages to attract industrial customers (Maskell et al 1998; Poyry 2002). For example, inter-firm propinquity traits, including face-to-face informal relations between firms in close proximity, established in forest industry clusters (Maskell et al 1998; Poyry 2002) illustrate how competition and cooperation create strong regional competitive advantage in well developed and interlinked industrial districts like Denmark's woodwork agglomeration. Here, industrial cultures and institutionalized supports are conducive to inter-firm and inter-industry communication of ideas and know-how, exchange of supplies, and circulation of highly skilled labor and resources (Maskell et al 1998). Such locally important and growth-oriented champion firms would be regarded as indicators of best practices in local development within their locales. This study seeks out similar local knowledge/industry agglomeration advantages and innovative approaches to human and physical resources created by BC firms. The research design of this thesis emphasizes connections between literature and empirical study.

1.2 CHANGING DYNAMICS OF BC'S FOREST INDUSTRY VALUE CHAIN

This research primarily seeks to understand the strategies and synergies developed by larger ('champion') SMEs that have already demonstrated the economic viability of value-added production within the BC forest economy. The empirical study focuses on selected 'leading-edge' study firms (firms demonstrating strong sales, employment and export market performance) that tend to use advanced (e.g. computer assisted research and manufacturing) wood product designs and processing techniques. The 14 case study firms identified for this research are established leaders in sales, employment and local and BC industry networking (Industry Panel 2003). Their status as innovators is investigated throughout the thesis. As locally 'large' firms (relatively large SMEs), their behaviors, growth strategies and activities would contrast sharply with BC's long established forestry production and marketing regimes, whereby manufacturing processes and product applications relied upon high volume, minimally processed commodity exports based on (a perceived) inexhaustible supply of wood fibre (Clapp 1998; Hayter 2000; Marchak 2000).

Indeed, many observers argue that the BC forest economy's difficulties will continue to threaten industrial production and employment unless restructuring embraces innovative production processes that encourage firms to build production technologies and human resource skills (with decreased wood fibre volumes) within regional economies (M'Gonigle and Parfitt 1994). BC's value-added industries show strong competitive advantage in market knowledge, wood supply quality, low energy and transportation costs (Industry Panel 2003; Chan 2003). Throughout the 1990s the value-added industries have significantly increased their overall market share within the provincial forest economy (Canadian Forest Service (CFS) 2003). At the same time, the entire forest industry has suffered job declines (Price Waterhouse Coopers 2002), and the BC government has experienced falling forest industry revenues (BC Forest Industry 2002; Price Waterhouse Coopers 2002). Nevertheless, the development of value-added, although promising, faces a range of complex challenges related to changes in forest policy, the international softwood trade

disputes with the USA that does apply to remanufactured wood¹, labor supply and skills, and access to wood fibre (Forest Renewal BC (FRBC) 2000). Moreover, the industry as a whole remains threatened by volatile commodity prices, 'falldown' effects (declining mature forest stands), increased raw log exports, and challenges from global competitors (Marchak 2000; Clapp 1998; Hayter 2000).

The changing dynamics of BC's forest industry set the context for this research. Since industrial restructuring gained momentum during the 1980s, softwood production has shifted slowly from primary production of minimally processed and commodity forest products to higher value products such as prefabricated and engineered wood, remanufactured and architectural millwork, as well as furniture and cabinetry. This trend has seen more BC value-added firms and higher value-added sales that in 1999 comprised over 20% of the provincial total (CFS 2003). This trend realized a substantial economic gain in value-added production during the 1990s. Thus by 1999 the value-added sector overall provided jobs for over 14,000 employees and produced nearly \$3 billion in sales (Figure 1.1).

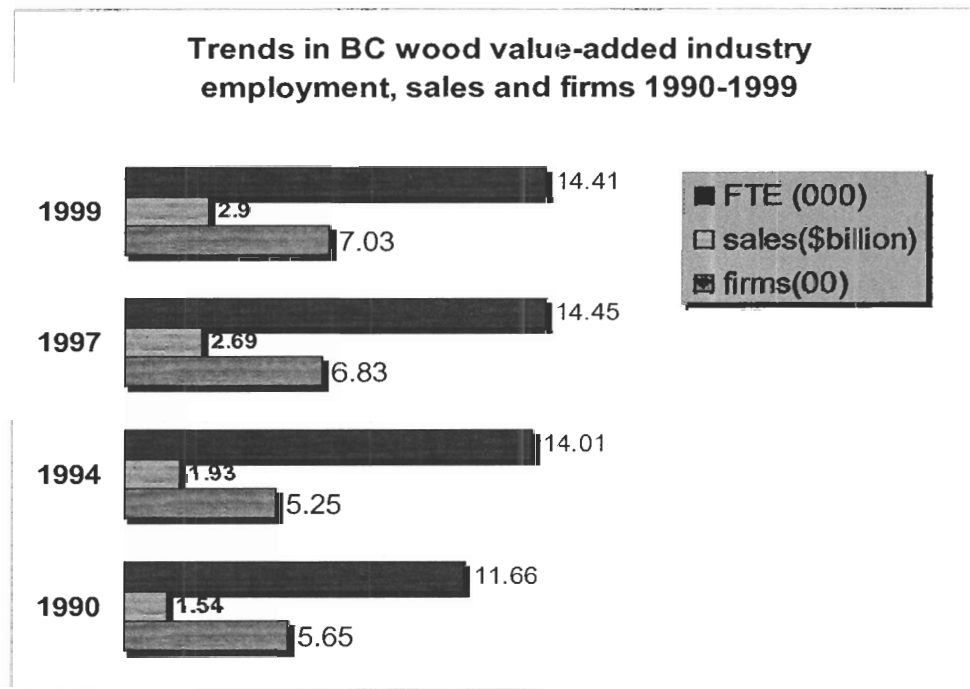
My study closely examines the pivotal industrial restructuring role of wood value-added 'champion firms', or at least potential champions, broadly conceived as leading edge or innovative medium-sized or large local SMEs that are important actors in specialized market niches but are otherwise not well known. More than two dozen such BC firms manufacture and export wood products for interior and exterior applications in six major value-added industry sectors that have been identified by the provincial government and industry. These categories are remanufactured; structurally engineered wood; millwork; prefabricated structures; cabinets and furniture (Natural Resources Canada 2003; Industry Panel 2003). BC's production in these six sectors is particularly rich and diverse, due to varied local wood species and applications; localized labor skills, access and unionization patterns; and perhaps not least the heterogeneous development of products, certifications and export market niches amongst firms in the various sectors (Canadian Wood Council 2004).

BC's potential value-added champions are highly concentrated in the greater Vancouver/Lower Mainland, with a smaller group in the Okanagan (Industry Panel 2003; Downing 2003; FRBC 2003). The initial operations and successful economic

¹ Tariffs >25% (countervail duty) imposed by the USA on Canadian remanufactured softwood products (BC Wood Specialties 2003).

growth strategies of BC value-added production may be related to the economic position and location selection of these case study firms. Their current capabilities would identify industry potential and signify leadership in local development, industry networking and skills training (M'Gonigle and Parfitt 1994).

Figure 1.1 Recent Trends in BC Value-added Industries



Source of data: Canadian Forest Service (CFS) 2003

Note: data include all value-added manufacturers; full time Equivalent = FTE; total BC Value-added sales = sales (\$billion); number of BC Value-added Firms = firms (x 00)

1.3 RESEARCH QUESTION AND THEMES

The empirical research for this thesis seeks to evaluate a comprehensive range of leading-edge (innovative, best practices) product, process and market strategies used by large SMEs proposed as champions in BC's forest economy. The study examines their use of local resources (human and physical) and engagement with industry networks, local institutions and global markets. The broad research question that guides this thesis is:

What are the contributions of BC's wood value-added champions to flexible specialization production in the BC forest industry?

My thesis proposes to answer this question by revealing, in a multi-faceted way, the geographic and organizational characteristics of BC's wood champions. The central themes of this examination focus on:

- a) The location, origins and evolution of BC's wood champions;
- b) The innovative behavior and product and market developments of BC's champion firms;
- c) Job creation and skill formation within BC's champion firms; and
- d) The linkages with wood suppliers of BC's champion firms.

1.4 RESEARCH DESIGN

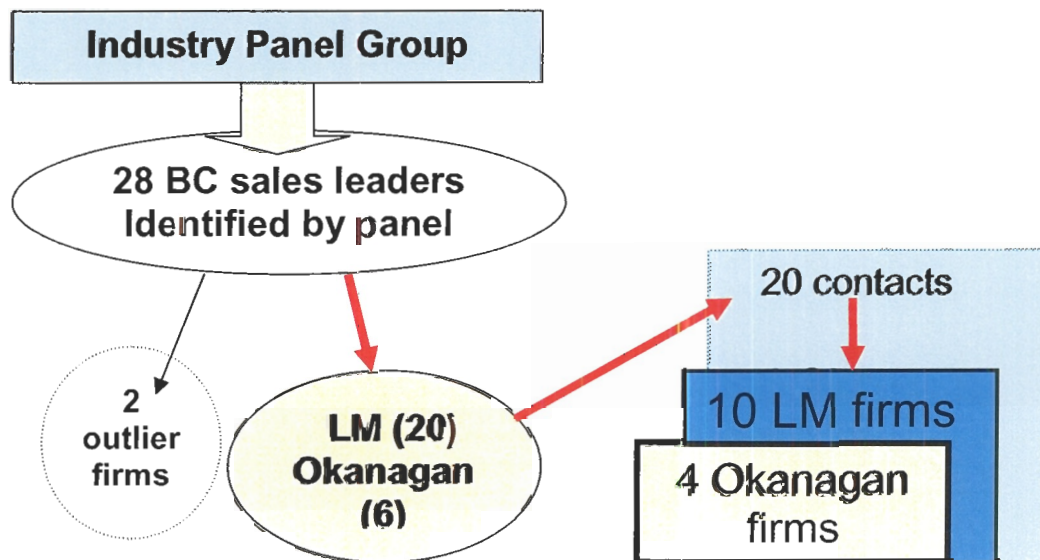
To address this research plan, 14 case studies were selected from 28 value-added manufacturing firms identified as champions. At least two and no more than three firms were selected from each of the six value-added industry sectors used by the provincial government and industry and that form the greatest source of value-added sales and employment in BC (Industry Panel 2003; Downing 2003). The Industry Panel's (2003) list identified particularly successful sales leaders that are also large community employers. This thesis examines the business development and organizational practices demonstrated by case study firms as a way to assess BC's progress in establishing and building value-added capacity, local learning, R&D and technological assets. In approach, this research design may be summarized as an 'extended' case study approach (Reiffenstein et al 2002) or a comparative case study approach.

The fourteen case study firms were chosen from a list of 28 large BC wood value-added SMEs that was provided by an expert Industry Panel (2003) during pre-fieldwork interviews. The Panel was composed of CEOs, program administrators and directors (Industry Panel 2003: Forest Renewal BC (FRBC); Advanced Systems Technology Institute (ASTI); BC Wood Specialties). All but two of the 28 study firms are located in southern BC value-added clusters: the lower mainland (Greater Vancouver, east to Abbotsford, and south to the USA border); and the south

Okanagan region between Kamloops and Penticton (Figure 1.2). Two outlier firms were excluded due to a research focus on industrial districts.

Initially I contacted 20 firms over a two week period during 2003. One firm owner declined to participate, and five firms were unable to participate during the fieldwork season, although they expressed interest and willingness to meet later in the year. The remaining 14 firms agreed to see me during the time planned for interviews and site visits. Therefore my final selection of 14 case study firms followed 20 preliminary contacts with firm owners and/or principals (Figure 1.2). As owners agreed to participate in this research, we arranged suitable interview and site visit appointments according to firm owners' schedules and my travel plans. I decided to limit interviews to two or three firms at most in each sector. All firm, owner and employee names and addresses are coded in accordance with research ethics demands, and to maintain anonymity of sensitive financial records. From time to time my discussion also refers to other coded or unnamed firms and respondents for the same reasons (i.e. Firm ____; Mr. Z etc.).

Figure 1.2 Case Study Firm Selection



The case study firms are noted for creating significant export sales and in-house (training within the firms) skills development (Industry Panel 2003). All 14 firms maintain local manufacturing operations and have influenced local economies. Overall, the chosen firms allow sectoral, regional and firm-level differences to be

noted. The study assesses the formative characteristics, growth patterns and contemporary organization of selected firms that are active participants in BC's forest industry restructuring and diversification processes. The research also examines location dynamics underlying the locally based value-added manufacturing activities of the case study firms. The six industry sectors, or industry categories, are labeled throughout this thesis as: R=Remanufactured; E=Engineered; P=Prefabricated; M=Millwork; C=Cabinets; and F=Furniture. Three study firms were selected for the remanufactured and engineered wood product sectors, and two firms from each of the four remaining sectors (i.e. millwork, prefabricated structures, cabinets and furniture) (Appendix A).

Primary information was obtained from semi-structured interviews with firm principals. The interviews were designed to obtain information on location origins, product/market characteristics, R&D activity, labor relations and wood supply (Appendix B). In general, the firm principals were generous of their time and answered the questions in a full and complete manner. In outline, my approach for organizing fieldwork interviews, collecting and analyzing data was sequenced as follows:

- a) Selecting firms by meeting with industry/government panel and representatives; and related literature research (academic and industry);
- b) Submitting proposed research design with interview schedules and obtaining ethics approval from Simon Fraser University Ethics Board;
- c) Mailing letters of introduction and ethics approval forms to firm principals for review;
- d) Traveling to visit four Okanagan firms and ten lower mainland firms: conducting site visits and semi-structured interviews; and reviewing firm literature on-site as offered by owners;
- e) Transcribing interviews for writing case studies: aggregating and analyzing quantitative and qualitative data to create tables, charts and figures.

Semi-structured interviews were created to collect primary data, with specific qualitative and quantitative questions. I considered these interviews, within the extended case study framework, most appropriate for evaluating individual internal and enterprise-specific processes, as well as inter-firm and regional networking

perspectives (from the point of view of firm owners or principals). Since this study seeks to broaden our understanding of how (potential) champion firms gain competitive advantage and impact local industrial development, detailed case studies are an effective way to investigate firm activities (as much as possible) in the actual context of local industrial communities. For example, activities intrinsic to study firms' manufacturing, marketing or labor operations are part of local knowledge networks (local industrial knowledge exchanged informally or socially). The analysis of case studies examines such interactions in specific locational contexts. In general, the idea of flexible specialization anticipates a complex range of varied behavior and networking among SMEs. The proponents of flexible specialization have cited a case study research design as the most appropriate way to elucidate their 'model' (Rees 1993).

The data collected for this thesis explain the nature of contemporary best practices within BC's value-added industries, as exemplified by comparative study firm behaviors. In particular, the firm type targeted for my study (locally large sales and employment leader) is not expected to represent the population of SMEs as a whole. Rather, the case study firms illustrate industrial behavior across characteristics of location, entrepreneurship, resources, and leading edge or best practices institutional linkages and social ties; and personal knowledge and financial capital. The 14 value-added firms manufacture varied wood products within six major industry sectors: remanufactured wood products; engineered (structural) products; architectural millwork (interior and exterior); prefabricated structures; cabinets and furniture (solid and composite wood). By selecting two or more firms from each of the industry sectors, the study is both detailed and extensive. This approach facilitates comparisons between firms, industry sectors and regions.

1.5 THESIS FORMAT

This chapter has introduced the idea of BC forest industry restructuring, the nature of local and regional forestry conflicts, and how this research applies to these restructuring problems. The following chapters successively explain this approach and examine various aspects of study firms' research, business organization and location. Collectively, these chapters stress the significance of inter-firm networking capabilities relative to location dynamics, internal creative capacity, local economies

and export markets. Chapter 2 reviews the concepts of flexible specialization, value chains, innovation and large SMEs that guide these case studies.

Chapter 3 begins with a review of recent BC forest industry dynamics and then discusses trends in wood value-added manufacturing. The 14 study firms are introduced in the context of regional location, product category and year of start-up. The chapter reports their contemporary sales and employment contributions to BC wood value-added productivity. Detailed assessments of networking activity and production characteristics of the case study firms continue in Chapters 4 through Chapter 7, first with an assessment of comparative firm origins, ownership, product and market characteristics. Firm growth and relocation are related to temporal phases of restructuring.

The results from Chapter 5 expand the contemporary picture of flexible specialization promoted by the study firms by focusing on their product and market creativity. Chapter 6 analyzes the way study firms have organized labor and technological skills internally, particularly employee education, transferable skills, and participation in management. Throughout Chapter 7, the emphasis of my thesis shifts to study wood supplies and study firm-supplier interactions. This final results chapter comments on inter-firm species selection and diversification within the two locales. Chapter 8 includes a final discussion with a view towards future research. Throughout this thesis, the research results explore diverse and innovative approaches to organization and location illustrated by the 14 cases.

CHAPTER 2 FLEXIBLE SPECIALIZATION, VALUE CHAINS AND SMALL FIRM INNOVATION

The idea of flexible specialization as conceived by Piore and Sabel (1984) has been incorporated in economic geography literature for almost two decades. This literature explores the nature of industrial organization, in particular secondary manufacturing that features small and medium firms (SMEs), and its tendency to cluster in close-knit industrial districts. The concept of flexible specialization assumes a dynamic (innovative) local industrial community composed of SMEs connected by competitive and cooperative relations. While the flexible specialization thesis does not focus specifically on natural resource industries, Rees (1993) and Reiffenstein (1999) have extended this literature to understand BC's forest economy, and to assess localized value-added industrial development.

This chapter reviews the flexible specialization literature and its connection with the concept of value chains (Porter 1990). The connection is not new; both flexible specialization and value chain approaches have been developed to explain agglomerations of SMEs that form innovative networks. This chapter will update the flexible specialization-value chain connection by integrating related literature on firm innovation, notably by Maskell et al (1998), Freeman and Soete (1997) and Britton (1991). This chapter progressively develops the related ideas of flexible specialization and recent literature on SMEs and innovation, and then addresses the value chain idea of Porter (1990, 1995).

2.1 FLEXIBLE SPECIALIZATION

The concept of flexible specialization imagines a vibrant local business community as a set of networked SMEs and suppliers loosely bound by competitive and cooperative social and labor relations within related industries (Piore and Sabel 1984). Flexible specialization theory explores the industrial development practices and potentials of manufacturing agglomerations and explains regional systems of specialization and innovation (Hayter 1997; Porter 1990; Piore and Sabel 1984; Maskell et al 1998). At the core of the dynamic flexibly specialized industrial district is

the local labor pool - the quality and depth of human resources within the locale. For example, clustered SMEs, each with specialized products and processes, collectively offer numerous opportunities for exchange of information and service on equipment, supplies, technology, product development and so forth. Further, the broad range of employment opportunity, and flexibility, offered among related firms and industries is connected to firm-specific training and human resource practices. At the level of the individual firm, workforce flexibility develops when employees are closely involved in shop floor, management and technological decision-making and collaboration, participate in job rotation, in-house training and education, and receive monetary and non-monetary benefits that invite long term commitment and personal development. Labor flexibility also tends to flourish among local firms that cooperate and compete for skilled workers (Piore and Sabel 1984). At the local-regional scale, employee circulation (movement between firms) creates a dynamic and flexible labor pool, where skills tend to be magnified as workers and firms seek advantage.

In their seminal study, Piore and Sabel (1984) interpret flexible specialization in two related ways: first, as a general debate about long run industrialization trends over decades and centuries, and second, as a localized model of industrial organization involving SMEs. Piore and Sabel (1984) view industrialization over historical time as a confrontation between the flexible specialization (or craft production) and mass production models (Sabel and Zeitlin 1985; Hirst and Zeitlin 1991) that began during the Industrial Revolution. In this debate, the mass production model organized by large corporations to exploit economies of scale (high volume low cost standardized products) is challenged by the flexible specialization alternative. Flexible specialization production engages numerous SMEs in competitive, complementary market interactions that are voluntary, arms length and designed to capitalize on external economies of scale and scope - an ever-changing array of varied and specialized products. Mass production led by the USA became the dominant vision during the 20th century, culminating in the development of assembly line techniques by Ford (Piore and Sabel 1984). However, during the 1970s Piore and Sabel (1984) propose that a 'Second Industrial Divide' marked a rebirth for flexible specialization that was stimulated by technological changes of the micro-electronics revolution, increasingly severe recessions, and by consumer demands for more product choice.

The viability and strength of the flexible specialization renaissance has been questioned. Amin (1994), for example, notes that huge companies frequently dominate production in many sectors. In this view, mass production has become 'flexible mass production' that is still dominated by large firms rather than flexible specialization that features SMEs. Nonetheless, local knowledge and skills developed within flexibly specialized networks remain vitally important despite the trend towards globalization (Malmberg and Maskell 2000). Local knowledge and skills connect firms to local places in terms of local research and development (R&D), supplier and market networks, or value chains (Porter 1990). Furthermore, strongly networked systems of SMEs continue to express regional competitive advantages in many locales where they circulate valuable locally-specific knowledge or informally exchanged know-how (Maskell et al 1998). Business and supply chain relationships distill valuable locally-embedded skills and expertise that are unique in their attachment to specific locales (Hayter 1997; Piore and Sabel 1984). Moreover, some systems of flexible mass production exemplified by Toyota and its network of supplier firms feature both a dominant corporation and a plethora of SMEs

Notable examples from the literature on flexible specialization reveal how diverse industrial districts have developed and retained localized capacity without relinquishing attachment to regions, in spite of globalizing trends in manufacturing activity that has paralleled industrial decline in both core and peripheral regions (Hilpert 2003). Successful flexibly specialized industry clusters illustrate how "innovation and advanced industrial development are not merely economic processes ... but consider non-economic conditions in government and society" (Hilpert 2003: preface np). In Sweden, for example, local conditions (e.g. forest industry knowledge combined with local demand for inexpensive, functional furniture) were exploited to create the internationally prominent wood furniture agglomeration concentrated in two southern locales, Jonkoping and Skaraborg (Solvell et al 1993). A prominent feature of this cluster was the strategy of lead firm Ikea that addressed prohibitively high domestic labor costs, as the firm pioneered ready-to-assemble (RTA) or knockdown (i.e. do-it-yourself) construction, retailing and packaging technologies (Solvell et al 1993; Maskell et al 1998). Ikea began in 1943 with a customer-centered approach from a single mail order outlet located in southern Sweden. Sales of \$1million US in 1954, from Ikea's first retail store, increased to \$15 billion US by 2002. During this period, the firm's 151 retail stores expanded to 31

countries (BCIT 2004). As Ikea expanded internationally, however, it has retained close attachment to an agglomeration of SMEs and suppliers in its original location.

Hilpert (2003) cites the significant role of the Greater Paris industrial district as a mainstay of the biotechnology industry's innovation and collaboration. Here, local industry cultures and skill sets associated with university research facilities have propelled intensive innovation and production activities of new and adapted specialized technologies that are dispersed within the region. Regional specialization of value-added products has also been noted in four northern regions of Italy; where industrial fixtures are produced in Piedmont and sports products from Veneto are driven by long term inter-firm, institutional, social and cultural exchanges (Maskell et al 1998; Hilpert 2003). The geographic proximity and social-business interaction between firms, suppliers and local institutions of these locales tend to reinforce the capabilities of innovative firms, for SMEs draw upon local resources and contribute to the industry milieu (Maskell et al 1998).

Maskell et al's (1998) research on industrial specialization at wider scales has documented persistent regional and national trends that challenge globalization tendencies rooted in increasing mobility of production and foreign ownership, declining local investment and patenting. Central Canada has continued to specialize in value-added forest and metal products; Sweden has maintained industrial strength in pulp, paper and related machinery; and Denmark has built durable and advanced flexibly specialized wood value-added industrial capacity within three inter-linked flexibly specialized industrial districts. In this respect, the inter-firm networks of small market economies have developed resilient regional specializations that are (variously) enhanced or restrained by regional industrial innovation and development policies (Hilpert 2003).

2.1.1 Inter-firm Networking

Inter-firm networking is closely linked to SME innovation (Britton 1991), and explains the dynamic nature of local business relationships and inter-firm networking for developing industrial knowledge and capacity (Malmberg and Maskell 2002). Across a wide range of industries and industrial spaces Porter (1990, 2000) notes that past the initial startup phase, SME innovation and location patterns become increasingly intertwined within local and regional industrial environments and their research support facilities, and related economies and institutions. In order to

maintain competitive advantage SMEs often rely on localized networking, local market niches and technology adoption strategies for their support, thus reinforcing the tendency of agglomerations to promote diverse mixtures of firm types, innovators and sizes (Freeman and Soete 1997; Piore and Sabel 1984). Porter (1998) describes the ideal value-added cluster as interwoven and highly specialized in depth, multi-dimensional in scope - a local geography encompassing related intra-industry firms through R&D, supplier and market channels, and inclusive of product standards and certification and training institutions.

According to Piore and Sabel (1984) and Maskell et al (1998) smaller firms advance local interdependency and geographic concentration through transfers of knowledge, the mutual adoption of new organizational structures, various forms of cooperation such as support for industry associations, as well as through interdependent inter-firm and supplier relationships with supporting institutions, governments and allied industries. In their view, flexibly specialized clusters of geographically concentrated locally embedded SME groupings builds stronger regional economies than the geographically dislocated, although more powerful giant MNC planning firm structures. Maskell et al (1998) also remark that in highly developed value-added clusters, industry cultures flourish through interactions taking place along firm value chains and within surrounding networks. Hayter et al (1998), Barnes and Hayter (1998) and Steed (1982) suggest that the ways the local SMEs organize and create their technological and product research and development (R&D) attributes herald future possibilities for local development, building a critical mass of best practices across business management/human resource development and resource conservation. Flexible specialization, therefore, as a dynamic process of knowledge intensification, skills and resource exchange in highly developed interdependent industry clusters propels regional industrial capacity and competitive advantage (Maskell et al 1998; Porter 1990).

2.2 SMES AND INNOVATION

Recent literature on SME innovation has revealed the ways that firms create specific innovative strengths, or areas of expertise, that enable development and adaptation of their products and processes to maintain competitive advantage. Freeman and Soete (1997), for example, compare innovation characteristics and

their effectiveness among three firm types, namely the product and process innovations made by entrepreneur/start-up SMEs, large SMEs, and giant multinational (MNC) firms (Table 2.1). Table 2.1 relates firm size to innovation. Eight innovation characteristics describe motivation, flexibility and cost advantage across product invention and adoption resources for marketing and scaled up production, external knowledge and skills adoption. Three firm stages loosely related to size categorized by Freeman and Soete (1997) are distinctive regarding effects on comparative advantage across innovation characteristics.

Both start-up SMEs and large SMEs have greater motivation and flexibility than MNCs during invention and technology adoption stages. However, large SMEs have greater capabilities for developing their products, production processes and markets than do the tiny SMEs (Table 2.1). For example, decreasing technology adoption flexibility is associated with increasing firm size (Table 2.1). In contrast, the flexibility advantages of large SMEs are challenged by scale economies and market expansion resources of MNCs (Freeman and Soete 1997).

Freeman and Soete (1997) emphasize that the significant core strengths of SMEs are flexibility, efficient internal communication channels, and concentration on specific product development. These strengths may be furthered by strengthening the inter-relationships and integration of R&D, marketing and production functions. Moreover, by reliance on ingenuity, flexibility, basic or informal R&D, new low to medium-technology SMEs in particular initiate production and are able to invent important new products and processes (Freeman and Soete 1997). Steed (1982) and Britton (1991) note that Canadian manufacturing SMEs typically under-access available public sources of R&D and capital. The important implication of this finding is that unmet potentials for SME innovation may be realized by particularly innovative SMEs. Large SMEs are particularly adept in product design, and research and development that require substantial internal and/or external sources of capital (Hayter 1997).

Table 2.1 Comparative Innovation Advantages of Three Firm Types

Innovation Characteristic	Entrepreneur SME start-up	Large SME subsequent product	Established MNC
Motivation for product innovation	1	1-	3
New product/ technology adoption	1 +	2	3
Cost/ speed of prototype and early model manufacture	1	1-	3
Market penetration resources	3	2-	1
Large series production/marketing	3	2-	1
External knowledge/cost advantage	1	3	2
New product R&D resources	1 -	3	1
Ability to develop technology	1	3	1

Source of data: Shimshoni (1970) in Freeman and Soete (1997)

Note: 1+ = highest advantage; 3 = lowest advantage (yellow cells show large SME level 1-2)

Empirical research on relationships between firm size and rates of informal and formal innovation indicates that start-up and later stage SMEs have made disproportionately large contributions to radical product inventions in both UK and USA manufacturing industries since 1902 in comparison to MNCs (Freeman and Soete 1997). However, patent records also show variations in registered inventions among SMEs of differing stage, size and industry type. Therefore, firm size, location and industry type are important for evaluating product or process innovation amongst firms (Freeman and Soete 1997). Overall, creative product development is best initiated and managed by a mixture of SMEs that include both tiny and large SMEs within the industrial district (Storper and Harrison 1991).

Britton (1991) cites the critical restructuring role of innovative Canadian manufacturing SMEs that encompass a range of leading edge practices and creative value-chain organizational and entrepreneurship characteristics. Further reinforcing this view, Steed (1982) recognizes the importance of 'threshold firms' that are highly innovative SMEs and have considerable potential for local development. Hayter et al (1998) suggest such firms could be the basis for a distinct segment of large firms that differ significantly from both small firms and giants. From a local development perspective, threshold firms may be considered as local 'champions' - firms that are big locally. These champion firms are broadly conceived as leading edge or innovative small to medium-sized firms that are important actors in specialized

market niches, but are otherwise not well known; that is they are also 'hidden'. Locally important large firms, or champions, are growth-oriented, dynamic and focused on export development (Hayter et al 1998). Larger SMEs differ from both giant MNC competitors and tiny (one-or-two person) firms (that intentionally remain small in anticipation of stable business, supply and labor relationships within immediate locale).²

Relationships between SMEs and industry clusters remain strong. Geographically, agglomeration tendencies reinforce the skills and innovations contributed by local SMEs as they increase product value internally and through the efficiencies of localized cooperation. Long term local knowledge industry advantages thus remain, collectively, within regions to form resilient localized knowledge structures. Porter (1990) and Maskell et al (1998) argue that tacit or informal knowledge retained locally by way of social and business transactions continues to explain the remarkable retention of localized knowledge and the expansion of regional best practices. In local industrial environments, SMEs tend to prosper in specialized component industry niches where specialist R&D, flexible skilled labor and lower production volumes favor their flexible and cooperative decision-making and labor/ management structures (Freeman and Soete 1997). In contrast, giant MNCs have different creative capabilities, and are better able to capitalize on incremental technological improvements that capitalize on internal scope and volume of R&D, labor and (production engineering) resources to scale up previously introduced product and process innovations (Freeman and Soete 1997). However, as larger SMEs and even individual entrepreneurs frequently patent 'radical' product inventions, and that over time MNCs adopt and scale up, small firm innovations lead to significant change in the nature, trajectory and complexity of regional industrial production (Freeman and Soete 1997).

In summary, a range of informal and formal innovation characteristics offer different advantages to each firm type. SMEs benefit differently from R&D during various size stages. Start-up SMEs remain highly flexible and responsive; yet larger SMEs capture advantages during subsequent product developments, and in design and production of prototypes. Giant MNCs have resources to penetrate new markets

² Maskell et al's (1998) and Porter's (1990) research shows that aggregate behaviors and strategies of these vast numbers of tiny firms, a multitude within each industry, reflect national industrial innovation policy.

and expand existing markets. Overall, the comparative analyses of innovation advantage among firm types illustrate that SMEs in value-added networks depend upon internal communications, flexibility in directing firm growth, motivation for R&D, and long term operating flexibility. By interpreting Freeman and Soete's (1997) data we can better understand how industrial districts achieve comprehensive R&D coverage with a strong core of leading edge mature SMEs along with many tiny start-up firms (Storper and Harrison 1991). The related concept of value chain innovation explores the way production systems operate within and between firms and their suppliers in related industries.

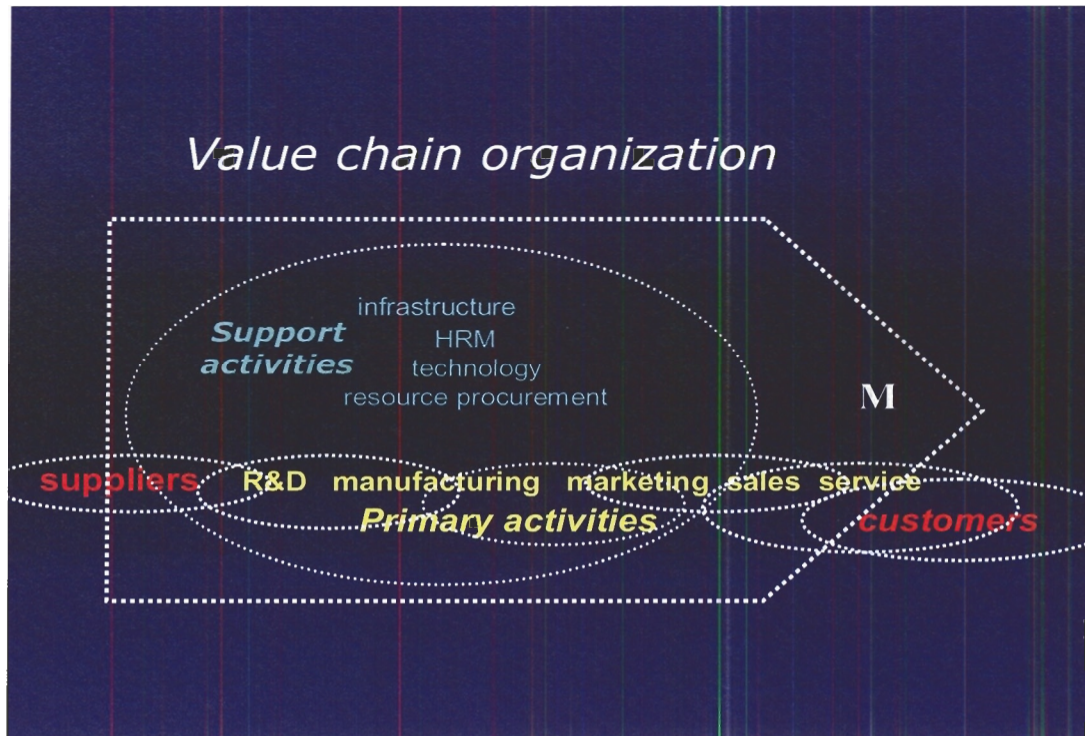
2.3 VALUE CHAINS AND THE LOCAL PRODUCTION REGION

In the business literature, Porter (1990, 1995, 1998) has pioneered the idea of value chains and systems of industrial innovation and development. Porter (1990) explains the value chain as a vibrant and multi-dimensional firm-centered system of industrial production and regional specialization (Figure 2.1). His model of value chains distinguishes support and primary activities. Support activities are infrastructures (physical and planning structures), human resources management (HRM), technology and its associated skill development, and resource procurement. Primary activities are the design, research and development, manufacturing and production, marketing, sales and service mechanisms that deliver products to selected customers.

In Porter's (1990) view, value chains are more than a series of linear interactions linking internal activities of firms to their customers and suppliers. Niche markets and products are carefully selected and developed according to local supports and resources, and in conjunction with specific customer demand. Primary activities produce outputs and also draw upon a myriad of supporting activities and internal relations (Figure 2.1). Value chains involve local exchanges of knowledge and resources, promote the flexibility of firms and identify 'codified knowledge', that is formalized, written and registered legal patents for products and processes directed towards specialized niche markets. Furthermore, Porter (1990) states that firms must coordinate inter-related value chain activities throughout primary (production) activity - R&D, manufacturing, and sales-marketing-service development. The ideal

production model would develop in concert with internal support activities, and those of supplier and market (channel) value chains.

Figure 2.1 Value Chain Organization: Primary and Support Activities



Source: adapted from Porter 1990

Studies of firm value chain innovations in economic geography reveal the nature of linkages that successful firms are able to forge within local, national and global trade networks (Maskell et al 1998). This analysis helps understand how firms expand value chains towards the market niches of specialized industrial export customers (Porter 2000). The promise of the value-added concept within the context of flexible specialization is that economic value is captured by firm value chain innovation, while knowledge spillovers are dispersed, circulated and retained regionally. Value chains are an expression of the economic (profit) value captured by all dimensions of firm product and process innovations (Porter 1990). Value chains broadly encompass innovative natural resource utilization and labor organization in the trade and political arenas. Indeed, innovative development of value chains towards the 'highest value', or market end of the supply chain diversifies local and regional growth by acting in concert with local actors and agencies,

networks of research facilities, suppliers, education, services and other industries and associations to instill core firm competencies (Porter 1991, 2000; Maskell et al 1998; Hayter 2000).

A related conceptual framework proposed by Porter (1990) interprets local advantages and constraints in terms of local 'factor conditions' that support innovation at startup and during later industrial growth and developmental phases. These interdependent factor conditions, or assets, refer to natural, human and capital resources; physical, administrative, information and scientific/technological infrastructures, all of which can be developed by firm innovative capacity within the regional competitive context (Porter 2000). Porter's research on industrial factor conditions focuses primarily on industrial knowledge development at regional, national and international scales. This thesis adopts Porter's value chain framework to understand the local economic geography and character of the case study firms.

Porter's general advice is that local development is best achieved by producing more economic value with higher value products (or value-added products) rather than greater volumes of commodities or unprocessed goods that rely on internal economies of scale. This argument is that with industrialization labor costs increase, and in order to offset these higher costs firms must increase the value of their products, possibly in association with advanced skills. For Martin and Porter (2000), innovation and progressive commitments to enhancing value are important, related imperatives for profitability that firms need to seek internally and throughout supply management chains. Commitment to progressively develop value chains is linked with geographic clustering of industrial activities (Maskell et al 1998; Porter 2000). In this context, the activities and inputs of firms are seen as value chains that require close coordination and the full utilization of locally-based physical and human resources (Porter 1990).

Analysis of value chains is of critical importance when considering the relationships between internal firm competencies and local networking advantages. Porter (1985, 1990) conceptualizes the firm's internal value chain as the analytical centre point, absolutely crucial for understanding firm cost advantages and differentiation capacities in organizing product and process innovations and coordinating activities. In his view, the creation and growth of firms must incorporate radical and incremental innovations throughout value chain activities. To develop specialized, geographically-based market niches, firms must use creative

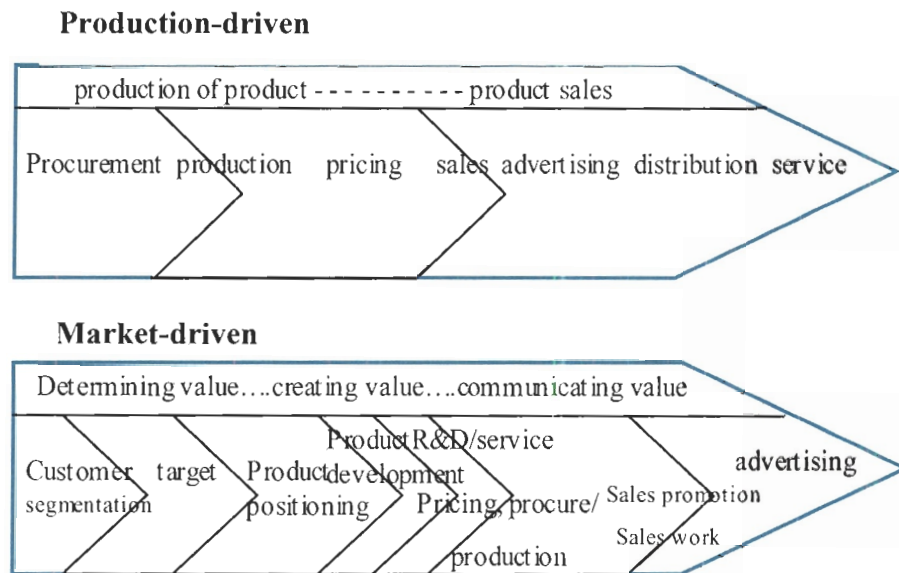
'differentiation' strategies, or product specializations, and iterative management processes while continuously balancing support and primary, production-related activities.

Porter's (1990) value chain model highlights the importance of both primary (production) and support activities of firms that add value to firm services and products. According to Porter (1990) the building of strong value chains draws upon and reinforces local clustering through inter-firm networking and interaction. Value chain innovations represent significant dual commitments to enhancing firm profit, while building a local core of value-added industrial development (Britton 1990; Hayter et al 1998). The value chain model suggests engagement of labor, management and entrepreneurial assets along the firm's value chain, yet recognizes the complexity of behaviors and activities that effect production efficiencies.

Strong value chains may achieved by focusing on customer demand (Porter 1998), and by adopting a 'market-driven' or value-based and customer-oriented approach to design, production and marketing of products (Pesonen 2002). The market-driven process seeks knowledge of customer needs and incorporates customer input in product design (Pesonen 2002). In contrast, 'production-driven' market development is based on manufacturing and supply chain efficiencies (Figure 2.2).

In advanced value-added production, market intelligence, an understanding of niche market demands, is integrated with primary activities to anticipate R&D and manufacturing (Pesonen 2002). The market-driven process (Pesonen 2002) extends Porter's (1990) value chain model to focus specifically on customer feedback for product designs in specialized markets (Pesonen 2002). The market-driven approach represents a sea change from the production-driven traditions of primary industries (Pesonen 2002) and commits firms to advanced communications that engage niche market customers in product R&D activities. Pesonen's (2002) model also reinforces Porter's (1990) proposal for highly specialized value-added product and market niche development. This iterative value-based process involves suppliers, institutions and industries within the production locale (i.e. R&D collaboration and product certification), as well as providers of transportation and related services.

Figure 2.2 Comparative Marketing: Production-driven and Market-driven



Source: adapted from Pesonen 2002

2.3.1 Entrepreneurship and SMEs

The literature on entrepreneurship reinforces Porter's (1990) and Freeman and Soete's (1997) studies of SME innovation, for entrepreneurs-owners of SMEs rely on familiar local place-based assets, socio-economic conditions and relationships (Man and Chan 2002; Tilley and Tonge 2003; Hillary 2000). Furthermore, SME start-up owners must rapidly learn and apply innovative entrepreneurial and personal competencies that are founded on relationships, concepts and original ideas, organization, strategy and commitment (Man and Chan 2002). During rapid growth, however, SME competitive advantage often remains tied to the industrial district through historical industry supply networks, and competition and cooperation (Man and Chan 2002). Ideas that focus on specific entrepreneur-owner abilities also suggest a strong formative role for value chain development and early establishment of dynamic infrastructures accompanied by managerial expertise (Porter 2000).

Active and dynamic industry clusters attract SMEs during their founding phases (Stuart and Sorenson 2002). At start-up many SMEs establish in or near geographical clusters of like industry firms where entrepreneur-owners form attachments and share industrial knowledge, business connections and labor resources (Stuart and Sorenson 2002). Longer-term business sustainability prospects among established, large SMEs are more related to their internal capital and labor assets, and to competition and cooperation factors. Agglomeration attractions most favorable to business establishment and growth also enable continuing competitive advantage for mature SMEs in resource-dependent manufacturing industries (Porter 1990; Hayter et al 1998; Maskell et al 1998; Bekar and Lipsey 2001). Britton (1991) stresses that formative location decisions, focused entrepreneurship, and innovative, specialized market niche strategies are critical challenges affecting long term success and growth of all new Canadian manufacturing firms. One year firm survival rates for all small business startups in Canada are in decline, at the same time as “the number of business startups keeps snowballing” (Johnson 2004 np). Faced with intense competition from giant firms and local competitors, new SMEs must remain dynamic through early rapid growth phases after startup (Johnson 2004). Remarkably few SME start-ups, however, are able to move beyond the early market niches during formative years (Johnson, 2004). BC's wood value-added industries are represented by many such firms;

“Hundreds of small BC firms which will always remain mom and pop operations - keeping one or two people busy making cabinets for the builder down the street... with no interest in product, process or market innovation ... or in exporting” (Downing 2003).

In contrast, particularly large or rapidly expanding SMEs represent a special sub-type that may have potential for innovation across internal and networking activities (Hayter et al 1998). The economic geographies of such firms reveal their ability to expand market niches while retaining their capabilities within the local institutional environment and production region (Hayter 2000; Maskell et al 1998). Since contemporary literature increasingly recognizes innovative value-added production as a means to strengthen local and national industrial diversity (Porter 1990, 2000) leading local firms are significant for revealing approaches that address economic-employment and environmental goals. Several studies have suggested a pivotal restructuring role is realized by leading edge, locally important firms or ‘hidden

champions', also known as 'threshold firms' (Steed 1982). Steed (1982) considers these large SMEs to be key local innovators in specialized export market niches that supply industrial customers, but otherwise are 'hidden', or not widely known. Such firms are also the basis for a distinct segment of large firms that differ significantly from both small firms and giants (Hayter et al 1998). In B.C., a few studies have noted the advantages of a regional core group of value-added champions within the province's forest industry restructuring process (M'Gonigle and Parfitt 1994). Inspiration, leadership, commitment and vision are the impetus for innovation and change towards sustainable production. M'Gonigle and Parfitt (1994) advocate a shift towards the value-added solution in BC forest industry production practices, as illustrated by Larevee Guitars and BW Creative Wood.

Firm categories and boundaries are imprecise and vary according to value chain activity, management and supply characteristics, product orientation, firm size, growth and market expansion. In contrast to giant firms, champions are locally important, attached to local places, and able to access informal local knowledge innovation (know-how). Large SMEs may prosper in peripheral regions or within prosperous industrial districts. The success of SMEs, however, is uncertain. Britton (1991), for example, states that less than one third of successful one-year business survivors reach local prominence within five years. Among all Canadian small firm start-ups, only 10% remain in business beyond the first year (Britton 1991). In contrast, champion firms are by definition successful, and have already managed internal and supply operations, start-up capital acquisition, delegation of HRM, and rapid employment growth (Steed 1982; Britton 1991).

2.4 CONCLUSIONS

The conceptual literatures of flexible specialization, SME innovation and BC value-added studies have been reviewed in this chapter. The chapter has commented on the importance of linkages between locally large SMEs, their customers, and local flexibly specialized value-added networks. By examining the value chain and flexible specialization concepts in relation to BC forest industry studies, my thesis seeks to understand how BC value-added manufacturing, and 14 champion firms in particular, promise to positively affect the interplay of: innovation-driven SME expansion and a hearth of best practices; specialized global niches; and

expanding local skills and employment with fewer wood inputs in processing. Champion firms are frequently commended for their design ability that exploits trade (USA softwood product tariff) exemptions, and to capture significant wood conservation, eco-certification and reprocessing efficiencies (M'Gonigle and Parfitt 1994). The following chapter reviews contemporary restructuring of the BC forest economy and the implications of value-added wood production. Chapter 3 then describes current trends in BC's wood value-added sectors and introduces the 14 case study firms. Barnes and Hayter (1997) and M'Gonigle and Parfitt (1994) argue that to address economic and local development imperatives, BC's forest industry production must shift emphasis to value-added products and processes in order to meet employment and environmental goals. The remainder of this thesis addresses this prospect from the perspective of large or champion SMEs.

CHAPTER 3 BC FOREST INDUSTRY VALUE CHAIN AND HIDDEN CHAMPIONS

This thesis investigates the activities and characteristics of 14 wood value-added case study firms. To contextualize the role of these firms and their six respective industry sectors (sub-groups), this chapter reviews recent forest industry dynamics, and situates BC's value-added activity within broader forest industry production. The current activities of study firms are then highlighted with a focus on their regional location, product line, sales and employment characteristics. The final part of the chapter provides a brief overview of their current production trends and market approaches. This discussion summarizes key product, processing and market attributes of respective case study sectors represented by the 14 firms. This chapter defines the rationale for promoting value-added production; and introduces the cases identified as leading edge manufacturers whose production processes provide a contrast to the traditional structures of British Columbia's forest economy.

3.1 FOREST INDUSTRY RESTRUCTURING DYNAMICS

The BC forest industry remains in a prolonged state of crisis in terms of sustaining local forest resources and local economies (Drushka 1985; Hayter 2000; Marchak 2000). From the late 1970s to the present time, the provincial forest economy has experienced hard years of deep industrial, social, political and ecological change, associated with and even precipitating an emerging awareness of the need for more sustainable forest resource uses. In this context several commentators have urged that innovative value-added production be developed in BC to build a viable and diversified industry within the local, regional and national economy (Hayter 2000; M'Gonigle and Parfitt 1994; Rees and Hayter 1998). According to this viewpoint such an expansion of the range and diversity of locally designed and produced lean products must proceed in concert with considerations for 'multiple forest values' or ecologically and socially based values (Clapp 1998; Hayter 2000; Marchak 1999). BC's value-added manufacturing industries promise to: increase employment with far lower wood volumes than in primary production; gain

access to USA markets with highly processed, tariff exempt products; and manage efficient wood utilization, conservation and reprocessing.

In BC, the 'Fordism' phase of capitalism, especially after WWII between the 1950s and 1970s was a time of expanding sales punctuated by volatile cycles based on mass production of undifferentiated commodity forest products, and socially differentiated (mostly unionized) labor force. During this period BC's value-added/secondary manufacturing was a relatively minor component of the provincial forest economy, especially in advanced and engineered wood product sectors (i.e. furniture, millwork, trusses and laminated beams). Recent forest industry research, however, stresses the great potential of emerging and established value-added SMEs as core contributors to local flexible specialization (M'Gonigle and Parfitt 1994; Hayter 2000). This thesis takes the position that leading value-added SMEs have specific attributes that would contribute disproportionately to creating differentiated, advanced wood products for specialized global market niches (Industry Canada 2005). However, global competition in forest products is a compelling counterforce to localized industry development SME agglomeration. World markets, MNC competitors and foreign ownership impact local firms and institutions, and decrease local/provincial controls over supply, labor and resource environments. Globally, forest industry harvesting patterns are based on availability and quantity of standing timber, harvesting and transportation cost advantages (Clapp 1998).

Shifting location advantage frequently favors those forest regions producing virgin timber or fast growing, fast maturing plantation species (e.g. radiata pine grown in Chile and New Zealand) suited for primary processing or wood chipping operations. Traditionally, forest regions have engaged in a vicious, escalating cycle of extraction and production that leads to local resource exhaustion (Clapp 1998). In contrast, the flexibly specialized wood value-added industries demand a somewhat different set of location advantages connected to local institutions: stable supply access; highly flexible, skilled labor; collaborative internal and/or external research and ongoing technology development and training. Yet in practice, BC value-added manufacturers face numerous challenges to flexible specialization that continue to be shaped by entrenched employment and cost structures (Hayter 2000).

3.2 FOREST INDUSTRY PRODUCTION TRENDS

Recent trends in the BC forest economy show a precarious position for the primary wood products sector. Declining provincial revenues and job losses during the 1980s and 1990s have exposed a fragile industrial base that remains dependent upon sawn lumber, pulp and paper and raw log exports (Industry Canada 2005). Weak sales for commodity products, heavy employment losses and revenue declines (in the form of payments to the province) have been suffered by the provincial economy, industries, and particularly, forest dependent locales and rural communities. Direct forest industry employment fluctuated throughout the 1990s, yet posted an overall decline of more than 3,000 jobs during the decade (Table 3.1).

Nonetheless, BC's forest based exports accounted for one third of Canadian forestry exports during 1999, indicating provincial forestry to be a vital component of national trade. For example, Canadian forest exports were valued at \$44.2 billion in 1999; USA customers purchased 88% of all softwood products (79% of all species) harvested in Canada, making the USA the leading marketplace. The largest share of Canada's 'processed' products, however, are (minimally processed) pulp, newsprint and softwood lumber (CFS 2003), although literature cited in my research argues that such products generally add value to raw log shipments with relatively small inputs of local employment (Hayter 2000). Data for capital expenditures in wood products during the 1990s (especially since the high point in 1995) indicates the BC wood industries are failing to commit capital to infrastructure, process and skills development (Table 3.1). In this regard, Industry Canada summarizes the recent (still bleak) restructuring trends that provide such a significant backdrop for the emergence of value-added production in the province;

Throughout much of the 1980s, the primary strategy of... the sawmill sector was to increase revenue by increasing productivity and capacity. Raw material supply was relatively cheap and plentiful, and commodity markets could take as much as the sector could produce. The coast of BC was (and remains) an exception, given the unique size and quality characteristics of the resource; however, productivity was seen to be the key to profitability. There was also a focus...primarily on volume recovery... and since mills could do very little about log costs the focus turned to reducing manpower costs. The objective was fewer people producing more lumber...on making the equipment run faster...and on finding ways to automate what were often very labour-intensive manufacturing processes. (Industry Canada 2005)

BC's forest exports are characterized by the highest 'unprocessed' volumes (i.e. wood chips and raw log softwoods) and sales among Canadian provinces (Natural Resources Canada 2003), and general trends in BC forestry employment show declines in BC throughout the 1980s and 1990s. These job losses are especially troubling in view of poor sales for many primary forest products, and increasing global competition in commodity wood products (Hayter 2000). For example, softwood and wood pulp sales remained stagnant through the 1990s, although some other product sales, including value-added, have gained ground during this period (Table 3.1). Recent employment trends in the BC forest industry parallel the declining revenues earned by the province, and generally stagnant sales between 1995 and 1999 (Table 3.1). A disastrous nine-year net loss of 3, 000 full time direct forest industry jobs indicates the depth of BC's forest industry restructuring difficulties. Provincial forestry job loss and capital expenditure declines during the 1990s indicate there are few secure forest industry jobs across the wood industries.

However, there are several interesting exceptions to BC's forest industry employment and innovation problems, namely the long-established MNC and foreign owned primary plants that have undergone internal restructuring; the largest, growth oriented specialty remanufacturers (mills producing high volume uniform oriented strand board, veneers and multiple ply sheet goods) connected to primary operations; and last but not least, the largest and most innovative value-added manufacturers. Within the BC industrial restructuring environment, value-added industries promise to create growth of skilled employment within a more flexible and durable production system that pursues long term sustainability of human and wood materials (CFS 2003).

Table 3.1 BC Forest Product Sales, Expenditures, Revenues, Labor 1990 - 1999

	Total direct FTE	Total Value- added sales(\$M)	Total manufactured *wood sales (\$M)	Total Paper industry Sales (\$M)	Total Sales (\$M)	Total forest industry revenues to BC (\$M)	Capital Expenditures manufacture (\$M)
1990	93 800	1 540	6 377	5 122	11 499	1 561	
1991	90 700		5 912	4 337	10 249		152
1992	92 200		7 284	3 882	11 166		155
1993	92 200		9 567	4 058	13 625		268
1994	95 900	1 930	10 775	5 006	15 781	1 884	506
1995	97 500		10 699	7 792	18 491		539
1996	99 100		11 018	5789	16 807		414
1997	97 250	2 690	11 442	5 392	16 834	1 851	347
1998	91 400		10 187	5 436	15 623		242
1999	90 600	2 900	12 211	6 402	18 613	1 626	209

Source of data: Statistics Canada 2002; BC Statistics 2002; BC Wood Specialties 2002
(*wood sales data include value-added wood product sales)

3.2.1 The Promise of Value-added

BC's value-added wood production fits within the broader forest industry profile of BC and Canadian forestry, although there is no precise definition for 'value-added' nationally or regionally. Even within BC primary industry and related research institutions, various terms are used to describe value-added industries and sectors³. However, the BC wood manufacturing industries Association, BC Wood Specialties (former value-added technology training institute), and technological research/training institutions, University of British Columbia (UBC) Forestry Centre for Advanced Wood Processing (CAWP), and BC Institute of Technology (BCIT), provide the value-added definitions and relevant data for this research. These organizations loosely define 'value-added' as secondary manufacturing by SMEs that are producers of specialized, highly engineered or advanced wood specialty products. The largest provincial wood value-added association, BC Wood Specialties, includes remanufactured and engineered wood, architectural millwork and prefabricated (pre-manufactured) structures; cabinets and furniture in its six major value-added industry sectors (sub-groups or classes). These BC value-added

³ The primary (i.e. sawmilling, paperboard and OSB) plants refer to themselves as 'value-added' manufacturers. BC Statistics also classifies these industries, along with furniture, as 'secondary manufacturers'. Industry Canada does distinguish value-added from primary production, yet classifies industry sectors differently than BC industry.

sectors differ somewhat from those of the Industry Canada and Statistics Canada database, making inter-provincial comparison unmanageable for specific value-added sectors (i.e. Industry Canada's North American Industry Classification System, NAICS, harmonizes Canadian, USA and Mexican industry classes). The analysis in this chapter thus uses national and provincial data advisedly: the Statistics Canada data for comparing general provincial sales and employment; and BC Forest Statistics, Canadian Forest Services (CFS) and BC Wood Specialties data for reviewing BC value-added sector-specific trends. However, the growing significance of Canada's value-added wood sectors has been noted in the industry, government and academic literatures of innovative local and regional economic development;

Value-added wood products are a relatively new focus for governments and the industry. There is no set list which defines value-added wood products...five categories of value-added wood products accounted for \$6.1 billion in manufacturing shipments in 1997. The contribution of value-added wood products to the balance of trade has increased greatly in recent years. Whereas the balance of trade was near zero for five product categories in 1991, it neared \$1.5 billion in 1997. (Industry Canada 2004)

In Canada, most wood value-added manufacturing is concentrated in central Canada, where the great majority of SMEs and large firms manufacture advanced wood products. For example, Ontario's value-added sector is eight times larger than BC, and Quebec value-added firms produce four times BC's value-added sales output. Both Quebec and Ontario wood value-added clusters, composed mostly of furniture, millwork and prefabricated structure firms, have captured regional competitive advantage (Industry Canada 2004).⁴ Some commentators argue that remanufactured wood should be excluded from value-added, since product lines encompass boards, structures, tongue and groove panels and rough sawn lumber. The particular hope for BC value-added industries is to create localized value-added strength that includes both the remanufactured and engineered sectors using local softwood species.

BC wood value-added firms are situated intermediate in location and process between standing timber (and/or primary producers, sawmills, log markets, tenured forest lands, community forests) and generally, specialized market niches. These industry sectors would thus have distinct potential for creating higher value, highly

⁴ Engineered and remanufactured products are not included in these data, so the position of BC's value-added sales within Canada would be stronger with the inclusion of these two relatively large sectors.

refined products and lower-volume processing than primary industries (M'Gonigle and Parfitt 1994). Important community actors, the local value-added SMEs would participate in local training and become intimately connected with the locale by developing value-added production networks (i.e. re-manufacturing primary by-products, millwork, furniture), and potentially capturing higher employment and economic value for the region (Hayter 2000; M'Gonigle and Parfitt 1994).

BC Value-added Production and Employment

In BC, the wood value-added industries generally rely on dedicated capital, human resources and creativity with a focus on specialized export market niches (Industry Panel 2003; Hayter 2000). Indeed, a notable expansion occurred in BC's value-added sales during the 1990s; the BC value-added sectors captured over 20% of provincial wood product sales by 1999 (Table 3.1). A comprehensive survey of BC value-added firms documented 14 000 fulltime employees involved in the main value-added wood manufacturing sectors during 1999 (CFS 2003). In contrast with BC's primary production base, the contemporary wood value-added landscape (1999-2000) shows significant growth in flexible specialization (CFS 2003); this success is manifested in sales and employment of 703 BC firms (Table 3.2)

Most BC value-added firms are small. In 1999, for example, 40% of value-added firms had fewer than ten employees, and average employment across sectors was 20 full time jobs (CFS 2003). Value-added sales were mostly within local markets (Canada Wood Council 2004). Since 1993, however, the BC wood value-added industries have focused increasingly on export sales, although export markets have been pursued by only a small portion of BC's value-added firms. These generally larger export-oriented SMEs include the case studies examined in this thesis (Industry Canada; Industry Panel 2003).

Table 3.2 BC Value-added Industry Sectoral Employment, Sales and Plants - 1999

Industry sector	Total value-added Employment	Total Sales (\$M)	Total number of BC plants
Cabinets	900	100	90
Engineered wood	3 700	650	190
Prefabricated structures	6 000	1 590	170
Furniture	1 100	140	75
Millwork	1 800	234	120
Other	910	186	58
	14 410	2 900	703

Source of data: Canadian Forest Service 2003

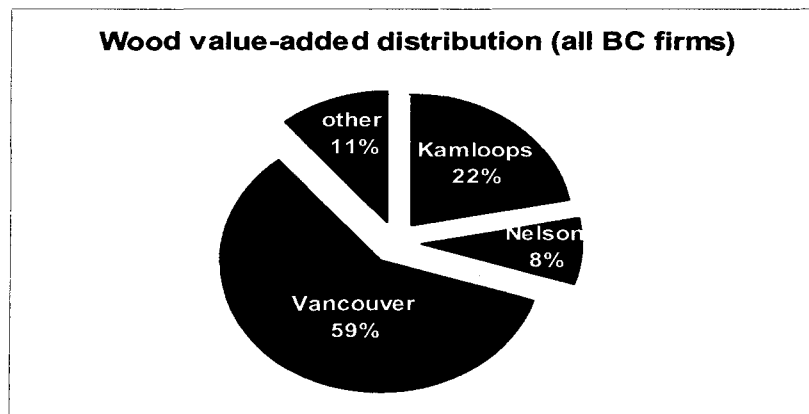
Sales have increased in six value-added sectors that comprise BC's wood value-added industries, although yearly variations among sectors were linked in part to impacts of the Asian economic problems and disruptions of BC-Japan wood sales (BC Wood 2004). In general, rising value-added forest product sales during the 1990s reflects reliance on USA markets, along with strengthening Japanese niche markets (CFS 2003; BC Wood 2004). The heightened fortunes of provincial value-added sales during the 1990s should be considered in the context of dismal primary forest industry performance; for the flexibility attributes noted in value-added agglomerations rely on rapid response to dynamic conditions typical of industrial restructuring, although at a smaller production scale (Downing 2003; Chan 2003). Indeed, wood value-added sales have nearly doubled in BC over the past two decades and rose sharply during the 1990s (Table 3.1); while employment increased by 2,000 jobs in this ten-year period (CFS 2003). However, sales growth outstripped employment gains by 20%, while the total number of value-added manufacturing firms grew from 565 to 703 during the 1990s (CFS 2003; BC Wood 2003). These data indicate in part the potential for BC value-added production. On a local geography basis, however, the shape of BC's value-added production tends to be segmented between very few industrial districts in southern BC regions.

Regional Distribution of BC Value-added Manufacturing

In terms of regional value-added distribution, over 80% of all provincial wood value-added enterprises are within the Vancouver and Okanagan forest regions, 59% in the Lower mainland, and 22% located in the southern interior Kamloops/

Okanagan region. The remaining 19% are dispersed throughout Nelson and other forest districts (Figure 3.1). In contrast, the 14 case study firms are selected from a narrow base of 28 large BC sales leaders. Within this smaller, leading-edge group or champion firm category, well over 90% of identified (large) firms are located in either the lower mainland or south Okanagan (Industry Panel 2003). Therefore, in view of overall growth trends documented across contemporary value-added sales, employment and facilities (albeit concentrated mainly in Lower mainland and Okanagan regions), flexible specialization production in the Vancouver and south Okanagan promises to create and/or increase inter-sectoral diversity of product, process and market niche development, and to further local skills and technological development (M'Gonigle and Parfitt 1994; Reiffenstein 1999; Hayter 2000; Wood Manufacturing Council 2004). The contemporary value-added environment would be expected to reveal varied innovation characteristics amongst the 14 study enterprises that are the subjects of the remainder of this chapter.

Figure 3.1 Regional Distribution of BC value-added firms - 2000



Source of data: CFS 2003

3.3 POTENTIAL CHAMPIONS OF THE BC FOREST INDUSTRY

The promise of flexibly specialized value-added production is expected to be revealed in the location dynamics, behaviours and operations of the 14 case study firms. Their potential for innovative and locally-based competitive advantage is anticipated across product, market, human resources and wood supply development (Industry Panel 2003; Downing 2003; Hayter 2000). The case study firms represent a

potentially large source of value-added productivity within the remanufactured wood; engineered products; millwork; prefabricated structures; cabinets and furniture sectors.⁵ Most study firms are non-unionized and located in south west BC (Figure 3.2). Their respective industrial districts are two facets of BC's southwestern cluster of large, innovative firms that exhibit high sales and employment (Downing 2003).

Within these industrial locales, each study firm represents a distinctive example of strategic establishment and growth that addresses varied location and institutional/community relations; product and process developments; adaptations of local wood species; and export market orientation (Appendix C). The main business characteristics of each enterprise are introduced according to location, industry sector and main product mix. These characteristics are then discussed in connection with broader economic contributions to BC's forest economy made by the 14-firm study group. In general, the firms are ordered sequentially throughout this discussion and in the subsequent chapters: remanufactured products (Firms R1, R2, R3); engineered wood products (Firms E1, E2, E3); architectural millwork (Firms M1, M2); prefabricated structures (Firms P1, P2); and the four cabinet and furniture study firms, two from each sector (Firms C1, C2, F1, F2) combined in Chapter 3 and Chapter 4 as one industry group in consideration of product R&D similarities and complementary manufacturing processes.

This study reveals that collectively, the case study firms make significant sales and employment contributions to the industrial fabric of BC forestry, with sales and employment of the 14-firm group constituting over 10% of BC value-added production (Table 3.3). Yet the firms represent only 2% of all value-added manufacturers (CFS 2003); thus their sales contributions, exceeding 10%, and employment, accounting for 11% of value-added, demonstrate their strong aggregate quantitative contributions. Beyond these measurable economic advantages, however, the firms show potential for localized processing that would promote highly skilled employment and higher product value goals over the long term. Furthermore, all study firms have remained within the regional locales of initial business starts, and continue to exhibit diverse product lines (Table 3.4), manufacturing and marketing characteristics over their 50 year formative period.

⁵ The BC Wood Specialties classifies one additional 'specialty products' sector that describes all other wood products, for example musical instruments, wood boats, handcrafted and artistic woodworks.

Table 3.3 Study Firm Employment and Sales, BC value-added - 2002

	BC value-added firms	Study firms	% study firms' contribution	Average per study firm
Number of firms	703	14	0.2	
FTE	14 400	1 598	11.1	114
Sales (\$M)	2 900	299	10.3	21

Source of data: Study firm fieldwork data 2004; BC value-added firm data, CFS 2003

Figure 3.2 Map of BC Shows Locales of Case Study Firms at Start-up



Table 3.4 Study Firm Location and Product Mix - 2002

Firm/sector	Location	Main product mix
R1 Remanufactured	Okanagan	1" spruce/pine/fir (spf) finished board and custom specialty board products.
R2 Remanufactured	Okanagan	Knotted Lodgepole Pine furniture. Custom wrapped/ sized pine and spruce edge-glued panel for furniture industry; tongue and groove pine and clear cedar kiln dried (K.D) wall paneling; groove wall paneling; specialty mouldings; custom finished specialty wood.
R3 Remanufactured	LM	Products: lumber and sawn timber; prefabricated structures; cedar siding; decking; fencing, ornamental wood fascia; custom specialty remanufactured lumber.
E1 Engineered	Okanagan	Structural laminated wood (glulam) beams and laminated structural members; custom pre-cut packages for commercial and residential projects.
E2 Engineered	LM	Structural engineered trusses and structural members; MSR (machine stress rated) and planed and milled specialty engineered wood products.
E3 Engineered	LM	Structural insulated and engineered panels; self-supporting structural wall membrane replaces wood frame construction.
M1 Millwork	LM	Architectural millwork and hardware: interior stair components and exterior deck accessories.
M2 Millwork	LM	Prefinished millwork and mouldings; interior and exterior doors; panel products.
P1 Prefabricated Structures	LM	Premanufactured custom home packages: structure design, engineering and manufacture.
P2 Prefabricated Structures	LM	Premanufactured commercial, industrial and residential structures; custom design and manufactured projects.
C1 Cabinets	LM	Counter and cabinet components, four wood product lines: a) Laminate doors - high pressure laminate and wood veneer b) Solid wood doors c) Medium density fibre board (MDF) painted doors d) Casework - gables, mouldings, valances, decorative ends (European design adapted)
C2 Cabinets	LM	Catalogue and custom wood cabinetry for residential, commercial projects.
F1 Furniture	LM	Bedroom and occasional furniture: master bedroom suites; coordinated collections for youth bedrooms, dressers, chests, computer desks, mates and sleigh beds.
F2 Furniture	Okanagan	Lodge Pole pine residential furniture: full range household furnishings.

3.3.1 Study Firm Overview

An overview of the case study firms introduces characteristics that relate to their respective industry sectors, and aspects of firm differentiation strategies within industries. The case study firms, as part of the value-added industries, generally incorporate relatively high labor/employment values within (typically) high sales-low volume processing. The majority of the study firms, excepting the most recent firms (structural engineered wood firm E3 and cabinet firm C2) report relatively high fulltime employment levels coupled with comparatively high industry wages (at or above union wages if non-union). Qualitatively, their workforces typically include large proportions of skilled, professional, technical and management staff with forest industry, management, research and technological experience. My study of general employment characteristics also indicates that their labor pools are composed almost entirely of local employees. Although their overall management, skills and manufacturing activities indicate potential for more intensive processing than average value-added SMEs, variables separating study sectors are explained in part by inter-sectoral differences in production volume, product and processing. However, during 2002, the benchmark contemporary period for comparing study firms, 10 of 14 study firms exceeded BC's mean value-added industry employment and sales ratios, when I included all value-added firms within each sector. These introductory qualities suggest potential. The following review briefly comments on five study firm industry sectors, and explains how each case develops production and markets characteristic of their contemporary operations.

Remanufactured Wood Study Firms - R1, R2, R3

All three remanufacturing firms (R1, R2 and R3) are closer to the production traditions of primary processors (i.e. highest volume products) amongst the value-added sectors represented in this research, and particularly compared to the lower volume/intensively processed engineered wood products, millwork, cabinets and furniture study sectors⁶. The remanufactured study firms R1 and R2, however, have higher than average employment and sales (i.e. compared to BC remanufactured sector means for full time jobs and sales). Most remanufactured products in this

⁶ Remanufacturing and prefabricated study sectors (firms R1, R2, R3, and P1 and P2) represent the lowest employment per sales sectoral averages among the case study sectors examined in my research.

study consist of re-sawn, specialty-cut, partly assembled or ready-to-assemble (RTA) board products and specialty items like panels, fence posts and gazebos with a high percentage of solid wood fiber in high volume finished products (compared to the other sectors examined in this study). Mr. D of lower mainland firm R3, for example, notes that his firm's value-added remanufacturing production process is characterized by primary-focused "volume production machinery, product wrapping, extensive lumber storage (inbound and outbound) yards and scaled-up transportation facilities."

Cabinet and Furniture Industry Study Firms - C1, C2, F1, and F2

Product quantity and processing differentiates the product and process focus of cabinet and furniture industry study firms sectors from other case sectors. These four firms employ a series of intensive and complex production, reprocessing, finishing and assembly/wrapping lines. Wood inputs for many cabinet and furniture study firm products are already remanufactured or previously processed (i.e. medium density fibreboard (MDF) for furniture components, millwork and cabinet gables). Firm F2, however, produces an entire product line with solid wood inputs in contrast to lower mainland firm F1 that relies almost exclusively on remanufactured wood inputs for its product components, in addition to composite moulding materials, plastics and metals.

The two cabinet firms C1 and C2 are distinct from one another in organization and production. Firm C1 has five main product lines and hundreds of variations. The firm uses many wood inputs, and other materials and components; and has exclusive use agreements with composite materials suppliers. The firm's manufacturing is an "extremely flexible" two level production system - "...with hundreds of different custom jobs happening at any given time" (Mr. V). Firm C2's current strategies and inputs differ. The finished products consist of custom solid wood products as well as composite materials like MDF for cabinet backs, casework and gables. Yet this firm also operates a highly flexible, albeit smaller and simpler processing environment. Firm principal Mr. E explains; "the ideal flexible specialization firm is an assembly space where nearly all inputs for cabinets are produced elsewhere."

Both cabinet firms practice job rotation throughout numerous extensive, and extremely varied firm tasks (from CNC, computer numeric controlled machining, and Cad Cam, computer aided design and manufacturing programming to handcrafted

woodwork skills and hand-finishing). All three non-union cabinet and furniture firm principals comment on their highly developed internal communications that draw no social divisions.

Engineered Wood Study Firms - E1, E2 and E3

A unique industry type within the study group of six value-added sectors is represented by the three engineered wood firms in this study. Engineered wood products are used in a wide range of structural (high strength) applications. Products are generally intended for high strength, large span and/or aesthetic appearance applications with manufacturing technologies (Appendix D) that incorporate;

...the organisation of selected wood components in such a way that parts with the highest tensile strength, for example, will be stressed in tension, while lower grade parts may be used near the neutral axis. This is made possible by pre-sorting and pre-grading lumber pieces in order to optimise the lay-up. Consequently, optimisation of the end-product requires that each step of the way be optimized. (Industry Canada 2005)

Engineered products produced by study firm E2, for example, include various advanced technologies in design, testing and processing, namely MSR (machine stress rated) lumber grading systems; proprietary plate connected wood trusses (engineered prefabricated roof and floor structural members); wood truss hangers and hardware; engineered wood design truss and beams; floor truss testing; shear wall panels; and solid and composite wood beams (including laminated components).

All three engineered wood study firms use highly engineered computer controlled manufacturing processes, yet manufacture diverse products with varied wood inputs. Okanagan firm E1 specializes in heavy structural members like laminated (glulam TM) and complex arched beams, bridge and stadium trusses and roof components. Firms E2 and E3 are more recent lower mainland firms that manufacture, respectively, structural truss and industrial membrane supports; and structurally engineered and insulated building panels. Two of the three engineered wood firm cases, E1 (1962) and E3 (2000) have sales and employment values that far exceed the BC engineered wood sectoral industry average. Skill levels, capital investments and technological development of product and manufacturing processes within firms E1 and E3 are well developed compared to the somewhat simpler production process of truss Firm E2. However, firm E2 has three separate divisions;

only the firm's engineered truss product line is included in this study. (E2's other product lines fall under specialty remanufactured products divisions). Thus the employment and sales comparisons between firms should consider the sophisticated outputs and processes of the (more advanced process) firms E1 and E3. Furthermore, owners of firms E1 and E3 describe their highly integrated product and production research and development as sophisticated and complex processes. Mr. S of Firm E1 notes that "the product and process R&D is undifferentiated in the engineered wood products sector; there are two parts... research, and machinery knowledge, a spillover from the EU." (i.e. E1 imports German machinery for its computer design and manufacturing systems). For these reasons, E2 does not fully represent a 'pure' engineered products firm.

Prefabricated Wood Structures Study Firms - P1 and P2

The two lower mainland prefabricated structure study firms produce an extensive range and variety of products targeting diverse export niche markets; Japanese markets for P1, and USA markets favored by firm P2. The wood inputs of both prefabricated firms incorporate other wood value-added (millwork, specialty lumber) components within complex production processes. Both these Vancouver area firms P1 and P2 manage numerous and complex inputs to manufacture their extensive product lines. Firm P1 manufactures most wood and other components in-house, including hardware, glass and metal framework assemblies and cabinetry. Firm P2 incorporates more externally produced remanufactured and milled wood inputs.

3.4 CONCLUSIONS

This overview has situated the 14 study firms and their respective sectors in terms of their overall economic significance within provincial forest industry wood production. The study firms show significantly high employment and sales ratios (> 10%) compared to respective BC value-added manufacturing sectors; although collectively they make up only 2% of the province's value added firms. However, the true importance of the 14 cases to BC's value-added production depends upon their qualitative contributions; even more so within the wider context of Canadian value-

added industry. However, signs of innovation potential are visible in this initial assessment of firm employment and production characteristics, and as evidenced in the business success of long-established firms. The size of firm sales and workforce, even for recent study firms, exceeds the corresponding BC sectoral averages for each firm. Regionally, all 14 firms have created large scale employment opportunities for SMEs within two communities.

Diversity is typical amongst the study firm sectors; and the 10 lower mainland study firms are unique within local industry sectors in terms of their products and processing. As expected, the lower mainland industrial district shows a diverse mix of firm types located in close proximity. Sectoral and product diversity is more limited in the Okanagan region. Aside from interior engineered products firm E1, the other three (two remanufacturers and one furniture company) Okanagan firms are less diverse and rely on similar interior species. Amongst the lower mainland study firms are several globally competitive firms that have advanced leading edge export products (that is in forest industry terms) and developed production processes unique to the region (e.g. firms E3 and M2). The study firms generally show potential for advancing industry skills, and could thus act as incubators for future spin-off enterprises within the lower mainland and Okanagan regions.

This chapter has highlighted BC's forest industry restructuring dynamics, and the regional location, sales and employment characteristics of 14 cases. This discussion sets the stage for the forthcoming qualitative and quantitative assessments of firm structures and location advantages. The following chapter analyzes the genesis and growth characteristics of study firms in relation to local geography, and early development of products, markets and human resources. Later chapters will review contemporary aspects of study firm primary and support activities by examining R&D, human resources and skills, and wood procurement activities.

CHAPTER 4 FORMATION AND GROWTH OF HIDDEN CHAMPIONS

This chapter examines the formation and overall evolution of the case study firms. The analysis is inevitably complicated because the 14 case study firms were founded at varying times from 1951 to 2000, they operate in six value-added sub-sectors and they are located in two regions of British Columbia. The factors shaping the evolution of these firms are highly varied. Nevertheless, this chapter reveals local connections to be a vitally important, insistent theme for all the firms. This chapter progressively elaborates on this theme in three main parts beginning with an examination of the temporal, geographical, product and organizational start-up characteristics of the case study firms. The second part explores the evolution of these firms through the eyes of their leading, usually founding entrepreneurs. The final section examines the case studies from a networking perspective to reveal their interlocking connections with the local region.

Local connection between case study firms and communities is vital at start-up and during growth. The discussion of firm origins and evolution relies on qualitative and quantitative evidence from firm principals. The original concepts of the firm owners are interwoven with their subsequent business/location decision-making to explain how they created successful locally-based value-added firms. Broad temporal and geographic patterns of development indicate that the study firms' growth opportunities are linked to initial location and relocation dynamics. However, the formative role of internal (study firm) assets is also significant. The results data show how firm owners skillfully incorporated entrepreneurship, local business assets, social and family networks to build visible and latent knowledge into the human resources, physical and market structures of their firms.

Much as sports analysts, athletes and coaches proclaim the competitive advantage of playing on 'home ice', in familiar local venues rather than 'away' in more hostile, less familiar playing territories, these entrepreneurs established business very close to home. Amongst home ice advantages cited by both athletes and business owners is the intimate knowledge of minute local conditions, localized social ties and supports, and access to capital. To what extent are the developmental

geographies of these 14 study firms explained by reliance on entrepreneurship, local resources and institutions, social ties, personal knowledge and financial capital? To answer these questions, salient aspects of firm start-up competency and owner-entrepreneur creativity are compared and related to local industry and community spaces.

In regional terms, all study firms, ten in the lower mainland and four from the Okanagan, still manufacture in the same general locales. These inter-linked value-added districts have acted as crucibles for dynamic study firm growth over a fifty year period. Site-specific growth strategies, however, differ inter-regionally amongst firms. The four Okanagan firms, for example, still retain original sites, while seven of the ten lower mainland cases have relocated at least once since the time of start-up. However, both formative and relocation decisions relate to firm principals' approaches to initiating business and enhancing growth. As firm owners conceptualized first products and processes, they also strategized initial market niches. In this way, the earliest plans of study firms connected initial location of firms with advantageous labor and wood supply; home community, family and partnership support; and capital acquisition.

4.1 START-UP CHARACTERISTICS

The 14 case study firms began operations at varying times between 1951 and 2000 (Table 4.1). In rough terms, the origins of the firms are classified into two broad periods and firm groupings that I have named Group 1 (1951-1979) and Group 2 (1983-2000). Thus, the first seven study firms started during the so-called Fordist period (1951-1979) when BC's forest economy was dominated by the growth of standardized commodities manufactured by large corporations in very large mills that employed union labor. Another seven firms began operations in 1983 or later during the so-called post-Fordist period when the traditional industrial base has been extensively restructured, and SMEs became more important in BC's forest economy. Three of the case study firms are relative newcomers, starting between 1995 and 2000 (Table 4.1). During each of the two broad time periods, start-up groups each consisted of seven firms. Most Group 1 firms (six) started manufacturing in the 1960-1965 and 1975-1979 periods, whereas Group 2 starts were distributed more evenly throughout 1983-2000 restructuring (Table 4.1).

The severe recession of the early 1980s marks a convenient turning (boundary) point for distinguishing Fordism from its restructuring; although diverse industry sectors and employment numbers typified the formative geographies of all study firms throughout the 1951 to 2000 period. Restructuring uncertainties include local wood supply capacity, declining local ownership in primary manufacturing, labor scarcity and increased competition from giant firms in R&D, and access to local and export markets. To some extent, pre and post restructuring factors shaped formative internal organization and market focus of firms in different ways that are discussed throughout this chapter. The division between two broad industrial periods, Fordist and restructuring, is far from precise (Table 4.1). In general, the earliest (1950s-1960s) Fordist firms (R1, F1, P1, E1) began operating in the environs of primary industries, with access to relatively secure (unionized) labor pools, long-established community ties, good local market possibilities for first and subsequent products, and well-known wood supply networks. Two early firms were unionized at start-up.

Subsequently, the group of six firms that began during the 1975-1985 'bridge' between boom and bust and restructuring faced a different set of initial conditions. In many ways, these firms reflect shifting perspectives and structures in local, provincial and global development of labor, environment/forest practices and markets. Although two of these six firms were unionized at first, two others from the bridge group initially faced very tough labor negotiations (and shutdowns) to ensure non-union status. Two firms from this group were early leaders in environmental certification for wood products. In contrast, four recent (1990-2000) firms - E2, M2, C2 and E3 - intentionally embraced the concepts and practices of flexible specialization at start-up. These four most recent firms to start business employed professional management and focused on immediate export development (market knowledge), progressive non-unionized labor organization, environmental efficiencies and integrated operations.

Table 4.1 Study Firm Start-up: Group 1 (1951-1979); Group 2 (1983-2000)

Boom and bust period 1951-1979						Restructuring period 1983 – 2000			
1950-1955	1955 - 1960	1960 - 1965	1965 - 1970	1970 - 1975	1975 - 1979	1983 - 1985	1985 - 1990	1990 - 1995	1995 - 2000
R1		F1			M1	R2 U	F2 U	E2	C2
		P1 U			P2		R3	M2	E3
		E1 U			C1				

Note: R=Remanufactured; E=Engineered; M=Millwork; P=Prefabricated; C=Cabinets; F=Furniture; U=unionized

The specific economic, entrepreneurial and business conditions during start-ups over fifty years are linked to formative location characteristics of the firms. However, typical of both start-up groups were diverse products, firm types, industry sectors and employment levels (Table 4.2). Table 4.2 describes initial industry affiliation and employment complement in past-to-present sequence for each case. Mean start-up employment varies little between the two start-up groups. However, the median employment level (10) for Group 1 firms is higher than the median of four jobs for Group 2 firms, indicating somewhat fewer job opportunities at start-up for the recent business starts.

In general terms, the sectoral, geographic origins and employment sizes of the case firms are not affected by when they started. Apart from prefabricated structures, the other five sectors comprise firms that originated before and after 1980. Among four Okanagan firms were two that started before and two firms after 1980; while for the Vancouver start-ups, five began before 1980 and five afterwards. In terms of employment size at start-up, both relatively large (100 employees or more) and relatively small enterprises (four employees or less) started in both time periods. In contrast, initial markets, ownership and infrastructure patterns varied among Groups 1 and 2. Group 1 featured family owner/employees and land ownership, while start-up trends of Group 2 firms were based on sole ownership, rented facilities and export markets (Figure 4.1).

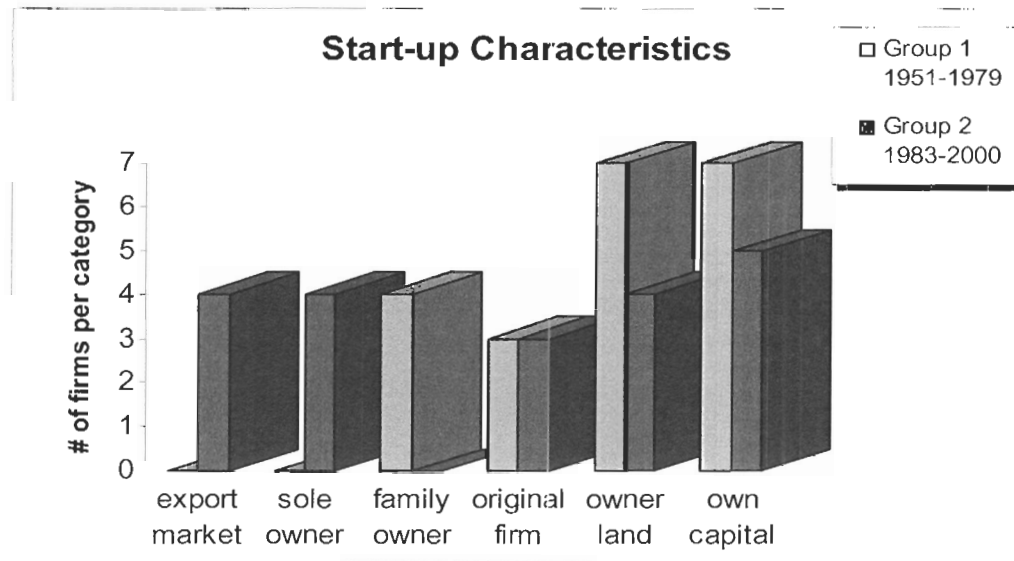
Table 4.2 Firm Start-ups: Year, Sector and Employment (FTE)

Firm	Start-up year	Industry sector	FTE
R1	1951	Remanufactured	4
F1	1961	Prefabricated	100
P1	1961	Furniture	10
E1	1962	Engineered wood	10
M1	1974	Millwork	25
P2	1977	Prefabricated	6
C1	1979	Cabinets	4
R2	1983	Remanufactured	10
F2	1986	Furniture	150
R3	1988	Remanufactured	4
E2	1992	Engineered wood	10
M2	1995	Millwork	4
C2	1997	Cabinets	4
E3	2000	Engineered wood	2

Note: FTE = fulltime equivalent employment; includes owners and family members

Localized and internal factors differentiate the first markets, human resources and infrastructures created by firms during the two periods. The original competitive advantage of firms is related to the interplay of ownership, capital assets, firm type (i.e. spin-off from local firm, original firm, or takeover of other firm) and original facilities design or ownership. Start-up market orientation, for example, reveals important linkages between study firms and Fordist or restructuring (competitive export market) phases (Table 4.3). Early markets of firms show distinctive time-based trends, although the initial wood product designs were entirely unique amongst firms and industry sectors, regardless of start-up time or location (Table 4.3). In much the same way, start-up firm type and ownership characteristics differ temporally.

Figure 4.1 Start-up Characteristics: market; owner/firm type; infrastructure; capital



4.1.1 Market Characteristics

Creative market niche development was an immediate concern for those growth oriented study firms that intended to develop large, locally important manufacturing operations (Table 4.3). Generally, the 14 study firms demonstrate innovative product and market behavior at the time of start-up; firms exploited market advantage in a way that capitalized on local and firm-specific assets in order to meet local, regional or export demand, although start-up strategies vary temporally. The seven firms that began during the 1951-1979 period relied almost exclusively on readily accessible local markets and local wood supply, while their specialized wood products were designed to meet local industrial supplier markets. The seven Group 2 study firms differed markedly at start-up; in particular, the Group 2 firms immediately addressed wider export or regional markets. Trends in start-up market development among study firms paralleled industry restructuring, in which global competitors vie for highly specialized export niches, which in turn increases import competition (and the proliferation of diverse, low priced import products). For recent firms, export markets are clearly more important at start-up compared to the Fordist firms. (Table 4.3). Thus the markets of the first seven firms were based mainly on local niches at start-up. Remanufacturing Firm R1, for example, began business by producing fruit box components for orchardists at a time when wood manufacturers had not addressed

this demand in the BC interior. Firm E1 manufactured structural laminate (glulam) beams for south Okanagan schools and arenas within the local and regional communities. In all, six of seven Group 1 firms first made market forays close to home supplying specialized wood components for lower mainland and Okanagan industrial, millwork and cabinetry customers (Table 4.3). In the more recent (1983-2000) group of firms, the export market geographies are highlighted by four exporting firms F2, M2, C2 and E3 and by three firms (R2, R3 and E2) that first focused on regional (western Canada and northwest USA) trade supplemented by secondary export niches established at start-up. Such export and regional markets were addressed by product quality, refinement and differentiation strategies. In general, the initial market orientation of firms illustrates a progressive trend towards export product development. The pattern that emerges shows changes over time from local to export markets that reflects early growth intentions of firms and industrial conditions at start-up.

Table 4.3 Study Firm Markets at Start-up of each firm

	Initial product and market		Market focus (1=primary; 2=secondary)		
	First product	Initial market	Local	Regional	Export
R1 Ok	Fruit box components	Local/Okanagan	1		
F1	Bedroom/occasional furniture	Local/lower mainland BC	1	2	
P1	Mobile cottages	Local/southern Ontario	1		
E1 Ok	Glulam beams	Local/Okanagan	1		
M1	Millwork / Reman.	BC/Canada (USA)		1	2
P2	Mobile trailers/ and structures	Local/lower mainland USA	1		2
C1	Counters/ cabinet components	Local/mainland BC	1	2	
R2 Ok	T&G wall panels	Canada/USA		1	2
R3	Custom Sitka lumber	Canada/USA / Asia		1	2
F2 Ok	Doors & furniture	EU/Local Okanagan	2		1
E2	Truss structural	Canada/USA/Pacific Rim		1	2
M2	Prefinished millwork	USA/Canada		2	1
C2	Catalogue cabinetry	Japan, USA Local/lower mainland	2		1
E3	Structurally insulated engineered/panels	USA/Japan/BC		2	1

Note: 1 = primary markets for initial product - blue cell shade

4.1.2 Ownership Patterns, Firm Origins and Capital

Local advantages were significant to the formation of the case study enterprises (Table 4.4). The texture of firm start-up activity (blend of ownership and firm type) reveals the story of early assets and skills required by each firm (Table 4.4). Firms originated as three different types: spinoffs created by employees of local competing firms; original firms designed from scratch and without pre-existing infrastructure or production line; and takeover firms begun through purchase, merged and restructured business organization. These three start-up types varied among study

firm industry sectors and during both time periods. Intrinsic to the success stories of firms created by the 'spin-off' process was the ability of owners to capture and transport local industry knowledge obtained as employees of previous firms without compromising future employee, supplier and competitor relationships within the region. Before starting new wood value-added firms, all three spin-off owners (all located in the lower mainland) had been intimately involved in planning R&D and human resources, manufacturing and marketing with local competitors. Spinoff owners stress that human relations within their own partnerships, and with employees, suppliers and customers in the region were key to their initial successes. Owners had been key employees in value-added firms of the same type, sector and locale; when starting their own firms they had established portable industry skills, tacit knowledge, and supplier linkages. While spinoff mechanisms created three lower mainland firms, the start-up advantage of four firms (one from the Okanagan) was attributed to takeovers that demanded competency from owners during immediate restructuring. The nature of firm origins was connected to secure, stable finances at start-up, an immediate parallel concern.

Diverse ownership types - family, individual, and partnership - financial capital access and entrepreneurial assets, and local knowledge of social/industry networks, created varied forms of early competitive advantage among the 14 firms. During the interviews owners explain how original sources of firms, human resources, and start-up capital were significant for immediately advancing each firm's startup production and marketing. Firm principals cite human resources as the first and foremost propellers of innovation and productivity during start-up and growth. Entrepreneurship was connected to decision-making abilities self-described by owners (four individuals, six partnerships, and four families). Four recent lower mainland firms M2, E2, E3 and C2 began with sole ownership.

Ownership trends highlight family firms at first, partnerships somewhat later, and most recently, individual entrepreneurs (Table 4.4). Family connections also played a key role in the formation of study firms in the 1951 to 1962 period. Firms initiated by families were phenomena not repeated during ten subsequent start-ups. However, partnership arrangements figured prominently for six firms during the middle period and included three firm starts from each group. These partnerships typically consisted of only two or three individuals, although two firms later added partners. As a counterpoint to family-owned firms in Group 1 is the recent dominance of individual

ownership. However, my interviews indicate that all 14 owner-entrepreneurs relied upon personal drive across ownership categories.

Owners stress that (their own) entrepreneurial traits were typical during their respective business start-ups, and continued to be needed for these growth oriented exporting firms. Furthermore, firm principals note that entrepreneurial traits trumped wood supply, trade and inter-organizational constraints at start-up, and cite these forcefully as the primary elements enabling their early competitive advantage and later growth. The sole ownership profile of four recent firms is particularly significant in light of previous experience. Family/partner sharing of financial and labor risks, common amongst earlier start-ups, is presented by owners as a formidable strength. The advantages of local social position of the four family firms has since reflected multi-generational involvement and historical knowledge contributed by original owners, elderly parents, siblings and children. Conversely, the sole owners of most recent start-ups M2, C2 and E3 comment on the personal challenges they encountered while establishing their initial labor requirements. Thus these recent firms lacked accessible and committed family or partner resources, and the start-up of these firms faced organizational constraints that hindered rapid implementation of innovative human resources (HR) policies. Firm E3 owner Mr. G reports that his firm's beginnings experienced "...low interest levels, poor industry knowledge, lack of skills, lack of experience, and no loyalty to the firm."

Firm type was linked to entrepreneurial ability of owners. Both spinoff and takeover firms benefited from connections to local industry networks through former management participation in like industry firms. Start-up capital was said to be crucial in forming initial infrastructures, production, and product research and marketing (Table 4.4). Most firms supplied personal or family capital to fund initial operations⁷. However, an interesting alternative was Firm M2 which borrowed from a related parent company with pre-arranged repayment terms. Access to capital has important implications for these start-ups. Since 1986 all study firms started exclusively in the lower mainland. Reliance on external funding by two Okanagan firms, and a dearth of study firm starts in that region, suggests that capital access may have hindered recent study firm formation in the Okanagan.

⁷ Two exceptions to self or family financing were the funding arrangements made by two Okanagan firms for partial capital. Firm R2 accessed Forest Renewal BC (FRBC) Small Business Forest Enterprise Program (SBFEP) funds, while F2 sourced capital from a regional small business development bank program.

Table 4.4 Firm Origins, Ownership and Capital at Start-up - 1951-2000

Group 1	Firm Origin/Type			Ownership type			Capital
	original	spinoff	takeover	family	partnership	individual	owner supplied
R1	X			X			X
Okan.				X			X
F1	X			X			X
P1	X			X			X
E1 Okan.			X	X			X
M1			X		X		X
P2			X		X		X
C1		X			X		X
Group 2							
R2Okan.			X		X		
R3		X			X		X
F2 Okan.			X		X		
E2	X					X	X
M2	X					X	X
C2		X				X	X
E3	X					X	X

4.1.3 Entrepreneurship Characteristics

All fourteen owners value human resources and resourcefulness, collaborative skill development, and commitment to local community. Their distinctive personal and entrepreneurial qualities were integral to strategizing study firms' start-up, growth and relocation. In contrast, owner motivations for starting wood value-added manufacturing varied surprisingly little amongst cases in both times and places. Thirteen firm principals, for example, planned flexible (labor and production) manufacturing systems at start-up (usually with their own product and production line design) based on a cluster of firm-specific innovations and one explicit idea for developing and placing a single specialized product in one specified niche market. The individual traits and skills of owner/entrepreneurs who initiated study firms, rather than broader firm-wide management processes, explains in part the initial competitive advantage created by firm owners. In nearly all cases, entrepreneurship and personal networking characteristics described by owners - commitment to local development, education, personal and business organizational and management skills, personal industry experience, and knowledge of resources and markets - quickly engaged enthusiasm and involvement of local employees, industry sector markets and wood suppliers at start-up. However, such human factors were unrelated to industry sector, firm category or ownership type.

Owner-entrepreneurs typically pursued well-defined, thoroughly researched initial product and market concepts. Only one owner, Mr. H, described his firm's beginning as a 'chance business venture' that responded to the crop failures of his family's former Okanagan agricultural enterprise. During interviews owners explained how they had operationalized these original wood manufacturing ideas. Of particular interest are the four Okanagan firm principals who insist that their respective firms were intrinsically linked to the region and locale at start-up, and would not have thrived elsewhere given local wood supply opportunities and business/family connections. Unique attachments connecting Okanagan firms to their milieu during initial site selection are well described by three Okanagan study firms E1, R1, R2, and two lower mainland firms, E2 and F1. Referring to owner-entrepreneur networking abilities that produced immediate success, Mr. S of Okanagan Firm E1 emphasizes that during his firm's start-up phase;

I was originally motivated by entrepreneurship and family-local region connections...had a vision of becoming a local force in the heavy timber manufacturing industry. The great competitive advantage was the 'local market' in the south interior. At the time of the firm's start-up we had access to local markets, and we had experience - at a time when many communities were growing quickly and building or expanding large facilities like ice arenas, schools, etc. Without a local supplier of laminated arches and beams the time was right for an experienced manufacturer-builder to supply these local markets. I felt in a position to combine the business and engineering skills I'd acquired at university and 'on-the-job', while at that time the firm was going through a restructuring of markets.

Formidable expertise, training and educational skills were contributed by owners and employees in the early days of these value-added ventures. Skills and knowledge of owners were gleaned primarily from long term engagement with forest industries. Evidence shows that thirteen study firm owners, current ownership remaining the same, combined previous engineering, business and manufacturing skills to promote start-up activities. Most firm principals were native British Columbians, second generation or later. All express the desire to diversify and grow while retaining firm operations within local regions. Four firm principals are professional engineers; two are University of British Columbia graduates. Firm owner Mr. S of Firm E1, an Ontario university engineering graduate took over and restructured his family's heavy construction business following two separate R&D co-op terms conducting research in his home community. Three owners came from senior executive management positions in North American primary forest industries that produce pulp, paper, lumber and plywood. Five firm principals had specific prior

knowledge and on-the-job experience within related industry sectors. Embedded within study firms were the original skill sets and unique abilities of owner/entrepreneurs.

4.1.4 Land and Facilities Procurement

Study firm formation depended on securing land and manufacturing facilities. Beyond planning for initial product, supply and human resources, appropriate facilities met initial and anticipated long term production growth goals. In this regard, the mid 1990s marks a convenient watershed for separating pre and post land ownership firms. Property ownership was achieved by all seven early firms, and three of four Group 2 firms (Table 4.5). Nonetheless, owners and non-owners alike explain the importance of land and infrastructure certainty, critical to engaging initial production. Land owner firms were able to realize internal spatial flexibility and rapid on-site growth. Furthermore, these types of firms took advantage of local zoning bylaws during development. In this regard, the initial structuring of firm finances and facility ownership enhanced symbiotic relationships between community and owner-entrepreneurs. Conversely, lease-related cost/space and flexibility limitations described by untenured firm principals hampered the ability of these firms to quickly reach optimum scale and production flexibility and efficiency. Despite ownership concerns at start-up, half of the fourteen study firms later relocated, all within the lower mainland.

In summary, three recent firms rented plants and facilities within the lower mainland. The remaining 11 (land owner) firms typically purchased land with facilities. Only three firms initially designed and built for purpose (Figure 4.5); the remainder have subsequently expanded and restructured their first facilities. Overall, the highlights of internal (locally based) start-up strategies and capabilities among firms were: entrepreneurship, capital and infrastructure, and family or partnership ownership supports. Ownership characteristics also vary temporally. Family-oriented firms dominate early firm starts in both Okanagan and lower mainland; while recently, four sole owner firms emerged near Vancouver. The most recent start-up group also by-passed the local market stage typical of SMEs. All three spinoff firms began in the lower mainland. Firm origins - infrastructure, firm type and ownership - however, were significant in advancing firm growth in both regions and during both general start-up periods.

Table 4.5 Start-up Characteristics: Land and Infrastructure Ownership and Design

	Owned land	Owner designed facilities	Acquired facilities	Rented land and facilities
GROUP 1				
R1 Okanagan	X	X		
F1	X	X		
P1	X		X	
E1 Okanagan	X		X	
M1	X	X		
P2	X		X	
C1	X		X	
GROUP 2				
R2 Okanagan	X		X	
R3				
F2 Okanagan	X		X	
E2	X		X	
M2	X		X	
C2				
E3				

In summary, three recent firms to start manufacturing, all within the lower mainland, relied initially on rented facilities; of the 11 (land owner) study firms were only three that planned, designed and built for purpose. However, the remainder have subsequently expanded and restructured their initial facilities. Overall, the highlights of internal (locally based) start-up strategies and capabilities among firms were: entrepreneurship, capital and infrastructure, and family or partnership ownership supports. Ownership characteristics also vary temporally. Family-oriented firms dominate early firm starts in both Okanagan and lower mainland; while recently, four sole owner firms emerged near Vancouver. The most recent start-up group also by-passed the local market stage typical of SMEs. All three spinoff firms began in the lower mainland. Firm origins - infrastructure, firm type and ownership - however, were significant in advancing firm growth in both regions and during both general start-up periods.

4.2 THE IMPORTANCE OF START-UP LOCATION

Location strategy has been a cornerstone of growth opportunity for most case study firms; as such, the relocation decisions of seven firms addressed firm position at the nexus of local networks, wood supply, labor, and customer demand. Initial site selection, growth and relocation strategies highlight the interplay of geography and business activities that created their competitive advantage. Spatial dimensions of firm growth and relocation differ in the lower mainland and Okanagan. The original sites of the four Okanagan firms have been retained, yet with expanded and redesigned facilities and production lines. In contrast, lower mainland study firms exhibit less (initial) site stability, yet all ten firms remained within the lower mainland. Seven Vancouver area firms have required merged operations and/or multiple land acquisitions; owners cite ownership, market and labor proximity, and land and facilities management as the basis for dynamic growth. Three firms purchased land to facilitate design and set-up of their own flexible production lines. These new production systems address firm growth, expanded and refined product lines, and variable output of different products. Millwork firm M2 provides an excellent example of internal design change for flexible production. The firm's largest production line can be mobilized to permit multiple horizontal adjustments (much like an overhead crane on the ground); specialized milled wood products can thus be controlled for quantity and quality, type and line speed above wheels and rails. Illustrating a different local site development perspective, Mr. Q says that his furniture firm's local geography expresses site and growth needs for design/production facilities, employees and suppliers;

From 1960-1986 our (family) firm facilities were located in Marpole, south Vancouver near the Fraser River and Richmond. We've moved only once since then (in 1987) to our current site in South Surrey. The advantage of our facilities was our plant design...we focused mainly on innovation in finishes and techniques (processes). Our ownership and the location advantage - we were in the city - close to lower mainland suppliers, and for employees too, close to homes and northern BC transport via ship (workers lived in south-east Vancouver, and many first nations employees from Northern BC, and eastern European employees). Our entrepreneurship and skills? We saw a niche for making and finishing furniture here.

Interesting geographical trends in firm startups appear during recent years. The five newest study firms (engineered wood, millwork, cabinet and remanufactured sectors) all started manufacturing in the BC lower mainland. Enterprise start-ups and

growth in this region are related in part to high regional population growth. Western USA and south west BC commercial-agricultural and residential construction booms created positive regional demand for products manufactured by firms E2 and E3, whose owners attribute part of their early success to regional growth that provided niches for specialized high technology wood structural/industrial and construction/residential components. Although exports are primary markets for new cabinet firm C2, millwork firm M2 and structural panel producer E3, all three of these lower mainland firms have capitalized on western USA and BC regional industrial customers.

Among recent (1984-2000) firm starts, most relied on in-house and collaborative product design and production engineering and professional management systems; all integrated market development and design/certification. Emerging from this recent group, concurrent with restructuring, were fast-growing firms that successfully integrated local industrial factor conditions and global markets to gain regional prominence. Contemporary firms report rapid sales growth following start-up. Firm E3, for example, doubled sales within two years. According to firm E3 owner Mr. G, sales growth is directly related to market knowledge (of firm share and position in global industry) and product engineering and certification targeting specialty markets. Recent entrants faced immediate international competition for export products. However, from a local knowledge/human resources perspective, start-up was not a true beginning point for three lower mainland spinoff firms (Table 4.6). Cabinet firm owner Mr. E explains his personal design/production and management history with a rival lower mainland sales leader. His former experiences provided a springboard to industry supply and market networks that enabled firm C2's early success:

From start-up we began very close links with suppliers and even more so with customers... so the design project for a single home may have 200 pages of cabinetry specifications/ CAD drawings, including all assembly details. Personal contact with customers...extremely important, not only for local customers but just as much for USA and Japanese - nearly all come to visit the plant near YVR(Vancouver international airport). Personal contact with suppliers... is critical to the firm's success. This holds true for the local supply region and to some extent for our Alberta suppliers ... of MDF, finished gables, casing. At start-up there were lots of competing firms locally, yet we have a very different focus. For the Japanese market and exports to Hawaii our system is very highly specialized (in) design and engineering. Another distinction...in local markets we maintain control of installations (ensuring quality control) unlike most stock manufacturers who have no control or input in the installation process.....In Japan, builders go very fast (compared to here)...no half-time construction work, and less skilled installers are needed there because we have ensured accurate pre-assembly. (Firm C2)

Recent study firms, all located in the lower mainland, have negotiated growth challenges of a special nature. Local institutions and the local regulatory environment governing construction and plant operations have tightened dramatically in the highly urbanized region. Building permitting, zoning bylaws and environmental regulations impact firm growth and processing, particularly for those firms with unique production systems that manufacture highly differentiated products, use new technologies, or are engaged in 'disruptive technology' (new/unique to locale industrial processes). Two recent firms were confronted by zoning authorities during relocation, and report that municipalities lack both industrial knowledge and capacity to assess new development. Stressing that local institutional barriers are specific in nature to local municipalities, firm owner Mr. G expresses concern for institutional constraints his firm encountered. He suggests that community/ industrial development policies in one lower mainland municipality have created an uncompetitive playing field -

Local institutional barriers...and total lack of support towards new business establishment.. have been a real headache for this firm's development in this site. One municipal issue; the local municipal authority has been very, very hard to deal with on the conversion of the plant to the new production line... and has so far refused a building permit. The same thing with Vancouver and Aldergrove councils and administrations... and again the lack of backing. We need a political and regulatory arena to support ...not block new and innovative manufacturing business. A great deal of time and energy is wasted in frustrating interactions with these bodies. (Firm E3)

Table 4.6 Strategic Development of three Lower Mainland Spin-off Firms

C1 1979 Four-partner	"In 1979 our first division was started up by four friends: K, J and 2 others ... who'd recently left high school and were working together. They were 19 year-olds and worked at F manufacturing, and within 2 years thought "we can do that better." J was and still is our original innovator – our idea man – a great designer. The firm started out as an informal, seat-of-the-pants operation – it still is! Firm F our previous employer was located in Burnaby, supplied and installed countertops. Our backgrounds? Though no partners had forest industry background, we all had several skill sets between us, which covered key aspects of the firm as it grew. Out of school I went into finance, worked as a federal government income tax special auditor, got my CGA... went on my own ... soon became an accountant for this firm, and was asked to buy in. Original vision? No - we were just kids, motivated mainly by entrepreneurship and skills acquired as employees of previous firm. When our first division started up, Firm F- our former employer - then became our supplier. Right off the bat we learned how to network and work within the industry...how to overcome cultural barriers..."
R3 1988 Two-partner	"Both of us had very extensive training and knowledge through former forest industry jobs. E had experience ...5 years spent in forest industry transportation and a good reputation with established industry networks and contacts. I graduated in Commerce from UBC. we met in 1980 in the industry doing cedar sales. Gaining experience in grading and lumber sizing, we expanded on this knowledge base to include wood industry location decisions and reasonable pricing. By 1986 we were working together at Firm S, and during 1988 started our own sales office with 2 other guys. R, one of our first employees, is still our traffic expert. Business skills and language (Chinese, Punjabi) were another strong point. Our original motivation? We were entrepreneurs; we already knew a lot...and made a seamless transition from before (our former jobs) to our own business. By the time we started we had already learned the business using someone else's money. Competitive advantage? We were very flexible and were able to restructure every few years; we had contacts and experience, and knew the Canadian cross-border duties. Then, because we used telephone marketing and were used to doing the orders that way (much the same with our suppliers) we already had long term relationships established. The remanufacturing side was so good and we soon doubled sales to Europe."
C2 1997 One-owner	"A close family member started Firm __ 35 years ago - largest in BC; I set up the factory production line and acted as production manager as well as business manager. The firm was sold 12 years ago. I stayed on for 6 years, didn't like the way the firm was heading, and had my own ideas for starting up a flexible production system for cabinets. So in 1997 I started up this firm myself along with an expert team which I put together. I wanted to start an innovative cabinetry firm. Firm X worked on an integrated manufacturing and production system, and I was convinced that a flexible system would be better. The vision I had at startup was to begin with a very flexible design and manufacturing and service system that stressed high quality and affordability; the special and demanding Japanese market was an early focal point (during the '90s the local and Northwest condo market had dried up)."

Source: Fieldwork interviews 2003

The location, experience and orientation of labor supply posed a unique challenge when Firm P1 restructured production and relocated manufacturing facilities. Reinforcing a perspective of local labor constraints, production manager Mr. N notes relocation problems encountered when the firm's "non-local" managers began exporting to Japan from the firm's new unionized plant. The new managers were marketing experts, yet unfamiliar with local employment and skill development;

The marketing side of this business was well developed at start-up in this location, but it has taken quite a while to figure out the local labor, and we've had trouble with training, because we don't have the long term connections to this area, or in the area.

Over the 50 year period of firm starts, the location, growth and relocation factors have inevitably varied amongst firm types, products and sectors. Group 1 firms differed in character from those of Group 2, for local wood fibre availability and local demand influenced product mix and diversity among pre-1980 firms. Okanagan engineered wood firm E1 illustrates an early example of in-house R&D for product and production processes. Facilitated by family and industry connections, this firm demonstrates the nature of early expertise in manufacturing and forest products industrial production. Firm E1 growth benefited from owner Mr. S' personal experience and well-honed familiarity with local industrial production technologies, institutions and wood supply access. The firm's competitive advantage and growth reflected innovative ideas, knowledge and application of skills and business acumen within local markets. A broad sectoral mixture of firms grew in coastal and interior (then tiny Okanagan communities) locales. The growth success of these early firms, started during the predominantly 'Fordist' industry regime, is attributed by owners to: specialized, informal access to local wood supplies (and own supply), and localized product demand in exclusive markets. Four Okanagan firms were significant employers, two the largest in their communities. Interior firms manage forest lands; one supplied 50% of wood fibre inputs. Mr. S (E1) reflects on his engineered products' firm's flexible and innovative on-site growth strategies:

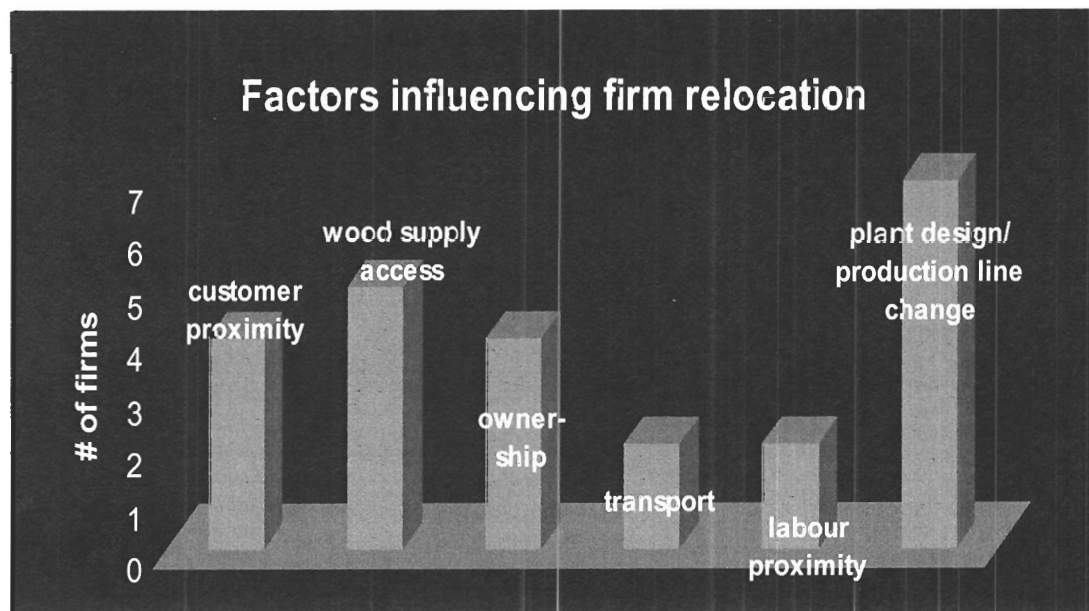
However the firm has experienced 25 years of ups and downs in business generally.... as has the glulam industry as a whole, peaking in the 1970s. During the early 1980s there was a downturn, and the firm's sales slumped to a third of what current sales are now...we were 'in a hole and shut down in the early 1980s' but now we have over 35 years experience in the glulam industry...always changing. Now (we're) the lead firm in North America in terms of technology advantage ...the first to import and design with ___ from Germany. In collaboration with other design/partner companies, and...international marketing innovation.

In general terms, all 14 case study enterprises have negotiated varied startup and developmental conditions to thrive within a competitive restructuring environment. The challenge of flexible specialization is addressed by dynamic growth and location advantages. However, firm growth is balanced by local cultural and production landscapes, home locale and experiences with local human resources. Specific firm location strategies illustrate the nature of land ownership, facility design and market access among seven lower mainland firms.

4.3 RELOCATION TRENDS IN THE LOWER MAINLAND

Firm relocations differentiate lower mainland and Okanagan firm start-ups. All interior firms have expanded and retooled on original sites. In contrast, seven of ten lower mainland firms have relocated to secure ownership, access markets and transportation routes (USA cross-border trucking post 2001), and to communicate with customers (Figure 4.2). Location certainty is considered crucial to allow for long term planning of: internal design and structure; production line function and inter-firm communication; and wood and equipment supplier access. Proximity to skilled labor and employee housing and transportation influenced two firm relocations (Figure 4.2).

Figure 4.2 Relocation Factors - Seven LM Firms (1980-2000)



Relocation factors vary according to market geography, local industry factors, and customer and supplier proximity. Vulnerable to global markets and restructuring externalities, relocated firms seek certain tenure to advance firm growth, operational and internal restructuring, yet within familiar regional institutional boundaries (i.e. environmental and taxation regulation) and localized skilled labor pools. Through strategic positioning and relocating to access a range of resources, five lower mainland firms oriented activities and communications towards the marketplace (Table 4.7). The market-led perspective of firm growth is articulated by Mr. M of firm E2. The firm evolved through iterative design of advanced structural products that would meet national and regional (USA and Canada) structural standards. Firm E2 considered engineering specifications of local building code jurisdictions of North America, with the idea of growing the firm through “innovative product, production and capital ideas that could be developed as building technologies constantly change.”

Lower mainland study firms have actively sought location advantage within the fast-growing urban region. The two newest firms C2 (1997) and E3 (2000), for example, both intended to improve design/production and internal communication spaces for customer interaction (in-house interactive Cad Cam design studio). The relocation of structural panel manufacturer E3 permitted space and flexibility for a newly designed production line. At the same time, better transportation access improved customer sales and service across the nearby Canada-USA border. Firm E3's relocation focused particularly on local labor by targeting a locale near farms where suitable trainees were recruited: “with a strong work ethic, and experience with machinery ... these are local farm high school graduates.” Firm E3's relocation thus exemplifies a complex set of location decisions: rent costs and uncertainty; competition for skilled labor; market access; and production design.

Generally, diverse reasons for relocating were cited by seven lower mainland firms (Table 4.7). ‘Push’ factors provoking relocation included ownership and space for implementing production line innovation and workspace organization. A counterpoint to ‘push’ factors was the ‘pull’ of market-led R&D that improved firm/customer and firm/supplier access and interaction. Relocation bolstered customer feedback, product design collaboration, sales and service. Although most study firms show a propensity to interact frequently via phone (and most often by

email) with their suppliers, they report lower levels of supplier involvement in product R&D.

Table 4.7 Strategic Relocation within the Lower Mainland (various years)

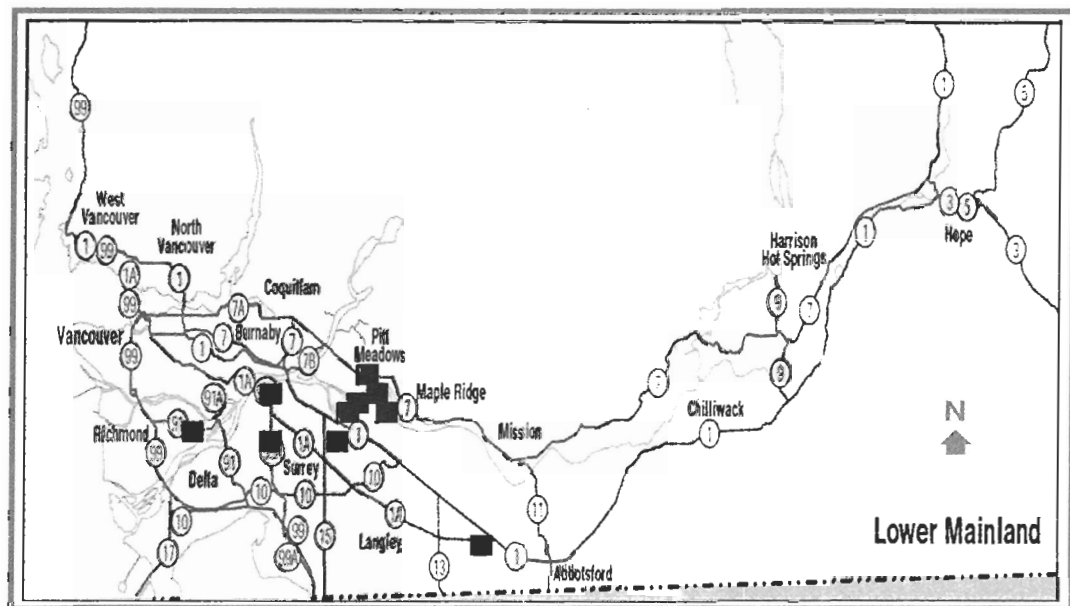
Firm/ year of move	Comments of Firm Principals - Strategic Relocation of firms
R3 2000	"Design of space... ownership of plant...lower rent and supply access on the Fraser River...and future bridge access across river at our new location"
E3 2002	"Suppliers and labor access, USA border proximity for shipping... lower rent farther south-east from core urban area"
M1 1980	"Larger appropriate space for newly designed production line, and river access for cedar supply. We amalgamated 2 previous (diverse) plants to unify firm operations"
P1 1988	"Larger spaces ... and ownership of plant at most recent move"
C1 1997	"Space for amalgamating 5 divisions... integrated flexible production... ownership certainty for production line refinement and internal communications"
C2 2003	"Customer interaction (local & YVR - Vancouver International airport); and supply access"
F1 1980	"Space... and proximity to LM suppliers and USA border customers"

Source: Fieldwork Interviews 2003

The highest concentration of study firms, 50% of all lower mainland study firms, are now located in the North Surrey/Port Kells industrial district on the Fraser River south shore (Figure 4.3). Four intra-regional study firm relocations chose this industry agglomeration where coastal wood supplies are towed via log boom to numerous primary sawmills on north and south, or Maple Ridge, shores. Imported offshore wood supplies arrive via the Vancouver Port Fraser River docks. The Fraser River/ Port Kells/ Maple Ridge region boasts a nearly uninterrupted seasonal wood fibre supply to five study firms in close proximity: C1, M1, P2, R3, and M2. Owner Mr. D (Firm R3) explains that wood supply flows on the river are rarely interrupted except during spring freshets this far upstream. The dominant directional trend for study firm relocation involves movement south and eastwards, from the older core urban industrial districts toward the Fraser Valley: Port Kells, North Surrey, North Delta and Aldergrove. Overall, relocation strategies of the lower mainland cases have advanced market-led production as firms tend to position facilities in geographic and

communicative proximity to their marketplaces. Firm location oriented towards the market side of primary activities, rather than the supply side, has thus promoted local product development in tandem with export market expansion. In the Okanagan region, a rather different set of factors has promoted firm growth on four original sites - without relocation.

Figure 4.3 Lower Mainland Study Firms' Location - 2002



4.4 OKANAGAN FIRM GROWTH

The four Okanagan study firms are deeply embedded in local communities through longstanding family ties, social and business networks. Remanufacturer firm R1's owner credits his business success to "the men and women who have worked shoulder-to-shoulder to build the company... valued family friends are the true riches" (Tracey 2002).

These two young men did have a vision. It wasn't a particularly grandiose vision, but they dared to do more than many... they took a chance and worked hard. Their success wasn't due to luck; it was due to hard work and perseverance. Fifty years ago, in order to make ends meet, two young men started a temporary project. They had no idea their project would take

off in such a way, eventually becoming the largest employer in their community (Tracey 2002).

Since its 1951 inception firm R1 has specialized in products, refined processes, and expanded local operations while shifting from local to export markets. Building a comprehensive local knowledge base in manufacturing technology, product R&D, human resources management; mapping (Geographical Information Systems, GIS) and sustainable forest management practices linked to watersheds and ecological protection, the firm employs professional and technical staff from diverse disciplines: designers, biologists, engineers, professional foresters and archaeologists who consult with community stakeholders (i.e. First Nations, recreation, environmental) regarding short and long term impacts of the firm's manufacturing and forestry activities. All four Okanagan study cases remain closely entwined with community and one another, and through interactions with suppliers. On-site growth among the Okanagan firms is connected to strategic market, human resource, supply and processing change. Inter-firm and inter-personal networking contributed to the evolution of these four firms. Originally, all four connected to local value-added industry networks, as well as wider industry sectors, processes and marketing developments. Integral to their early success was the capability to network beyond firm boundaries and exchange knowledge with related firms. Explaining industry networks, managing partner Mr. C recalls his firm's (F2) origins;

I'm certainly embedded in the BC forest industry network and have very longtime experience in both forestry... I worked for Mr. T. at T. Industries in Vancouver, it's a 1920s firm... and in secondary manufacturing and management. I sit, or did, on the boards of BC Wood, WoodLINKS, IVAWA, CAWP at UBC, and numerous other wood industry associations and education groups. I had management and business skills training and former jobs in other related forest industry sectors... also, a personal motivation to join with my two other partners, seeing the potential of this firm...and turning it around. Mr. T. always had an open door policy...he let me see everything, but expected the same from everyone else too.

Extending Mr. C's illustration of local and BC inter-firm interaction, my data illustrate the Okanagan region's progression in value-added study firm growth. Local networking dominated the growth pattern of the interior industry cluster. Development of a local industrial wood culture was promoted by three firms R1, R2 and E1 via inter-firm labor and skill transfers, forest tenure linkages, and product and production technologies that owners attribute to competition and cooperating interests in physical and technological resources. For example, Mr. C (R2) and Mr. S (E1)

explain how inter-firm knowledge and skill circulated when the locale gained an inventive professional who advanced product and processing R&D (with E1's hiring of Mr. C as head designer). UBC engineering graduate Mr. C had already pioneered the Okanagan Kettle Valley Railroad redevelopment. Mr. C's research with Firm E1 advanced the firm's product and production before he started his own competing engineered products firm (not a study firm). Subsequent restructurings and expansions of this new firm preceded yet another move by Mr. C and partners, who initiated a third firm, R2, a takeover and restructuring of primary sawmilling operations. The redesigned R2 specifically addressed production of specialty solid wood export panel products, particularly unique and high value for the time period.

Ongoing commitment by three Okanagan study firm owners to cooperate in extending value-added processing and finishing (internally and locally) precluded their full involvement in extensive primary sawmilling. These study firm owners focused on flexible supplier networks. Firm R2 partners took (the then unusual) steps to sell timber rights to competing firm R1 with interests in forest management. Firm R2's timber sales contributed to capital funding for decommissioning and conversion of primary processing operations (previous sawmill) to intensive and unique product and process R&D in a new remanufacturing plant. Synergistic spin-off effects directly involved all four Okanagan study firms, and at least one other important local firm, in developing local value-added capacity. Local knowledge and resource exchanges between study firms are pronounced in the south Okanagan industry agglomeration. Firm owners Mr. S and Mr. H attribute such inter-firm traits as "trust and cooperation" to long term friendships created within community as well as industry relationships. All four interior firms remain active in strengthening and expanding local and BC industry value-added liaisons. However, in spite of huge regional population and housing growth, commercial and retail development, the key players in wood value-added from this region are the early study firm starters discussed in this research.

These results highlight the Okanagan study firm group as a model of value-added growth and cooperation. However, the interior has experienced forestry and non-forest manufacturing industry shutdowns and firm relocations across the nearby Canada-USA international divide (Mr. H) from the mid 1980s to present. Lower mainland wood-producing industrial areas, however, have experienced value-added start-ups through to the present. The inter-regional contrasts shown between earlier and contemporary study firm start-ups suggest that manufacturing and related

entrepreneurial conditions linked to forest industry value-added have not been conducive to Okanagan start-ups since the 1980s, when restructuring began in earnest. Nonetheless, the tight local value-added linkages and firm development advantages created by study firms' owners in the Okanagan include both co-operative and competitive efforts to sustain study firm growth. These inter-firm networking processes contribute to growing the Okanagan value-added network through sharing of knowledge, human resources, product R&D, and timber supply arrangements.

4.5 NETWORKING PERSPECTIVES OF STUDY FIRMS

Distinctive temporal, geographical and sectoral patterns emerge from my case studies of local study firm networking. Local connections and relationships have stimulated the growth of study firms within the region. As these study firms embrace value-added practices within BC's contemporary forest industry restructuring environment, local value-added processing has advanced in concert with their interactions with the surrounding industrial communities. These findings suggest that in pursuing beneficial relationships, study firms generally leverage their internal assets by entering business development relationships. The capacity to network provides a source of supply chain and product creativity; through informal arrangements with related firms, study firm owners' cite examples of cooperative wood purchasing groups. The 14 firms and their respective sectors have remained diverse, although common assets were deemed vital to the establishment of all firms. Furthermore, owners state that the knowledge and skills developed internally and through networking form the basis of a dynamic industrial environment essential to innovative production. The literature particularly commends the local development advantages associated with inter-firm competition and cooperation (Malmberg and Maskell 2002). The historical character of local flexible specialization in BC, and local development trajectories, are reflected in the business culture of these cases. Inter-firm exchanges take place at local and wider scales as the firms form industry, educational and institutional relations oriented toward product, certification, supply and markets.⁸ Such networking exchanges develop internal capability, skills and

⁸ Local, provincial, regional and national value-added wood products, marketing, supply and skills research is conducted inter-firm and with industry/ government institutions: e.g. BCWood (a value-added marketing group, formerly also a training centre); FRBC Renewal

local industrial competence of the study firms. Neighborhood and community networking intensifies firm development. Local relationships are often informal, yet provide valuable interaction with suppliers, customers, competing and cooperating firms. Mr. C, furniture of Firm F2 explains how three partners engage community and industry;

Local (firm) networks and local participation...local memberships? We're in *Everything* - you name it! We also actively support and fund through donations and gifts - to three main local organization types. One of us (partners) supports arts organizations; ... (B) supports disadvantaged youth, and (D) is very involved with local sports organizations. Here are examples of arts projects, and in support of our community art gallery through web-link supports (Mr. C shows me a group of beautifully decorated and painted furniture pieces that the firm donated for arts designs and auctions, now displayed at the firm). ...and then we purchased back the finished products for the firm. Our communication and information-sharing between firms and suppliers and customers is a key aspect for the firm's viability ... and of the value-added industry.

Firm F2's creative networking involves BC's Secondary Schools Initiative Program; and firm partner directorships in WoodLinks Association; Gluelines educational publication; Interior Value Added Wood Association; Southern Interior Kiln Association; BCWood; Furniture West Inc.; Industry Canada Marketing; University of BC Faculty of Forestry Industry Advisory Board; Centre for Advanced Wood Processing Advisory Board (UBC); Forestry co-op program UBC (hiring forestry co-op students); and University College of the Cariboo (UBC Faculty of Forestry 2003).

4.5.1 Networking Interaction

Networking connects firms through institutionalized local relations and distant interactions and practices. Ten types of relationship deemed significant by firm principals engage study firms, industries, institutions and agencies (Table 4.8). Eight characteristics represent local knowledge exchange; two account for exogenous networking interactions. The first data set counts local education, government, not-for profit and arts networking; and includes interactions that involve firms with local to provincial scale education, industry and environmental management organizations or interest groups. International industry and supply networking make up the final pair of networking characteristics (Table 4.8).

BC); regional WoodLinks (interior value-added association); Industry Canada, Forintek, and Centre for Advanced Wood Processing (nationally based with R&D and training at UBC).

Table 4.8 Networking Types of Relationship - 2002

	Study firm connections with organizations and institutions									
	Local educ.	Local gov't.	Local not for profit	Local arts/ sport	BC Educ.	Local industry	Environ- mental Industry, NFP	BC industry	Inter- national industry	Intern'l supply
R1	X		X	X		X	X	X	X	X
R2	X		X	X	X	X	X	X	X	X
R3	X		X		X	X	X	X	X	X
E1	X		X		X	X		X	X	X
E2		X			X	X		X	X	X
E3	X								X	X
M1	X		X			X	X	X		
M2						X		X		X
P1					X			X	X	X
P2	X		X		X	X		X	X	X
C1	X		X			X		X	X	
C2	X				X	X		X	X	X
F1	X		X						X	
F2	X	X	X	X	X	X	X	X	X	X

Study firms and firm principals engage in comprehensive relationships with industry, institutions and informal community. Older firms' networking connections include long-established and extended family-employee interactions that contribute to hiring, supply management, production, research and marketing practices. All but three study firms are deeply involved in local education. BC post-secondary training, co-op and program development liaisons involve eight firms. However, firm principals express a common perspective of short and long term merits of interactions involving firms in skills, training and research at various scales from neighborhood schoolyards to international market research. Owners explain that less tangible advantages of networking partnerships enhance local profiles of their firms' products and activities; improve potential access to skilled employees; and build stronger, more diverse local/provincial educational programs connected to value-added forest industry and specific sectoral knowledge.

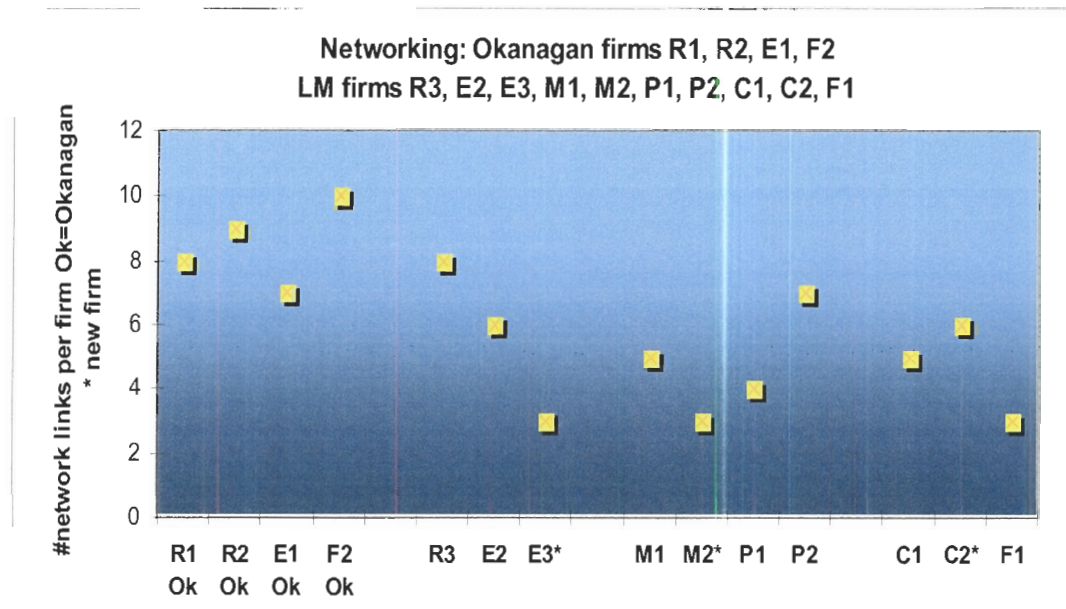
In contrast, only two firms have established strong networking connections with municipal governance and planning institutions. 'Not for profit' and sports organization interaction is well developed by nine study firms that promote such relations. Mr. V at Firm C1 is most supportive of intensive personal networking. His production manager/ firm partner, for example, has made important hires for the firm on the basis of numerous extended friendships and firm-related relationships formed in conjunction with his son's hockey career. Even through networking with local arts

organizations, three firms have formed durable relationships seen beneficial to firm development. Locally and provincially based networking mechanisms involve eleven firms in the immediate locale. The same eleven are also engaged in BC industry networks. Inter-firm and firm-industry networks range from marketing and communications groups to business development, trade mission, and industry sector, species specific value-added R&D. Five firms are active within environmental management initiatives, including all three remanufacturers. Significant bonds link study firms to industry and supplier networks. Most firms understand these inter-firm and firm-industry networking arrangements to be the backbone for a spectrum of primary activities.

4.5.2 Regional Networking

The four Okanagan study firms operate in close geographical and cognitive proximity to industrial suppliers, related firms, community schools and businesses. These four firms tend to be involved in a wide range and great number of industry, education and community relationships (Figure 4.4). Lower mainland firms differ somewhat, showing more limited connection with their local industrial community and social/cultural networks. Overall, the Okanagan firms have developed comprehensive linkages, perhaps because it is harder to be comprehensive within a community as large as the GVRD. Interior firms also lead lower mainland firms across their respective industry sectors (i.e. remanufactured; engineered; furniture) in networking characteristics examined, even though the interior study firms are farther from dominant industry and research centres. However, amongst the lower mainland firms are several with particularly strong relations (>6 types): R3, E2, P2, and new firm C2. These firms interact effectively within a complex industry milieu. Firm owners value stability and long term cooperative interactions that contribute to business and process development. For most enterprises, these interactions create the supportive climate needed for product, market and supply chain innovation. Characteristics of product R&D, and the synergies between market and product development, are reported in the following chapter of this thesis.

Figure 4.4 Inter-regional Comparison of Study Firm Networking



4.6 CONCLUSIONS

This chapter has examined the start-up, growth and networking development of study firms within both industrial districts; and revealed the way firms have managed the key aspects of start-up and ongoing competitive advantage. The 14 firms have successfully negotiated growth, relocation and local industry development within their local milieus. These firms have largely supplied their own capital funding, and have capitalized on entrepreneurship initially, and networking later, to pursue market and process development, wood supply certainty, and an established human resources and infrastructure base. The early part of this chapter explained initial ownership patterns and infrastructures; and then discussed the significance of location dynamics amongst firms and regions. These findings indicate that locally-based, inter-firm, regional and international industry relations are particular strengths for the Okanagan firms. In the lower mainland, leading edge firms typically addressed export oriented value-added product and market development. Yet the Vancouver area institutional environment has not fully developed the capacity to support modern forest industry value-added production. In this respect, local institutions and related industrial development policies have complicated the growth and relocation of some recent study firms in the lower mainland.

All owners were, at the outset, committed to concepts and practices of adding value to wood fibre. However, adding value has meant different things to owners over several generations of start-ups. Owners from the earlier start-up group express, in retrospect, somewhat different perspectives than recent firms. For example, the early group, particularly 1950s and 1960s firms, was concerned with sustaining and growing long term (large scale) community employment. A different viewpoint is revealed by new firm owners who state their focus on internal management organization and efficiency, and advanced wood certifications, often collaborative, required for specific export markets. Nonetheless, across the firms I discern concerns for value-added prospects in BC, as well as personal commitments to creating more sustainable local forest and human resource management that would permit such objectives to be realized.

This chapter has explained how the formative geographies of local study firms can be explained by a reliance on entrepreneurship within local resources and institutions, social ties, knowledge and capital. The start-up geographies of these 14 manufacturers indicate that their long term, or contemporary, local value-added industrial advantage is linked to common initial and on-going strategies that first capture and later 'fix' their economic position in the locale. These findings provide part of an attempt to understand how firms access and negotiate local factor conditions, and utilize human and physical resources within a highly competitive, rapidly changing global forest industry.

CHAPTER 5 MARKET AND PRODUCT INNOVATIONS OF HIDDEN CHAMPIONS

Our original product (R&D) designs come from the marketplace - entrepreneurial adaptations to fulfill a niche identified in these geographic markets. (The) main reasons for new products development?...to enter new markets and for better marketability. The testing and research (for this product) were done locally. New products are offered first in BC...(for this product) happened over a two year period. Our product R&D, and adaptations, have allowed us to expand our product line. New products come about in response to ideas in the marketplace, and we modify them and channel through existing distributors. (Firm M1)

This chapter examines the strategic research and development (R&D) of contemporary products and markets among the 14 case study firms. The nature of their product and market innovation systems is revealed by qualitative and quantitative evidence that reports on linkages between internal R&D of firms, local institutions, and customer/market requirements. Maskell et al (1998) state that innovative value-added wood product manufacturers must rely on local knowledge sources within industrial agglomerations and customer liaisons to maintain competitive advantage. Within the group of study firms, owners note that their product research and market developments represent the core of competitive advantage, and that interrelated product and market specialization and diversification initiatives drive overall firm growth. However, their research activities are largely invisible to outside observers, making the product research process 'the black box' of production activity. This discussion of product and market creativity thus draws on data describing their in-house (internal) and external (institutional and market) innovation supports.

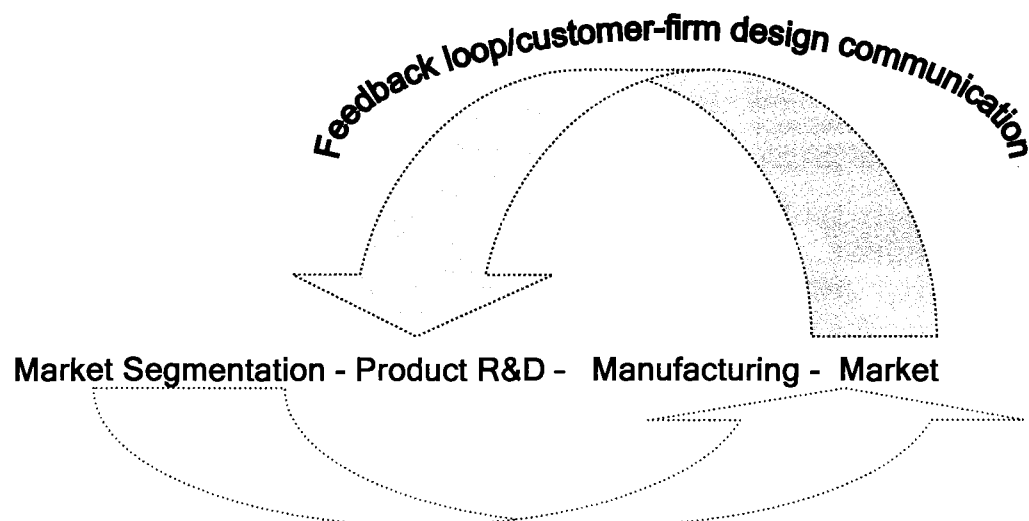
Knowledge communicated through local/regional networks and institutions enables study firms to conduct product research, develop labor and skills, procure wood supplies, and further markets. The quantitative data in this chapter focus on two interlinked production activities: product creativity or R&D strategies of firms and sectors; and current sectoral trends in geography of sales and marketing. Qualitative data explore the specific product and market advantages of individual firms and industry sectors. Overall, the product and market development of these 14 firms

signifies important contributions in research, communication and collaboration, and market skills developed internally and within the industrial district.

Ideally, the value-added product design process is guided by market knowledge that anticipates customer demand and design specification (Figure 5.1) (Porter 1990; Pesonen 2002), so that product R&D within the home locale depends on the way firms connect (often distant) market demands with in-house (internal R&D) and local research support. In advanced value-added production, firms research and develop products by engaging in customer communication that not only informs design but also becomes integral to local value chain organization (Martin and Porter 2000).

Innovative product development situates research at the leading edge of production. Product development (including quality, selection, differentiation and refinement) strategies in the wood value-added sectors generally demand iterative design adaptations that progressively connect invention, trials and product introduction phases. Advanced design strategies are informed by specialized market knowledge, research, and integrated product development approaches that identify segments of global markets, or customers within export niches. The creation and strengthening of inter-cultural linkages between firms and customers is crucial to the successful implementation of on-going product sales and service; for example between BC firms and Japanese markets (Reiffenstein 1999) where BC log home builders and their customers engage in collaborative research (Figure 5.1).

Figure 5.1 Market-led Product R&D



Source: adapted from Porter 1990 and Pesonen 2003

5.1 PRODUCT RESEARCH, DESIGN AND DEVELOPMENT

...evolving towards more remanufacturing, with engineered wood and appearance products being perceived as growth sectors in an industry intent on increasing its client focus as a means of delivering value. Progress will generally mean increasing attention to, and integration with, clients' manufacturing processes and end-user preferences. Design is singled out as the most potent link between... industry and its new clients... key to enhanced product value. Success will depend on choices... and commitment of industry and its allies to innovation through medium and long term R&D. It will depend on the stakeholders' willingness to support the more fundamental search for knowledge, which so often lays the base for technological innovation. It will also depend on expanding collaboration between the industry, its R&D institutions, its equipment, services and software providers, educational institutions, governments and end-users. (Industry Canada 2005)

The overall picture of product creativity demonstrated by study firms reveals parallel development of their new product lines and markets. Incremental product refinement, adaptation and differentiation typify the study firms' design modifications. In general, the interactive R&D activities of study firms also involve their value-added networks by circulating industrial research knowledge within the locale. The specific R&D characteristics of individual firms thus identify their respective innovation practices and those common to their respective industry sectors. As study firms manage product innovation, their R&D activities, though variable between firms, act in concert with customers, suppliers, other firms and institutions. At the same time, these firms are concentrating on evolving market niches that are highly specialized, markets that demand sophisticated product design and adaptation. The case study firms are primarily export-oriented, although several are actively strengthening regional Canadian markets. Products designed by the study firms typically incorporate market-specific standards and certifications that typically require firm-institutional collaboration. A pattern of collaboration with customers (and within customers' local jurisdictions) shows export market knowledge expressed in products of many study cases. Engineered wood sector firms, for example, are involved with local planning and building design authorities in municipalities or states of export market locations.

The diverse product research approaches of study firms include 27 types of R&D used in planning, design/development and trial stages (Figure 5.2). My study data account for in-house R&D and a range of innovation inputs that incorporate local, provincial and national sources of design/development. Figure 5.2 thus recognizes diverse product types, sources of R&D knowledge, and market niche

selection among study firms - a comprehensive group of product design strategies across 14 cases from six industry sectors. The 27 design characteristics in Figure 5.2 facilitate comparison between study firms: integrated design⁹; in-house/internal design resources; formal R&D budgets; licensing agreements; product design adaptations (from previous study firm products); university R&D liaisons; contracted engineering designs; industry design liaisons; information technologies integral to product design; participation in product standard developments (local to universal product standards; and BC directorship instituting product quality standards (Figure 5.2).

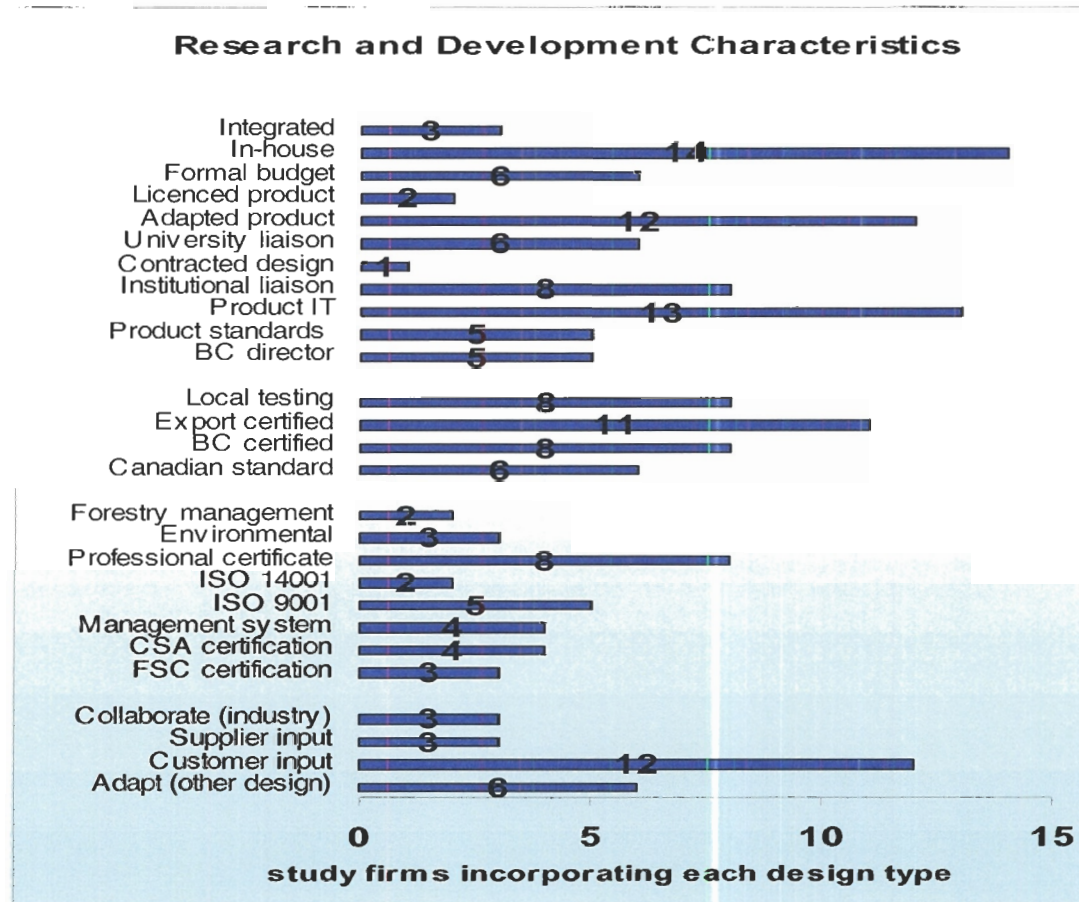
Product R&D of study firms (Figure 5.2) is also supported by local product testing; certification for specified export jurisdictions; BC regional and Canadian (e.g. national building code) product design certifications; R&D linked to forest and environmental management; professional certification for design engineering; standards ISO 1400, ISO 9001 and other quality management systems; CSA and/or FSC (manufacturer chain of custody) certifications. Collaborative (e.g. inter-firm) and supplier-firm R&D liaisons, customer design inputs and adaptations of external (to study firm) products influence the strategic development among various firms (Figure 5.2).

In general, the specialized product designs of exporting firms (a contemporary market focus for study firms) are shaped by standards required in specific export jurisdictions. The California market place of firm E2, for example, demands structural wood products certified for municipal building and structural engineering code strength and stability standards, fire and earthquake ratings (Los Angeles 2004). Different market design parameters, namely aesthetic, environmental conservation and forest management values, influence the product designs for specialty EU and UK customers of remanufacturers R2 and R3. Lower mainland firm R3 has obtained 'chain of custody' (COC) Forest Stewardship Council (FSC) certification for the firm's western red cedar (WRC) products. Design engineering of millwork and prefabricated study firm products variously addresses efficiency, air quality, and safety of wood components, finishes, connectors and glues within and surrounding building envelopes. The case study firms generally rely on multiple design and testing sources to supplement in-house concepts and/or to implement new or adapted

⁹ Integrated design characteristics are defined in this study as undifferentiated product and process research and development activities most common amongst engineered wood study firms.

product design, development and application.

Figure 5.2 Study Firm Product R&D Characteristics - 2002



5.1.1 Product R&D Trends of Study Firms

In-house product design is commonly used by the 14 cases (Figure 5.2). Figure 5.2 shows that twelve firms rely on adaptations of their previous products, with more limited adaptation based on other sources (six firms). The case study group is adept at integrating informal, locally based sources in their product design and testing (Figure 5.2). Nearly all of the study firms coordinate their product development with relevant market information, and most rely extensively on incremental product development (informal mechanisms embedded in local wood cultures, industrial and educational systems). Many firms conduct informal research that incorporates exogenous (external to the region) design inputs in conjunction with their export customers' specifications for export certifications. Firms conduct instituted and

informal collaborations with government and technology centers, and with cooperative standards development and testing groups. Fewer firms rely on patents and licensing agreements (Figure 5.2).

Nearly half of these firms have adapted designs of related or competing firms (Figure 5.2). These types of inter-firm design liaisons most often also advance study firm R&D with industry and/or wood manufacturing and marketing boards, technology institutes and universities. The R&D practices of these firms tend to be highly integrated with information technology (IT) related to product design, development and testing. Most study firms tend to secure some localized, provincial or national design support, but demonstrate little formalized budgeting for R&D capital or time expenditures¹⁰. Product and process research and development phases are generally self-financed.

Figure 5.2 indicates study firms' focus mainly on export-certified products. Enterprise-specific R&D is well developed by 11 firms who specialize in one or more specific product certifications for foreign markets.¹¹ For example, lower mainland firm E3's export certifications and organizational affiliations illustrate the firm's product and market integration (Appendix E). Customer feedback and input to design and engineering are also significant R&D activities among 12 firms. However, nearly all firms have conducted informal and formal customer surveys and industry-specific market research (Spafford 2003). For example, the marketing and branding plans¹² of three study firms are under development in conjunction with surveys, firm-customer design collaboration and industry marketing initiatives, trade shows and government sponsored foreign trade missions (i.e. Export Development Canada; Western Economic Diversification)

The 'in-house' R&D conducted by owner/engineers, manufacturing and forestry professionals is connected to external activities of firm principals who maintain firm-institutional linkages aimed at quality and technological processes. Study firm use of these R&D sources is relatively high considering the (generally) low-to-medium

¹⁰ This research does not compare R&D expenditures as these data are beyond the scope of this study.

¹¹ Several firms hold up to eight export product certifications that range from structural engineered wood product laminate glues to aesthetic characteristics (i.e. wood finishes) and stringent wood safety standards.

¹² An example of strategic product diversification and development is illustrated by firm C1's professional brand development and management. The firm's product branding integrates six interlinked initiatives: market research, strategic planning, brand management and database, call centre and direct marketing (Mr. V 2003)

technology design typical; of value-added forest products (i.e. relative to high technology and biotechnology R&D). Furthermore, the development and marketing stages of product introduction among study firms tend to carry higher risks than high technology industries due to production scale. Over 50% of the study firms engage in design liaisons with universities, government or industry, while slightly fewer firms are involved in product and processing research projects for Canadian and BC product standards development programs (Figure 5.2).

Design-based interaction with export customers reflects the way several firms have capitalized on cultural and linguistic ties with export customers. Cabinet firm C2, for example, has hired Japanese staff - architects and CAD design engineers to offer in-house Vancouver design studios as well as Japan-based sales/design and marketing offices (staffed with Japanese-speaking Canadian designers). This firm has developed interactive information technologies and multi-lingual web services to facilitate communications between the firm and customers. The dominant design input for study firms is customer input for refining and adapting previous in-house products. Most designs are derived from previous products. The study indicates that R&D activity of most firms draws on institutionalized and inter-firm sources of design in conjunction with customer input.

5.1.2 Sectoral Trends in Product Design and Development

The nature of product R&D varies somewhat between industry sectors (Table 5.1). Yet firm principals generally report that specialized market niches demand product quality and differentiation, so firms across industry sectors tend to be closely involved with customers to collaborate in product design/development and service applications (Table 5.1). In contrast, the only strong supplier-firm design collaborations are conducted by the two lower mainland millwork firms M1 and M2. However, the interior products manufactured by these two firms (Firm M2 produces only interior millwork) are small scale and use pre-milled components.

Study firms across industry sectors typically participate in BC, Canadian and export product standards development, professional certifications, and product-oriented communication (Table 5.1). The data in Figure 5.1 indicate that the three remanufacturing firms R1, R2 and R3 are close to primary operations, with more study firms engaged in FSC, ISO (including environmental practices), quality standards and environmental management initiatives. These results suggest that the

Remanufactured firms are situated functionally and geographically nearer the standing timber and primary suppliers (Table 5.1). Firm R1 supplies 50% of own timber, and the outputs of these remanufactured study firms are intermediate between primary producers and other value-added sectors (i.e. cabinets and furniture). One product line of firm R2, for example, supplies furniture and cabinet industries with components for export industrial application.

The engineered wood product study sector excels in professional and product certification and product testing (Table 5.2). The R&D of firms E1, E2 and E3 generally reflect stringent product strength and advanced safety, fire resiliency and aesthetics standards prevalent throughout these engineered wood markets. The market for engineered products is structural members designed specifically to niche market locale. This sector focuses particularly on the integration of product and process R&D. An example of specific locally based R&D by engineered truss manufacturer E2 shows the Vancouver firm's five year focus;

"We have a 'shear wall' design for earthquake zone wall (safety) construction. This is our own design work in-house, and liaisons. Our R&D budget is not formal...the firm is expanding existing markets and entering new markets...the new products are offered first in BC...In-house is owner design of products with some project liaisons with UBCs wood division ...university training institute collaborations. We've designed a 'purlin truss' with span size advantages (i.e. increased from 4 to 6 feet... that's significant). The firm has developed a 'top cord hung' detail ...truss designed to 1500 psi (strength in pounds per square inch) testing - to hang so beam sits higher... which increases clearances for warehouse ceiling with use of same(size) structural beams [Mr. M described examples of one Walmart store where same (firm) designed for ceilings and where larger clearances are possible with these truss plates.] Customer input is important, and there are spillovers from our custom products and processing (remanufactured MSR division). Supplier input is important, yes... but we are now our own supplier (with our MSR high grade) for the truss production... since 1995 (we've integrated). Patents to 2002 - one, and patent applications pending - one. Yes, we have licensing agreements, here is a two-sided connector plate for trusses (Mr. M shows me)...it is much better than a normal truss connector...and they (firm granting the agreement) ... supply software for connector. We do adaptations of previous products...same technology used for wood and truss connector plates and triangulating. Product innovations we've attempted since 1997... tried floor truss markets...new products are all tried first in BC and the firm's new product development has been most effective in saving money in production cost...since 40% of the input is wood ...and the product design has simplified production.

Table 5.1 Industry Sector Product R&D Characteristics - 2002

PRODUCT R&D TYPE		INDUSTRY SECTOR					
		Remanufactured	Engineered	Millwork	Pre-fabricated	Cabinet/Furniture	
Adapt other design		3	2			1	
Customer input	collaborate	3	1	2	2	4	
Supplier input				2		1	
Collaborate with other		2	1				
FSC chain of custody		2		1			
CSA		1	2	1			
QM standard		2	2				
ISO 9001	management	2	1	1	1		
ISO 14001		2					
Certified	professional	2	3		1	2	
Environmental Mgmt.		2				1	
Forest Mgmt.		1				1	
Canadian Certified		1	3	1	1		
BC-Certified		1	3	1	1	2	
Export Certified		2	3	1	2	3	
Local product tested		1	3	1	1	2	
BC director		1	2			2	
Standards Development			2			3	
Product IT		3	3	2	2	3	
Liaison with Other		3	2	1	1	1	
Contracted R&D				1			
Liaison University		1	2	1		2	
Adapt other Product		3	3	2	2	2	
License or use agreement			2				
Formal budget		1	1	2	1	1	
In-house R&D		3	3	2	2	4	
Integrated production			1			2	

Note: Inter-sectoral data uses the 27 R&D criteria illustrated in Figure 5.2; numbers 1-4 indicate firms per sector for each R&D type. Darker cell shades indicates more firms are active within each sector.

The millwork, cabinet and furniture study firms' R&D differ somewhat from the 'larger product' R&D of engineered and remanufactured sectors. All three of these (smaller product) sectors are involved in advancing product standards, product development and certification, and make extensive use of customer input and collaboration in the design process. They are less dependent on primary suppliers of

wood, yet show a propensity to liaise in developing product quality standards in conjunction with marketing.

Table 5.2 Product and Market Creativity of Study firms R1, R2, R3, E1, E2 and E3

Product R&D Budget/ Liaison	Market Demand/ *Geography	Product R&D focus (1998-2003) Development plan for targeted market niche ** Product development risk factor identified by firm
FIRM R1 Formal budget In-house design engineer Liaison: UBC CAWP Customer surveys (and their customers)	High quality; Diversity *Reduce USA dependence *Expand Canada, Japan, India market niches	"Product R&D ...modest additions and changes... Eased edge board design to expand our existing markets - and entering new markets (with more caution) and expanding our product line." ** Risk "may lose some current customers who still want square edge design"
FIRM R2 Informal budget In-house design engineer Liaison: UK industry Design; Marketing; technology Collaborate/ customer	'Do-it-yourself' marketplace' High quality; Well-presented * < USA dependence *expand Japan	"We have focused on market expansion of patterns in pine edge-glued product line; wood use, quality and utilization over the past 5 years, ISO management/certification. All design in-house – there is rapid change in all areas. We have higher prices for our pine panel products, but also much higher quality. Europe is already 10 years ahead of us with product design ...and production technologies. By 2002, our product design and 5-year wood recovery reduced waste from 12% to 4%." **Risk: "US dollar is killing us now. We may lose our USA distributors after 19 yrs because of our 10% hike in prices as compared to distributors' prices to their customers."
FIRM R3 Informal Design In-house and Contracted engineering firm (>\$20 000 to put out new product) Collaborate/ Customer	Quality, diversity; adapted, fine-tuned previous products *Expand European and other small market niches	"We are expanding our product line of cedar structure kits for existing markets and entering new markets; FSC COC certification. Cedar is a niche...very strong competition." **Risk: "Specialty cedar is a very small global niche and as such can't support big investments in R&D."

Product R&D Budget/ Liaison	Market Demand/ *Geography	Product R&D focus (1998-2003) Development plan for targeted market niche ** Product development risk factor identified by firm
FIRM E1 Informal In-house design engineer Liaison Professional engineering; Architectural Design/ Engineering Partner Firm collaborate/ customer	Quality, finishing Diversity Export certifications *Expand: Europe, Japan, Asia Jamaica, and USA architectural	"Main product mix has changed and expanded considerably... along with changes in markets and marketing. Meet project coordination goals with associated firm customers, processing capacity/ technology in firm plant." Our firm has integrated the product and process design, and we work, partner... with an associate (an engineering design and management firm)."
FIRM E2 In-house design engineer Liaison UBC Regional, National International Design and standards certifications	Quality Reliability Consistency Structural Span and strength standards, Grade certifications *Expand USA west	"R&D ...expanding our product line... 'Shear wall' design, for earthquake zone wall safety construction... 'purlin truss'...increased the span advantage with our 'top cord hanging detail' ...this permits increasing beam ceiling clearances with some structural beams in large warehouse applications."
FIRM E3 In-house design No formal budget 80% own design/ Engineering technology International certifications Collaborate/ customer	Quality; Increase energy efficiency; certification *Expand Japan USA *Enter new Canadian markets	"R&D? Focus is to adapt our initial product - to expand our line to build the larger panels which are better, more energy efficient, with fewer thermal breaks and more design flexibility. We did expand existing markets in Canada [limited success even though unique]. Importance of customer input? Yes it's very important in our product development ... because certifications to import our products into the USA are required, and for the construction process. There it varies by state. The California building code is tough - environmental regulation, local building authority etc. So yes, it's critical to have customer input into product development. We also need to have 3 rd party audit of our product design and process – state regulations."

Source: fieldwork interviews, firms R1, R2, R3, E1, E2, E3 - 2003

New product lines connected to specialized markets direct M1's large portfolio of in-house design and engineering (with limited contracted design). The firm notes that 30% of design diversification initiatives demand new equipment and systems. In conjunction with expanded wood designs, the firm has recently diversified beyond wood products with innovative applications for exterior copper and aluminum hardware, accessories (e.g. post caps) and newel (stair post top and base) fastening systems;

"... a competitive and important product focus. Our liaisons with UBC Forestry labs, BCWood, and inputs from wood suppliers are all-important during product design and development phases. Changes in our facilities are constantly needed for manufacturing new products - changes almost monthly. Personal contact with suppliers is very important in the 'very local' firm region, with western red cedar species, and kiln dried coast western hemlock both being very big in importance to operations. Our product ideas are adaptations of (our) previous products... yes, we get the ideas from the competition. A major product innovation since 1997 is (specialty) hemlock fingerjoint (interlocking wood fastening)... the testing and research for this product were done locally. (Mr. T)

An alternative design perspective of patenting and licensing activity suggests that most study firm principals consider a prime R&D strategy to be adaptive product design. New firms E3 and C2 are focusing on product adaptation during growth. Furthermore, all cabinet and furniture study firms experience rapid change in market demand; three now lack local direct competition. Mr. Q of Firm F1 expresses his view of the contemporary design dynamics in furniture and cabinet industries; "Fashion changes more rapidly than the garment industries, and thus precludes patenting." Mr. E of Cabinet Firm C2 elaborates on details of the design and patenting process;

"We probably could patent our products, but the firm's design process is very focused... and specialized, on a special Japanese market... so we don't need to (patent out designs). For example, we use a different thickness on backs, gables instead of the standard 1/8" thickness...this makes a vast difference in the assembly and stability of the structures."

Furthermore, the species-specific product orientation of each study firm cannot be imitated easily by firms outside the locale. Twelve long-established study firms follow similar R&D patterns concentrated on shared, locally based knowledge creation/ retention mechanisms, with product and market development well integrated in-firm across primary and support activities. Three lower mainland firms (C1, R3 and C2 spin-offs), and five merger firms still retain some continuity of product line R&D initiated by forerunner firms. As study firms generally tend to pursue an

“educated customer base” (Mr. E) to develop product and market advantage, owners of recent firms E3 and C2 currently view their prospective Japanese customers as ‘ideal’ market opportunities. Both owners explain how Japanese customers in specialty niches are able to understand and value unique, differentiated products; and possess well-developed capacity for positive design collaborations. In contrast, the short and long term prospects of the Chinese marketplace are considered negative by six firm principals. Owner Mr. H of Firm R1 explains;

“Regarding the firm’s future competitive environment and value-added export competition with China ... the firm has sent some lumber products there. We see China more as a competitor than a market for our wood. We expect the Chinese to quickly learn the production process, using inferior wood supply at first, and then within a few years they’ll do better and compete....”

This candid assessment by Mr. H is echoed by four firm principals contemplating Chinese markets, or with previous export experience in China. Predicting a gloomy future for BC value-added, Mr. T (Firm M1) bluntly explains how his firm’s competitive advantage in product R&D, labor, skills and experience “...will rapidly shrink as China builds its wood manufacturing research and training. In ten years all the value-added manufacturing will be in China.”

Indeed, Firm M1’s original local competitors have vanished since the firm’s inception. The firm still commands advantage, yet within a highly demanding sectoral restructuring environment that forces rapid product diversification in the face of a new regulatory regime that addresses human health exposure to wood chemical additives and treatments (now removed from M1’s product line). New Canadian standards demand traditional wood treatment phase-out, causing major product/production change. Copper, arsenic-based, creosote treated cedar, fir and hemlock exterior applications must undergo redesign. At the same time, M1’s environmental certification (i.e. FSC) exceeds most North American market eco-certification demands. Since M1 is the only remaining millwork manufacturer of its kind using coast softwoods, I conclude that this firm is currently retaining local competitive advantage in coastal wood species’ R&D.

Export trade barriers and foreign market wood certifications influence long and short term R&D plans of study firms. Anticipating Chinese wood manufacturing expertise, Firm M1 is actively diversifying both wood and metal hardware product design; yet owner Mr. T explains that such research and development efforts exceed the scope of all but the largest and most innovative local firms. Six firms in

engineered and remanufactured sectors also intend to diversify product lines with collaborative customer input. The R&D contributions of remanufacturing and engineered cases indicate close working dialogues with customers, beyond design and production, to include design for installation and service. Firms R1, R2 and R3 are also developing market acceptance for branded products. Firm R1 has recently pursued incremental quality design modifications linked to new export markets. This strategy would reduce R1's (softwood import taxed) exports to the USA by one third over a 20 year period (mid 1980s to 2005). In contrast, Firm R2's product diversification will extend product lines destined *for* specialized USA markets (R2's market > 66% USA by 2005). However, although R2's exports are exempted (from USA softwood tariffs), Mr. C expresses concern for Canadian dollar exchange rates over 2003 (an even higher cdn exchange in 2005). Yet regarding competition, Mr. C's perspective: there are no direct regional competitors, so the firm will open geographically proximate USA (western states) home renovation markets that are growing. However, Mr. C sounds a cautionary note: "...with human capacity and technology development... there are many new competitors in Chile, New Zealand, Scandinavia and Australia. And China is coming on as a competitor since 1999."

5.2 EXPORT SALES AND MARKET INNOVATION

Imagine marketing and selling a new wood product: perhaps a unique piece of outdoor western red cedar playground equipment or a locally designed complex structural truss section. The customer is from a specialized export market where language, culture and wood species familiarity may not be in synch with that of the BC value-added manufacturer. In facilitating trade, how is market intelligence acquired by study firms, how is requisite information exchanged, and how does communication flow across borders between distant continents? This part of the study analyzes the geography of sales of the case study firms, and explains export customer-study firm connections that occur within the local production region. Following product R&D, this section explores the competitive advantage of individual firms and industry sectors in certain specialized market niches.

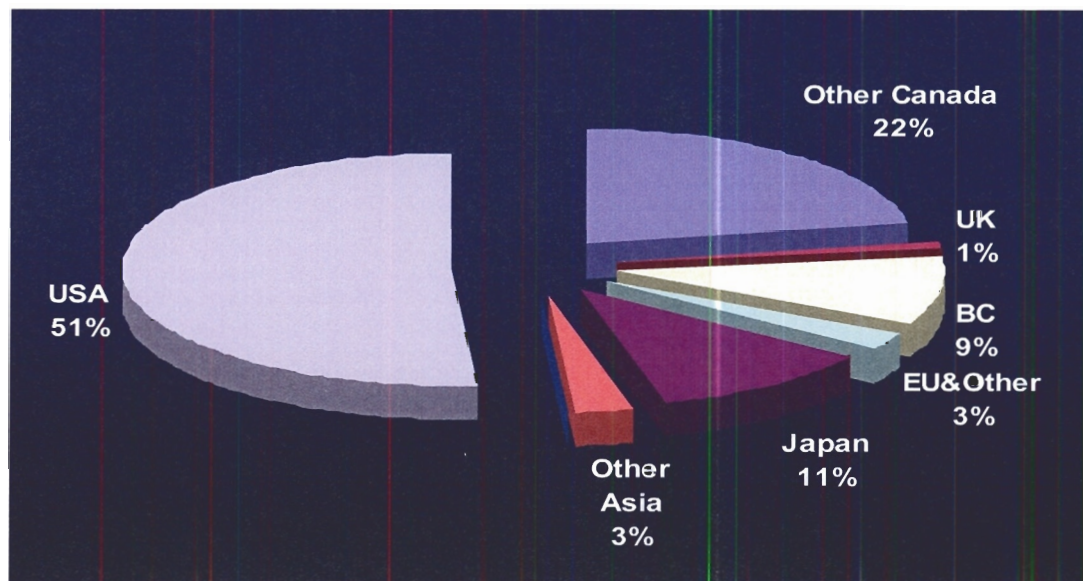
The study firms are typically involved in many small but diverse export markets; however, this group of firms relies overwhelmingly on USA markets for the majority of 'export sales' (Figure 5.3). The USA market place offers an exceptionally rich and

broad palette for the ongoing development of study firm products created for specific USA market niches. For example, ten firms have maintained long-established market niches in more than seven states, with highly specialized product certifications in specific local USA jurisdictions. In contrast with their USA (51%) sales, Canadian markets purchase 31% of total product sales distributions. Much of the total Canadian market, including local *and* BC sales, is contributed by only four lower mainland firms: E2, C1, C2, F1; and less significant sales by only two other LM firms R3 and E3.

The contemporary focus of product and market development by firm E3 illustrates a common connection between BC value-added exporter and American marketplace (Appendix E). Firm E3 manufactures energy-efficient structural insulated panels, a product line tested and accepted in code requirements across the USA jurisdictions that comprise more than 80% of E3's sales. Owner Mr. G notes that his firm is striving to expand several specialty market niches within the lower mainland, Gulf Islands, Vancouver Island and rural western Canada;

"We would really like to expand our Canadian markets and would like to develop more (business in Canada), but here in Canada, there is reluctance to change; we can't educate the markets here in Canada, and there are some other limiting factors which prevent it - we in Canada have low energy costs and, compared to the US and Japan and our other markets, lots of cheap labor ...compared to our export destinations... so that conventional wood frame construction is actually a good deal for the prospective homeowner in BC." (Firm E3)

Figure 5.3 Study Firm Markets - 2002



5.3 CONTEMPORARY GEOGRAPHY OF SALES TRENDS

The dominance of USA markets for study firms' export products typifies the pattern of sales across the firm group (Table 5.3). Strong USA sales for their value-added wood products reflect the long-standing economic and social synergies developed between these Canadian firms and their American customers. Proximate geographically, culturally and linguistically, another great tie binds BC study firms to their American customers: the widely used and commonly accepted use of wood in structural, framing, sheathing, cladding and roofing applications for single/multi-family residential and low-rise industrial/institutional construction indigenous to most regions of North America outside of Mexico. Wood structural and cladding members produced by remanufacturing and engineered study firms are complemented by diverse interior wood products of cabinetry, millwork and furniture firms C1, C2, C3, C4 and M2; and exterior millwork manufactured by Firm M1 (Table 5.3). BC exporters and USA importers also share parallel urban development and architectural design histories, engineering standards and building codes, and construction practices, wood harvesting, manufacturing and transportation processes.

Japanese markets, on the other hand, have proven more vulnerable to global economic change; more demanding in terms of product design, refinement, standards and certification. Only two study firms, C2 and P1, rely on Japan as a primary sales destination for products exported (Table 5.3). However, recent engineered firm E3 shipped over 10% of products to Japanese customers in 2002. This firm's remaining sales include diverse USA markets, including Hawaii and California. Although several firms have exported some products to Japan, only C2, P1 and E3 continuously design and refine products for Japan; for example product certifications specific to residential, commercial and institutional customers. Study firms exporting to Japan report significant cross-cultural international learning exchange between their manufacturing firms in BC and Japanese architectural and industrial customers that lead product design differentiation and specialization.

Recent entry lower mainland cabinet firm C2 is located near the Vancouver airport in North Delta, and frequently interacts with visiting export customers (e.g. Japan, Hawaii and California). However, like other recent entry structural panel manufacturer E3, firm C2 maintains firm control of product design and manufacturing

processes. All product design consultation/ collaboration and marketing are conducted by these lower mainland firms with use of in-house engineering and specially trained representatives. However, lower mainland Firm C2 is making particularly bold commitments towards in-house integration of product design and marketing. Not only fulfilling Japanese product design requirements (through firm hiring practices - Japanese designers/Cad Cam technicians), this firm is utilizing multiple language and cultural product identification strategies in firm graphics, web design and literature as a way to connect this local Canadian firm (and product identity) in the Vancouver locale with Japanese customers.

Significant for market depth and diversification amongst study firm export sales are the important 'EU and other' combined sales that reveal significant markets (i.e. EU; UK; other Asian sales outside Hong Kong) (Table 5.3). The export sales of millwork firms M1, and furniture firm F2 are advanced in specialized market niches in the UK, Europe, Hong Kong, Australia and Middle Eastern countries. Furthermore, many study firms continually develop extensive networks of friends, suppliers and customers to enable potential competitive advantage in specific export markets. Remanufacturing Firm R2 owner Mr. C, for example, explains how his ongoing, long term relationship with a UK industry friend (i.e. weekly phone calls, European trips together several times yearly) develops his firm's product, marketing and production. European customer/study firm export relationships also tend to be expressed by cultural exchanges and familiarity with specific western Canadian wood species. Also important to the product R&D/marketing processes are the long term linkages forged by several study firm owners with their EU machinery and computer systems suppliers. These supply relationships tend to enhance technology transfer, modification, refinement and development in western Canada.

Table 5.3 Percent Sales Distribution of Firm Markets - 2002

	BC	Canada	USA	Japan	EU	Other Asia	UK	HK	China	other
R1		18	62			20				
R2		35	63				1	1		
R3	2	13	70		5	10				
E1		20	70			10				
E2	15	5	80							
E3	5		80	15						
M1		25	50				12			13
M2		25	75							
P1			20	80						
P2		48	49							3
C1	72		26						2	
C2	20		20	60						
F1	15	59	26							
F2		60	25							15

Study firms often experience discontinuous and uncertain markets when they challenge European, Middle Eastern and Asian market niches. However, their efforts advance marketing, innovative communications and technology savvy across cultural-linguistic and physical spaces. For example, although EU niche markets comprise a small segment of study firm sales, the value to R&D attained in seeking such highly specialized customers is reflected in stronger USA market positions. Mr. H of firm R1 notes his incremental yet highly significant product R&D contributions; “our remanufactured products have been refined and modified to address consistency and extremely high quality...while at the same time focusing on diverse markets.” Firm R1 produces special kiln dried boards for North American markets; the firm has also designed patterns for industrial customers as well as specialty grades and special metric sizes for Asia and Europe. In concert with product firm R1’s R&D, marketing and technology development, Mr. H explains;

“Even though a value-added manufacturer, we’re a ‘low-technology industry’... therefore most major product R&D stuff has been done ... the competitive edge is building the customer, supplier and labor side of the business.”

As with several study firms, the ebb and flow of firm R1’s geography of sales, market retention and technology development are balanced by the firm’s long term

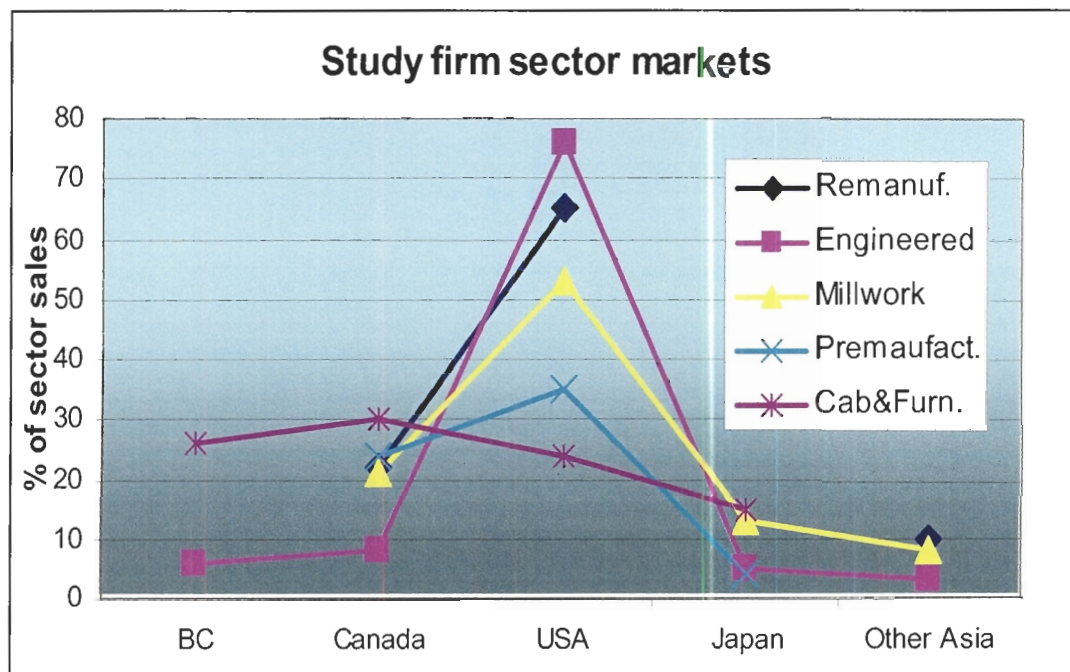
application of effort towards product differentiation. Firm R1 notes insignificant sales to EU customers, yet firm principals stress the value of their significant interactions with European customers and Swedish and German equipment suppliers during frequent trips to the EU.

5.4 SECTORAL SALES

As a counterpoint to advancing international niche markets, owners' across sectors remark that building durable and unique local or domestic markets (provincial to Canadian scale), ideal for their locally sustainable business development, is remarkably difficult to achieve in practice. Unlike formative locally-based sales geographies of early start-ups, the 'sectoral' sales distributions of these firms are remarkable for varied market concentrations (Figure 5.4). As noted, USA markets dominate aggregate export sales of all sectors. Remanufacturing and engineered firms are particularly dependent on US customers. Two remanufacturers are actively reducing USA market dependence; and recognize the ongoing constraints posed by Canadian dollar exchange fluctuations, import barriers to softwoods, and competing firms from new industrialized nations.

The engineered products sector, firms E1, E2 and E3, relies heavily on the American marketplace. However, firms E1 and E2 do not consider this to be problematic. Products from these enterprises are in high demand across small market niches connected with both 'high-end' and 'high-technology' architecturally designed construction projects. Owners of all three engineered study firms are leaders in Canadian and USA product standards and certifications (e.g. code-specific strength, longevity and decay test standards). The challenge for new firm E3 is to gain product acceptance in Canadian markets vis-à-vis price, long term product value; and integrating product within local construction processes. On the other hand, markets of both millwork and pre-manufactured study firms are far more diversified. Largely centered on US customers, the prefabricated firms' sales are also well-developed across Canada and Japan. The millwork sector also has diverse markets outside the USA, and particularly strong sales in Canada, Japan, Middle Eastern, and Asian countries outside Japan and China. Cabinet and furniture study firm sectors capture significant sales in local and BC niches, as well as Canadian, Japanese and other foreign markets.

Figure 5.4 Trends in Export Market Specialization - 2002



Generally, the study firms capture significant domestic markets for their (mostly) high-end wood products within the most highly populated urban locales across Canada. However, firm principal Mr. G of firm E3 explains how his firm's domestic market development encounters a widely dispersed population generally lacking in (consumer) awareness, education, sophistication and appreciation of value-added wood products. In the mass-production side of both renovation and new residential housing markets, there is less demand for specialty advanced wood products. Fieldwork interviews suggest a dearth of knowledge locally and domestically (compared to European and eastern USA customers) with respect to wood species, sustainability of forest resources and certified wood products, and local business development effects.¹³ In addition, the primary customers of many study firms are giant USA based and other MNC wholesalers and distributors - companies like Lowes, Home Depot, Ikea, and Sears - that resell globally and across Canada, thus precluding study firms' ability to strengthen direct sales and communicative marketplace contact. Firm survival in this environment is described by Firm M1

¹³ Research on consumer knowledge of value-added wood products and production indicates that BC and Alberta consumers lack knowledge of price, selection and certification (Kozak et al 2004).

principal Mr. T as extremely challenging. However, while retaining local and regional sales, several enterprises are making significant market advances and forcing concerted shifts in their own market geographies.

5.5 CONCLUSIONS

This chapter has discussed the way that each firm has recreated flexible specialization through networking, product and market creativity. In terms of individual and sectoral strengths, the discussion has concentrated on the nature of locally based networks, strategic R&D, and unique market diversification amongst industry sectors and firms. Summarizing this chapter, the evidence is complex. Overall, my research indicates that the product R&D contributions of study firms are most remarkable for their focus on the creative use of locally embedded knowledge. A short summary of results highlights the salient points from this chapter:

1. The networking role of regional institutional liaisons is significant for supporting product innovation, research, and marketing and on-the-ground operations of study firms. The sectoral trends in product innovation show varied design strengths amongst sectors, and a high level of national scale product development support for remanufactured wood products.
2. Study firms use diverse R&D strategies - in particular customer design collaboration and adaptations by in-house design professionals, but have limited formal budgeting.
3. Design and production decisions in study firm markets outside the EU and Japan tend to be shaped less by values customers place on firm practices in supply and forest management, production and environmental protection (i.e. product design and development that anticipates aesthetics, product longevity and human health concerns during product life cycle).
4. Inter-firm and inter-sectoral collaborations are limited with respect to product development. However, local product testing and product design initiatives involve study firms in collaboration, for example, with UBC Centre for Advanced Wood Processing and UBC Forestry Faculty, and Forintek (Canada's wood research testing and development organization), especially on structural and appearance product standards. The diverse product design and development perspectives for furniture, cabinet and millwork firms reflect their customers' demands for quality and differentiation based on selected species.
5. Industry sectors selectively access R&D and market development liaisons. The remanufacturing and engineered firms show the greatest awareness and motivation for wood certification, management and environmental systems.

Three study firms from these two sectors rely on integrated product R&D and technology development.

6. Firms tend to pursue R&D links between increasingly distinctive products and specialized global market niches. Remanufacturers and engineered firms are highly dependent on USA markets; but the two sectors respond differently to market dependencies.

This chapter has shown study firms and their respective industrial sectors to be unusually focused on innovative product development and geographical markets to generate growth. Products and markets differ amongst individual firms; yet representative firms could act as important innovators and incubators to lead value-added sales, R&D and local employment in BC. These firms specialize in export niche markets, and show potential for creating further local skills advancement in their respective locales. These aspects of study firm innovation and organization are researched in Chapter 6, where my study examines the way enterprises organize and manage human resources in concert with procurement of new technologies. Overall, my research indicates that the product R&D contributions of study firms are most remarkable for their focus on creative use of locally embedded knowledge linked to well-developed export markets. In policy terms, these findings point to the need for local firms and industry to strengthen relations with research institutions and cooperative local networking organizations (i.e. certification, standards, BC product branding). R&D should focus on strong firm-customer design relationships and increased education within Canadian markets, in responding to firm owners' valuation of the well-educated BC/western Canada customer base.

CHAPTER 6 JOB CREATION, LABOR AND SKILL INNOVATION OF HIDDEN CHAMPIONS

The nature of human resource and technological skill development reveals important assets that differentiate the 14 study firms. Union and non-union firms in particular differ in their management of human resources. Accordingly, this chapter explores the creation, organization and development of human resources (HR). Labor and skills underpin the research, production and marketing initiatives of case study enterprises. Furthermore, innovative labor organization also enhances the skills within the local network of value-added firms (Piore and Sabel 1984), for in-house training practices are closely entwined with regional learning and labor circulation. This study notes transfers of knowledge and specific skills among the 14 firm that are associated with unionization patterns and inter-firm competition for skilled employees. This chapter focuses on the role of labor among the study firms, especially with respect to best practices human resources development (HRD) that furthers our understanding of how study firms arrange, develop and reinforce labor and technology systems to best exploit internal, local, and more distant resources.

The chapter is divided into three parts. The first section describes employment patterns of the study firms, differentiates employment characteristics and skills by sector and region, and notes the geographical concentrations of non-unionized firms. My research then turns towards the internal organization of employment relationships by comparing firm-specific skills and employee participation. This chapter explores the implications of CAD (computer aided design), CAM (computer aided manufacturing) and CNC (computer numeric control) technologies for HR management and skill formation. Recent technological developments are considered integral to creative employment organization. The highlights of employment and technological characteristics draw on fieldwork interviews to comment on interesting variations in study firm strategy.

Within the flexible specialization model the ideal value-added solution engages highly skilled workers in a spectrum of interactive, flexible and interesting activities in a collaborative workplace environment conducive to market-led production. Leading-edge SMEs actively seek to advance on-the-job training that encourages employee

innovation and participation. Innovative firms leverage learning internally and co-operate with local institutions. They tend to exhibit flexibility in managing labor, and their internal communications tend to be horizontal and collaborative across management and shop floor (Bhide 2000). In such firms, the technological and human realms meet to increase skills and technological advantage (Hayter et al 1998). Particularly innovative firms open communications and advance education across job categories, while modifying and/or adopting alternative and advanced technologies. The idea of creative and participatory human resources development (HRD) is expanded in Porter's (1990) value chain model that conceives of human and technological resources as the support activities that underpin product and process development (Porter 1990).

Progressive employment practices are considered mandatory by all of the study firm principals. Without exception, the 14 owners claim to rely first and foremost on skilled human resources. My data show varied human and technological skill sets amongst the fourteen firms studied. Highly dependent on the local human resource bases, the study firms report fierce competition (locally and throughout the region) to retain skilled labor and a stable workforce. Some are particularly adept in accessing and retaining skilled employees. Moreover, firm owners stress that human and technological resources propel primary activities, and are also central to the conduct of local business relationships: "People are everything! ... As simple as driving down the block for saw blade repairs, as complex as hiring and managing employees from diverse ethnicities" (Mr. D Firm R3). Overall, firm principals view the workforce as a constant preoccupation in terms of local competition for skilled employees. Study firms generally strive for collaborative internal relations; opportunities for employee participation and communication in the management and technological process; high wages and benefits; and provisions for both safety and on the job skill development.

6.1 EMPLOYMENT CHARACTERISTICS OF CASE STUDY FIRMS

Generally speaking, employment and sales are positively related; more jobs imply higher sales for most industry sectors and amongst all 14 cases (Table 6.1). For all six study firm sectors the average jobs and sales per firm exceed BC's value-added average (per firm) sales and employment in respective industry sectors (Table 6.1). Among the study firm sectors, the remanufactured and prefabricated study firms

lead in (average) sectoral labor and sales contributions, irrespective of location. Yet important employment characteristics differ among firms, industry sectors and regions; and the overall distribution of study firms' sectoral employment, sales and degree of unionization varies somewhat between the lower mainland and Okanagan regions (Figure 6.1). The four Okanagan firms make the greatest contribution to total employment, workforce unionization and sales within the 14 firm study group (Figure 6.1). Although these interior firms R1, R2, E1 and F2 represent only 29% of all cases, their combined contributions account for 38% of employment and 37% of case study sales respectively. Likewise, workforce unionization is concentrated in the Okanagan, albeit within less sectoral diversity among these interior firms (i.e. they represent only three industry sectors: remanufactured, engineered wood and furniture).

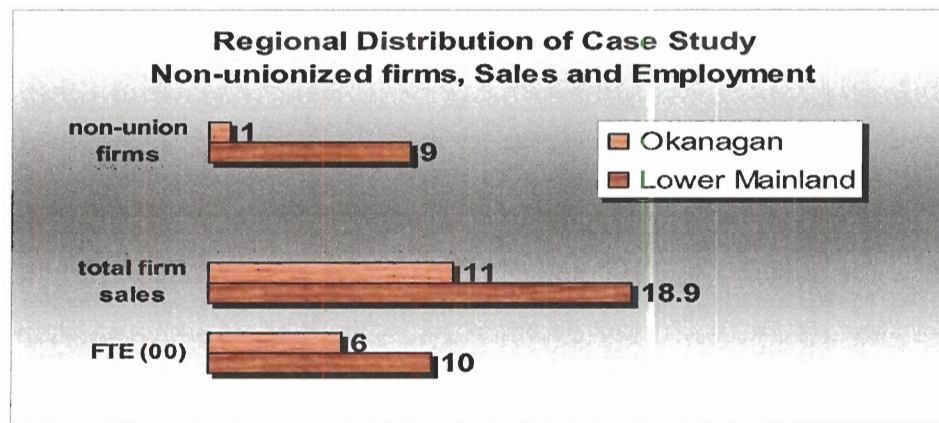
Table 6.1 Average Case Study Sectors and BC Employment and Sales - 2002

	Study Firm Sector FTE and Sales means; and respective BC Sectoral means (per firm)									
	Reman cases	BC Reman firms	Pre-fab cases	BC Pre-fab firms	Mill-work cases	BC mill-work firms	Eng. cases	BC Eng. cases	Cabinet and Furniture cases	BC Cabinet and Furniture firms
FTE mean (firm)	162	35	125	35	108	15	97	19	90	12
Sales mean (\$M) (firm)	37	4	32	4	14	2	17	3	12	2

Source of data: Fieldwork 2003; BC data, CFS 2003

Note: employment FTE = full time equivalent; sales (\$million); study firm data bold type

Figure 6.1 Study Firm Labor, Sales and Unionization: Two regions



Within the lower mainland, each case study sector is represented by one or more study firms. Interviews with the firm owners confirm that the localized pattern of industrial diversity near Vancouver furthers skills developed within the local labor pool of this industrial district. These 10 lower mainland cases are leaders amongst the 14 firms in types of jobs and diversity of training. Workforce composition among the lower mainland cases shows that labor supply and product research and development patterns differ between sectors in this locale. The remanufacturing and prefabricated case study sectors comprise the greatest source of average full time employment among the 14 case study firms and their respective sectors. The five firms (R1, R2, R3, P1 and P2) representing these two sectors employ nearly half of all study firm labor, while the millwork, engineered wood, cabinet and furniture sectors hire fewer employees. However, the R&D component of labor varies among the case study firms, and does not correspond directly to sectoral FTE trends. Firm owners also report fluctuating firm-specific and sectoral employment requirements with respect to design and development activities.

All five study firms from the millwork and engineered sectors, namely M1, M2, E1, E2 and E3, show FTE rates that relate closely to the number of R&D jobs within these five firms. The production processes and product R&D among these five firms demand intensive labor and technology investments that embody a greater skilled labor component than is the case in the cabinet/furniture, prefabricated and remanufacturing sectors. Furthermore, the employment expansion of recent Vancouver area firms, M2 and E3, demands skilled labor and design professionals. The firm principal of Vancouver area millwork firm M2 explains that as his firm

establishes labor stability with a core group of experienced employees, the potential for product diversification and market growth are linked to human and technological skills. However, Lower mainland prefabricated firms P1 and P2 share production organization characteristics unlike the other study firm sectors (e.g. more diverse components, sourcing, and more extensive wood inputs).

The furniture and cabinet study firms F1, F2, F3 and F4 are subject to seasonal production shifts and workforce requirements. Product design and market focus are significant in shaping the (variable) workforce size of cabinet/furniture study firm industries. These industries are subject to seasonal hiring-and-layoff peaks and valleys.¹⁴ Okanagan Firm F2, for example, reports high sales of children's furnishings in early fall, the back-to-school buying season, coupled with "declining demand in other lines from January to tax time" (also a low time generally for retailers) (Mr. C). The labor and sales prospects differ for lower mainland cabinet firms C1 and C2. With their close connections to western USA and lower mainland construction starts in a diverse range of BC, western Canada and USA residential and industrial projects, these firms, and particularly C1 (with more local markets) plan design, manufacturing and delivery with an eye to industrial development and residential construction starts.

6.1.1 Workforce Composition

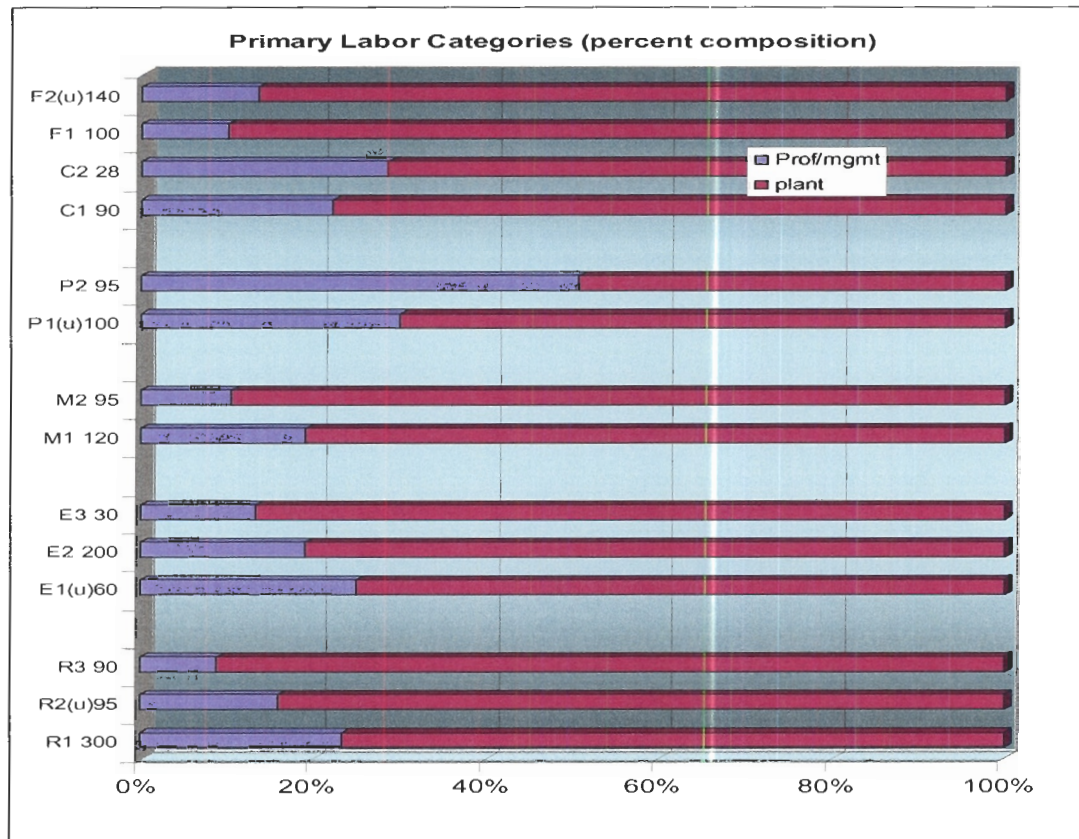
"Tech employees have specialized certification in Cad and Cam; CNC will be linked in the future. OTJ (on the job training) is important to develop our workforce - in skill and other qualities - and ties in with a "loyalty culture" which is both demanding and empowering. It ties in with our commitment to stay NON-UNION! Other training and education programs are offered, like CAWP (UBC Centre for Advanced Wood Processing)...don't really help us much (we have such specialized products and production processes)." (Firm E3)

A more nuanced assessment of internal labor organization and skill capacity develops two perspectives of study firms' employment trends: the internal composition of staff; and the segmentation of skilled labor characteristic of innovative labor organization. Employment within each firm is broadly categorized as professional/management staff and production workers. The data for individual firms are expressed as ratios for comparative purposes (Figure 6.2). The ratio of production workers to professional workers varies within and between sectors, from

¹⁴ Chapter 5 explained product and market approaches of firms C1, C2, F1 and F2, noting their typical dependence on industrial design dynamics; i.e. demand for new designs and fluctuating seasonal demand for particular cabinet and furniture lines.

about 10% of employees engaged in professional and management tasks to a high of 50% professional as in Firm P2. The makeup of management structures and production line requirements among study firms reveals diversity across the 14 cases.

Figure 6.2 Professional/ Production Workforce (percent) Composition - 2002



Note: Y axis identifies firm name, (u) union status; numbers indicate FT employees per firm

Varied trends in skilled, professional, management and production job composition are typical among the study firms. Within each firm, however, there are close relationships between the functions of jobs: engineering/design, technological, and skilled (from management through production line). Job types in this study are thus sub-divided as described by firm principals, and according to their respective firm-specific skill needs. Some firms include designers in professional design/engineering; others include designers (not always professional) in the skilled employment category. Firm-specific definitions that separate professional, skilled and semi-skilled workers vary, as some study firms limit 'skilled' job categories to certified

millwrights, journeyman carpenters or electricians, for example. Other enterprises also include 'skilled' non-journeyman employees, with experience and expertise, in the skilled classifications of research or production activities. The internal skills breakdown excludes 'unskilled' labor, since unskilled jobs are insignificant for the production and support activities of study firms.

Employers particularly value long-term non-professional employees, some of whom have been with these employers since start-up. Skill categories within each study firm are linked to job functions and the associated skill levels actually required on the job; so categories in this study describe on-the-job skills and experience required, as detailed explicitly by firm owners. Skill composition among firms and sectors crosses production line, product R&D, and technology activities in primary/production and support/HR activities, particularly where job functions require highly skilled technological knowledge and engineering/design in skilled (and often semi-skilled) designations. The data show that within the production worker category, skill sets vary according to three interrelated factors: production technology requirements, R&D design demands, and market focus.

The unique blends of labor skills, engineering and technical competence, either designed or learned through practice by study firms, form the key components of the firms' design-production capacity. Four study firm sectors, engineered, prefabricated, cabinets and furniture, have devoted over 60% of their labor to skilled job categories. Individual case study firms noted for advanced workforce skill levels across their professional, engineering/design/ and skilled labor are R1, E1, E2, P2, C2, and F1. This study finds that highly skilled labor has generally been hired and developed by these six firms with intentional dedication of human resources to professional, engineering design and skilled job categories. Only one firm (E1) from this group is unionized.

An excellent example of creative labor management and local skills development is found in the labor initiatives of the non-union Lower Mainland engineered wood Firm E2 that produces and exports structural truss and supporting members. This firm has a very stable, capable and highly trained workforce. Owner Mr. M stresses the value of internal training, communication and innovation across all job categories.

"Our employee turnover is *Very low*...no problem with employee turnover. And with fifteen designers in-house, this firm has on-going training programs ...employees are on the

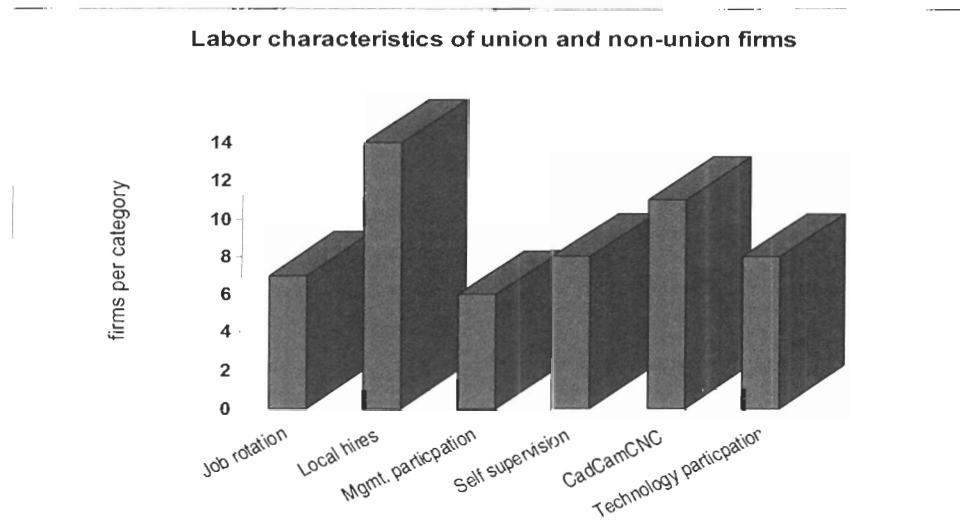
cutting edge of engineering and design. Our entire staff-many are registered professional engineers- are encouraged to participate in the innovation process. Everyone has an important contribution to make - highly skilled, goal-oriented. Of the 162 plant workers, the top 70% are skilled and semi-skilled. For our plant workers we do all in-house training.”

Notwithstanding variable workforce size and skill composition vis-à-vis regional location and union status, all study firm owners stress that internal labor organization, in-firm communications and workplace practices are major contributors to making or breaking a flexible production and marketing environment. The labor/management pattern for three most recent study firms, however, features professionally trained management, sole ownership and non-unionized workforce. For the newer study firms, efficiency and labor flexibility are closely aligned with firm start-up labor organization. However, the longer-established case study enterprises have been family owned and operated since start-up, and still included extended family and partnership. There are no strong regional distinctions in workforce composition.

6.2 HUMAN RESOURCES MANAGEMENT

Flexible, informal and collaborative labor practices are considered instrumental in wood value-added production (Figure 6.3). Among the key labor practices (Porter 1990; Hayter 1997) indicative of a flexible and progressive workplace are: job rotation; local labor pool; employee participation in management; self-supervision; significant use and integration of advanced technologies (e.g. computer aided design and manufacturing); and employee participation in technology selection and machinery modification (Figure 6.3). The study firm data show that most cases rely heavily on local labor supplies and advanced technologies, yet have more limited capacity to offer employees self-supervision and job rotation opportunities, even within the non-unionized group of ten study firms. This discussion focuses primarily on the internal labor organization of non-unionized cases, but also recognizes distinctive human resource strategies embedded in the labor structures of unionized firms R2, E1, F2 and P1, notwithstanding their predefined contractual obligations with their (unionized) workforce.

Figure 6.3 Study Firm Labor Characteristics - 2002



HR Innovation of Unionized Workforce

The four unionized study firms rely upon prescribed hierarchical labor management systems to determine job seniority, pay rates and training levels (Table 6.2). Therefore, unique labor characteristics that generally distinguish union and non-union firms are considered central to this discussion of internal human resource strategies (Table 6.2). For example, the four unionized firms adhere to detailed seniority schedules that affect each aspect of labor throughout production: in-firm reporting mechanisms, division of labor, internal communications, and worker participation in technology development. Regarding employee/management communication procedures, there are significant differences separating union and non-union study firms.

Table 6.2 Comparative Union and Non-union Labor Practices - 2002

	Job Rotation	Self Supervision	Informal Communication	Formal Reporting	Instituted Seniority	Internal Division of labor/skills	Employee Participation in mgmt. decisions
Union 4 firms	N	N	N	Y	Y	Y	N
Non-Union 10 firms	Y	Y	Y	Some	Some	Some	Some

All firm principals within the unionized group of study firms comment on several challenges posed by union agreements, particularly with respect to the social divide between management and various levels of staff. Such inflexibility hinders the communication process so vital to flexible and creative operations, although the union agreements protect workers' job position and seniority rights in a way that non-unionized firms cannot formally institutionalize. Owners report financial and social costs associated with union-prescribed reports, meetings and negotiations. The additional levels of "union-related bureaucracy" (Mr. C, Firm F2) are said by unionized firm principals to limit effective interaction and free exchange of ideas most conducive to creative management-employee collaboration and adaptation of customer design, and of manufacturing technologies. Although Lower Mainland Firm C1 is non-union, owner Mr. V explains that historically the firm pursued (union) decertification strategies in one branch of former operations to ensure continuity of flexible manufacturing. Overall, my research discerns no study firm principals supportive of unionization within individual firms¹⁵.

However, among the four firms with union agreements governing their labor relations and practices, my research notes the important contributions of unionized furniture firm F2 to wood value-added education, marketing, product and process certifications. This firm in particular has developed human resource training contributions that far exceed its contractual labor obligations to employees, in which all plant workers are covered under the IWA master agreement. Yet partner Mr. C comments on labor stability and training for specific design/ production demands that relate closely to this firm's (and the local Okanagan area's) economic viability. This furniture company is a significant employer within a smaller community, a valuable industry networking agent, and a strong promoter of internal, local and BC education.

We also have fluctuating employment needs...seasonally...there is a lull in the first 6 months of the year. During the third and fourth quarters we are very busy...production is one month ahead of the season (design to production).

...For labor and management ...we have way too many meetings. On-the-job training is important at our firm, and the (BC) *government is not serious about training!* Other than our own 2-month training program we not only use training centres, but I was on the board with CAWP (UBC), and hired most students from the program there. We used BCWood before that (when the training centre was in Abbotsford BC). I was instrumental in getting it going (the BC Wood training program)...and had 39 of the BCWood students

¹⁵ Firm owners' remarks with respect to unionization are entirely firm-specific, and not intended as commentary on forest industry or other unions more generally.

here at our firm to train too. One lady (who did the BCWood program) is a lead hand, she's been with us a long time, and she's one of our best employees.

But BC Wood is in marketing only now - *that's no good without education!* Abbotsford has gone to *Nothing...* and there's nothing to fill the void. If anything (other education programs) were out there, we'd know about it, but nothing is! The value of the UBC wood processing co-op programs to companies like ours... enthusiasm, work ethic and new ideas come with the students. (Mr. C Interview)

Okanagan remanufacturer R2 is also unionized. So when owner Mr. C talks of his firm's binding union master International Woodworkers of America¹⁶ (IWA) agreement he emphasizes that this firm's management/production staff composition and management is inherently less flexible than comparable sector non-union firms, due to specific, detailed union labor seniority, safety and training requirements. Mr. C cites an example that illustrates unionization effects on labor safety and training: proximity to acute medical care facilities or hospitals is the key important determinant for this firm vis-à-vis sufficient first aid staffing and training. Likewise, internal job categories are defined and limited by union mandates. Furthermore, intra-firm communications, job rotation and worker input in technology change and decision-making processes are also hindered by the structure of the firm's union agreement with the unionized workforce.

HR Innovation of Non-union Firms

These results help to explain the significance of firm-specific labor innovation promoted by the ten non-unionized study firms, all but one located in the Lower Mainland. Cross-firm labor profiles compare innovative labor characteristics of these non-unionized manufacturers (Table 6.3) Employment practices in these firms are generally organized around principles of flexible specialization, and are focused to address job rotation; skill transfer; on the job training (OJT); local hiring practices and continuing education program liaisons; open communications; and employee involvement in technology development and management. Human resource practices developed by the most advanced, or progressive, of the non-union study firms are supported by 14 such creative labor characteristics. These characteristics combine to form internally motivated and flexible strategies designed by firm owners to specifically bridge human and technological activities (Table 6.3). Residing within these firms are specific skills, local knowledge assets and value-added business

¹⁶ The former IWA union joined the larger North American Auto Workers Union during 2004.

experience that direct the short and long term supply and production management, research and marketing goals of each firm (Table 6.3).

This analysis of internal labor characteristics investigates the links between business locale, local labor pool, and firm-specific training and retention mechanisms of non-union firms (Table 6.3) to facilitate an understanding of diversity and strengths among cases. Furthermore, firm principals express various perspectives on the quality and reliability of local labor: workers' previous training and potential (reflective of general local/regional industrial skills); in-house technological skill development; and the need for a committed workforce with minimal turnover. Since study firm owners tend to encounter various challenges accomplishing labor supply and development goals, the ideas and views of firm-specific labor practices expressed by owners in Table 6.4 explore their unique and common approaches to advanced training, technological skill development, and human resource capacity-building strategies.

Table 6.3 data indicate that the ten non-union firms are committed to human resource development in three categories: non-monetary benefits (9 firms), on-the-job training and local hiring (eight and 10 firms respectively). The results from these classes of HRM indicate that the nine lower mainland study firms benefit from relative labor stability and OTJ knowledge and skill transfers. Furthermore, five of these lower mainland study firms are in close proximity, and also within a 10 kilometer range of more than 100 wood value-added SMEs. Eight firms use open area/internal communications to facilitate management, training and expanded production (Table 6.3). Aggregate data from the 'self-supervision', 'CAD-CAM' and 'CNC' categories in Table 6.3 show that at least half of the non-union study firms value and develop technology skills in-house. My findings also suggest spin-off potentials; for firm-specific knowledge used by new firm owners is first obtained during self-supervision and management participation - prerequisites for start-ups. However, progressive HRM amongst these non-union firms is more limited in terms of engaging employees in management and customer communication and decision-making (Table 6.3).

Table 6.3 Selected HR and Technological Skill Development Characteristics: Non-union Firms - 2002

	A		A	B	B	C	C	C	D	D	E	E		
	Job Rotat- ion	Open Area design	Mgmt. Partici- pation	Self- Super- vision	Non- Wage benefits	Union wage or >	OTJ training	*Other training	Cad Cam	CNC	Local Hire	External Hire	Staff Tech. input	Staff- Customer Cmms.
R1	1	1	1	1	1	1	1	3	1	1	1	3	2	3
OK														
R3	1	1+	3	1	1	2	1	2	3	3	1	3	2	3
E2	3	2	3	1	3	1	1	2	1	1	1	3	3	3
E3	1	1	2	1	1	3	1	3	1	1	1	3	3	3
M1	2	1	1	1	1	1	1	1+	3	1	1	3	2	3
M2	3	1	2	1	1	1	3	3	1	3	1	3	2	3
P2	1	1	1	1	1	3	3	1	3	3	1	2	2	2
C1	1	1	3	2	1	1	1	1	3	3	1	2	2	2
C2	1	1	1	1	1	1	1	1+	1	1	1	2	1	1
F1	3	2	3	3	1	3	1	3	3	1	1	2	3	3
**	6	8	4	8	9	6	8	4	5	6	10		1	1

1 = most important HRM strategy (1+ = highly developed HR strategy); 2 = some importance; 3 = not a factor for firm HRM

* Other training i.e. BCIT, UBC and/or other advanced wood processing education; ** Bottom row = total number of 1s for each HR characteristic

The lower mainland region study firm group is anchored by local labor and extensive OTJ training. However, owners across sectors say they suffer from (now) minimal access to external training. BCWood's value-added training has been eliminated; provincial apprenticeship program restructuring and staff downsizing limits student access and support. Based on my interviews it appears unlikely that local/ provincial wood engineering education will be reinstated without policy redirection and program funding. Nonetheless, my assessment highlights four individual firms, C2, R1, M1, and E3, that stand out for their well-developed and participatory labor practices (Table 6.3). Of special interest to this discussion is the strong performance of these same four firms in employment/sales described in Chapter 3. Innovative behaviors of non-union firms tend to be diverse, and subject to localized conditions and assets. Salient aspects of labor-location were previously discussed in my analysis of lower mainland relocation dynamics, wherein two study firms report labor supply as motivating factors in their intra-regional moves. The enterprise-specific labor profiles explained in Table 6.4 are further developed by interweaving the types of human resource initiatives with commentary of owner-managers. This more qualitative review explains in part the unique strategies pursued by ten non-union firms across six sectors (Table 6.4). Of particular interest to this framework are the strategic labor advances of those businesses established over 25 years ago, for they have of necessity been forced to re-create and adapt workforce and skills composition, and workplace conditions, alongside competing shifts in BC's value-added labor and production practices. The case of two non-unionized remanufacturing firms illustrates diverse labor strategies that have been developed to take advantage of localized conditions.

Firm-specific HR Innovation of Remanufacturing in Two Regions

Two of the three remanufacturing study firms are non-union. In both cases, the influence of local and regional forest industrial geographies remain tied to the context of specific labor organizational and human (cultural) resource support activities in these two firms. Owner Mr. H of R1-Okanagan, the first of two non-union remanufacturers to commence business, and the earliest study firm startup, suggests during interviews that his family firm's workplace is organized along the "best lines" (Mr. H) of seniority union-type principles, yet with open communications and considerable worker participation in management. To understand the context of this

location and time, we must bear in mind that during 1951, when this firm began, most large BC sawmilling and remanufacturing firms of the era were unionized. Firm R1's 2002 labor practices illustrate the contemporary strategies of this family remanufacturing business that started in the Okanagan region during a time when, typically, all unionized sawmilling and logger/feller positions commanded lifetime security, high wages and seniority progression up the workforce. Although significant growth and change continuously affect each aspect of this organization, the firm's strategic and dynamic approach to HRM, and in relation to the local community, represents the owners' ability to create a unique blend astride two production worlds, perhaps combining the best of both 'Fordist-style' (union/ seniority-based) and flexible specialization (no strings attached between employer and employee)?

The other non-union remanufacturer, Lower Mainland Firm R3, offers a most interesting counterpoint to Okanagan firm R1, and also reflects local labor availability, skills and unique industry organization. Partner Mr. D reports management and staffing intentions: considerable and well-thought-out innovation efforts (and results) towards implementing continuous improvements in workplace communications; training and worker retention during recent years. "Our firm uses job rotation and offers employee bonuses and non-monetary incentives" explains Mr. D. This firm has:

90 FT employees, a very low turnover - 10 left in 2002...we've really improved over the last 3 years with Mr. J (plant manager). With eight management and professionals in-house, all our engineering is contracted out for our building design and for engineering specs for regional code requirements in our markets (southern US states). The firm has skilled millwrights, planers and graders, and offers competitive pay for all employees (Table 6.4)

Both partners of Firm R3 explain how they develop and integrate HR practices across their production, product R&D and marketing activities; their twinned objectives are to increase effective productivity through employee participation. Workplace satisfaction and involvement lead to employee retention, commitment and loyalty "Internal communications and interactions are extremely important in the firm." Partners credit the firm's recent HRM successes to their production manager - for helping to implement significant changes in employment and training practices over the past five years. "Our plant foreman is key to success. As for greater cost savings on labor vis-à-vis our location? ...we could run away further - like 100km - or we could locate across the (USA) line." (Mr. D interview)

HRD - Type
A,B,C,D,E

Table 6.4 Firm-specific HRM Innovation/ Implementation – 2002
(as reported by study firm principals)

Firm R1
Okanagan
A-Job
rotation
Self-
supervision
Seniority
OTJ training
B -Non-wage
benefits

"...all non union... however, we're just like a union. We pay all employees better-than-union wages. Jack Munroe (IWA boss) says that our firm 'sets the union standards' ... he recommends our human resource management model for the union contracts (in this respect). Skilled trades are about 50% of our workforce, and qualifications are acquired 'on the job' for the most part - and (most importantly) with seniority, people can participate in management and decision-making. 70 of 300 employees are management and professional. We have very few unskilled workers, mainly for cleanup and packing jobs. We use job rotation and (strong) internal communications - and yes, it's very important, that employees are expected to learn self-supervision. Our starting pay is high...and job security is informal ...to treat employees well. The firm mandate is to provide regional employment, and our employees are very loyal and mostly from the local area." (Mr. H) [note: a former employee of this firm recalled his own work experiences at firm R1; and corroborated that labor practices are indeed humane, participatory, and furthermore, tolerant and inclusive of visible minority individuals and groups in the region.] Mr. L

Firm R3
LM

"Employees usually local to the plant, BC...as far as Langley, and Washington (USA). Some migration here from Vancouver Island, with Domans (in receivership)...and Canadian White Pine shutdown. The employer base is shrinking...there's growth potential in value-added. We use an 'open area/open door concept'. No one at the firm has a separate office. Management, employees and sales staff are all accessible to one another... a horizontal, non-hierarchical approach. If someone has a problem they can talk directly to anyone (boss etc.) directly...so in this way the firm operation is unlike union-style hierarchy which places employees vertically, with various levels reporting to the guy above. We have a classroom upstairs. Self-supervision is stressed for all employees. We say 'first, try to figure it out and/or make it for yourself.' We have ... speakers on different topics... a safety speaker giving a talk about dehydration ...not related to work but to leisure activities. Workers have links with consumers in the prefab (structures) side of the business, not with lumber side., Mr. J (our production manager) gives crew talks about packaging. Our employees with industrial first aid certification -5 of them- wear special vests. OTJ training is very important here. We use a vertical jig to drill and preassemble the building kit - with training provided. We've also used education programs, like with BCWood, we held a planer seminar here for 4 days for operating Stetson Ross. As well as informal communications, we hold regular educational meetings...varied topics... grading and industrial first aid training in-house...have used the training centre at BCWood in Abbotsford. Fine-tuning here involves everyone. Different ethnicities, for example, Mr. J is our plant production manager has really turned around our employment....He's really good at working with people. Advantages of our labor pool-Stability!" Mr. C

A-Self-
supervision
OTJ training
Low turnover
Cmns.
D - Local hire
E -Staff-
customer
relations

Firm E2
LM
B-Pay>union
Benefits
A-
training
Local hire
Low turnover

"200 FT employees are 100% Non union. Our firm has on-going training programs ...employees are on the cutting edge of engineering and design. Entire staff encouraged to participate in the innovation process. a highly skilled and motivated team ... with competitive pay rate for all employees, and other benefits. Our geography of recruitment is very local. ... for plant employees 100% are hired within a 30 mile radius, occasionally hired from other Canadian firms. Advantages of local labor? Firm has very low turnover. With our production jobs, all plant work is shift work...but firm has a growing production team...highly experienced (in Canada). Self-supervision is very important, but workers don't make technology choices... have no links with consumers. NO, customers never see the plant. On the job training is very important but no actual firm training programs are offered for specific tasks...employees continually benefit from quality, safety and technology (upgrade). The firm has used training centres - BCIT and BCWood etc. (before it closed). Significant changes in employment and training practices - introduced training videos in production and safety videos." Mr. M

Table 6.4 Firm-specific HRM Innovation/ Implementation – 2002
(as reported by study firm principals)

Firm E3
LM
B-Pay>union
Benefits
A-Job
rotation
Selfsuper-
vision;OTJ
training and
Participation
E-Staff-
customer;
Bonus

"Thirty (all) non union employees... quickly increased from the initial 4 since start-up. Our two-year employee turnover rate for plant workers has gone from 80% to 60%. It's taking time to get there (improving turnover) in terms of getting a stable, well-trained workforce. This firm's work is very specific, highly automated and directed by the architectural-engineering team... requires intelligence, a willingness to learn, commitment, adaptability. A lot of workers would just prefer to go and work (construction) framing. It's an attitude problem. There's always construction jobs out there, and always a high demand from the construction industry for framers, and pay is high even for unskilled. Most employees starting straight out of local high school. Job security, advancement, seniority are with merit and individual application. We have standard health benefits package. The geography of recruitment is VERY local for all plant workers...mostly kids from farms in the surrounding area. However, there are some skilled trades and technologists, carpenters, framers - who are paid competitive rates if qualified in accord with other industry experience and training. **'Learning is key'** to firm's success, survival and growth. The main HRM strategy for now is to stabilize the employee base... hire and train young employees who have a very positive attitude, with brains and common sense... seems to be easier to find here in Aldergrove. Job rotation, regular firm meetings...plans to use production teams in future, and implementing flextime, profit-sharing, bonuses, other incentives (internal communications and learning for all firm members). Plant workers participate in self-management and some self-supervision. At present plant workers do not participate in technology choice or have links with consumers, although this is partly due to the highly specialized 'top end' design functions and highly specialized niche marketing. Currently, 2 hold industrial first aid, but 'lots' have basic first aid as well. Significant changes in employment and training practices since startup really involve getting and training the people who will make a commitment to learning on-site, and we're improving and learning a lot as we go forward." **Mr. G**

Firm M1
LM
B-Pay>union
Benefit Bonus
Job rotation
A-OTJ
training
Participation
D-Local hire

"High turnover at entry level...seasonal layoffs (since March to April 2002 there was full inventory) and... (firm) needed planning for CCA and ACQ certifications for treated wood products. the firm's engineering and design work is done in-house or contracted out. skilled technologists trained and working in machine setup (CNC)- their pay is >\$30 per hour, on par with unions. Our entry level is better than minimum wage. **Employee turnover** ...with the overall firm employment, over 90% have been with the firm 2 years, and there are lots of 20-year employees. Firm uses 'limited job rotation' and pays an extra \$1 per hour bonus for employees with industrial first aid certification. For employees with welding tickets, there is also a bonus of \$1 per hour Non-monetary incentives: profit-sharing paid quarterly after 2 years employment; medical/dental benefits are offered through a Canadian superstore plan after 1 year employment; RRSP employee contributions by firm are offered to employees after 2 years. Internal **communications is extremely important, it's everything!** Staff participating in management... **area leaders who funnel** the communications...and goal setting, and we are big on workgroups...with daily meetings. **Self-supervision is important as a goal.** OTJ training is very important; and the firm has initiated other training programs as well... used training centers... and with BCWood we **pioneered the value-added grading certification.** But, we are the only company to use it! 90% of workers from the local town. Employment and training over the past five years... we have been concentrating on **'doing it right' and on maintaining** (employees) through good practices and benefits." **Mr. T**

Firm M2
LM
B-Benefits
Bonus
A-Job
rotation; Self-
supervision
OTJ training

"Competitive pay and... wage increases and in-house profit sharing....we have styled our wages and benefits to include extended medical and dental... full social benefits package, competitive salary. Plant workers' start \$11/hour first 6 months of employment, 2-year increase (\$0.75/hr to \$15/hour maximum over 2 years) Plant foreman: \$22/hour (plus a bonus of \$2/hour/year of employment) ... geography of recruitment - most are local employees ...from close by in Surrey area. Most trained in-house...we have (selected) employees on a training program - approximately 19 are on this program and they make \$19 per hour, as well as shift premiums. Internal communication here - yes, extremely important, and we're working on it to get more....between the foreman and management we have regular crew meetings, with committees to address various workplace issues. Workers participate somewhat this way... and self-supervision is very important. Workers' technology choices - we encourage that but there's only so much we can do. In the past we have hired from other training centres... a millwright from BCIT, but the problem is... then he quit. 80% have over one year of seniority. Changes in employment practices here over five years... the evolution (reduction) of turnover to create a more stable, trained and knowledgeable workforce. **Our local workforce is very competitive, and we get a high value from our labor.**" **Mr. E**

Table 6.4 Firm-specific HRM Innovation/ Implementation – 2002
(as reported by study firm principals)

Firm P2

LM

A-Job

rotation

Self-

supervision

OTJ training

B- Pay>union

Benefits

"Job turnover is very low in this firm. Many employees are long term and loyal. Production work categories include qualified trades - plumbers; electricians; labourers; designers and estimators. In the head office (a different location than plant) the firm hires professional project managers; administrators and sales staff. skilled trades earn \$20 - \$25 per hour, also job security. Plant work uses job rotation; production teams; flexible hours; bonuses and other non-monetary incentives. Internal communications are extremely important in this firm - employees must 'interact well with co-workers and customers' Workers participate in management, and self-supervision is important.... Workers make some technology choices, and also have some interaction with customers. Customers are very involved in the factory designed structures. Some employees have been here 25 years... provides great OTJ learning opportunity for new employees. The firm has used training centres: CAWP, BCIT, BCWood. Most workers are hired from local area, some BC and Canada." Mr. M

Firm C1

LM

B-Shares;

Benefits

Job rotation

Self-

supervision

OTJ training

E-

Participation

D-Local hire

"Our labor is currently non union... during the early 1980s there were labor problems, as the early arm of our current firm was union. We laid off all except one employee, saw the LRB (labor relations board) and decertified the union.... voted the union out. Six months later we had 2 shops and 1 customer". Pay for plant workers (non-union) is high in the industry, with training on the job. Average wage is \$13/hr; 50% of workers are above that up to \$18.50/hr. highest wage age of employees in division is 40 yrs. Shipping wages average \$12.00/hr. ...average age is 30yrs.

Shareholders and accountants average age is 45 yrs. One engineer. J is not an engineer but can do all the same things. .into marketing and now working with consultants on USA branding. Security and seniority are determined within the firm and depend on work performance and time with firm; benefits include shares and standard health plans. Geography of recruitment , all local Surrey area residents, core employees have low turnover rate. All trades are skilled or semi-skilled, but all qualifications are evaluated by performance on the job. In general, all training is provided OTJ. We use job rotation, ...there are about 600-700 different jobs that happen at any given time under this one roof...and so it's important to give people a chance to move around. Upper level plant is where the (bad, or) undesirable jobs are... it is boiling hot up here. Usually we get the same workers - and their families and friends... coming in to take on those jobs... their English is very bad...they are Fijians and Serbs, and they are willing to work here. Often they can't get any other jobs and they like the way they get treated here...we are open. Internal communication, within all aspects of firm production, is not just important...**without communication, we'd have nothing - it is vital to our business operating.** We have a high level of interaction within the plant at all times - always chatting and changing things around...and fine-tuning on the production lines. Workers participate in self-supervision, except in the cases where we have language difficulties - like the Fijian and Serbian workers, who do a lot of the jobs. The firm is very open to all ethnic groups - with increased internal communications - informal (based on J's style - he's all over the production lines all the time). Shares for employees; and self-supervision and production line improvements encouraged by all employees. (also shared activity - like potluck lunches, training and information) . Mr. V

**Table 6.4 Firm-specific HRM Innovation/ Implementation – 2002
(as reported by study firm principals)**

**Firm C2
LM**

A-Job rotation Self-supervision OTJ training Participation D-Job stability Local hire E-Staff-customer

"Employee turnover.... nearly all are from the local area, and we are regularly raided for our best employees. We pay in the \$9 to \$16.50 per hour range (competitive labor market here in the lower mainland) ... Our skilled trades are qualified and skilled....mostly highly skilled in wood finishing. As we grow, more employees will be skilled and trained, and we will be networking more to keep our workforce stable. OTJ and at CAMW at UBC is important – most of the skill (here) is in the finishing, which is all hand-done. No unskilled workers. Management and professionals include engineers/designers, sales and technologists. Benefits proposed - profit-sharing, bonuses and non-monetary incentives.... teams. **What we need here is a 'structure' in our (HRM) growth.** Now I am working on developing extensive benefits and participation plan for employees. Internal communications extremely important – everyone works in an open plan area and even though the design studio CAD Cam technicians are in one area, everyone has an input into ideas – we listen to customers and employees.

Job rotation, yes, and workers are also invited to participate in self-supervision and in technology choices. Since the customers are coming through constantly, workers have links with consumers more than in most manufacturing firms. CAD, CAM, CNC are trained on the floor. On the job training is very important at the firm. WoodMark certification training. Firm worked on developing WoodMark certification standard for furniture and cabinets. The local pool? Skills of employees we hire are usually high....but we need structure to keep trained employees longer. Developing this structure of HRM ...benefits/and training package to enable firm growth and flexibility. We have to be flexible enough to quickly shift between assembly and finishing....now need structure in our growth."

[note: communications - Mr. E showed me 'hard copy' of floor-management-design- input/output flow where all products/ production are tracked. A new showroom designed for marketing local products opened 2004. The firm has developed a very innovative and simple system of tracking project progress and completion (on computer) however, he showed me a sorting inbox-outbox and dry board system the firm uses to track visually...as he says 'people like to see what is actually happening so it is important for all of us to have a hands-on way to measure what is happening that we can all share in'.] Mr. E

**Firm F1
LM**

B-Extended Benefits A-Job rotation Self-supervision OTJ training/CNC D-responsibility Local/external hires

"All employees are non union: there was an attempt during the 1960s to unionize. The core group of people – ranging seasonally from 55-60 people at startup to 72 people in 1980 - has remained the same to the present time. The industry is cyclical, with spikes in two main periods, May-June and again in August-September. So the major group of employees has been very stable and loyal. [C said the firm didn't really want to relocate because it might cause hardship to a lot of these long-term employees (i.e. traveling to and from work much longer distances than to the current Surrey location)] We hired a designer to work in-house. No entry training required ... **we can put anyone to work** if they are willing to learn 'on the job' Benefits? BC medical, other extended benefits; longer holidays with longer term employment. Most employees make \$10 - \$12 per hour after training and time; however the lead hands and supervisors earn \$13 - \$14 per hour for the training, responsibility. **Employment Canada rules changes has had impacts on our employment** – EI rules and length of work etc. so people who used to be with us could be on UI now have restrictions on the time before eligibility.... We have 2 employees with industrial first aid (certification) 2, specialized certifications; 2 CNC machines and transportation equipment. On the job training is important for unskilled employees, and firm has used BCWood for marketing. However, we're already doing this marketing.

Workers... mostly local area... many ethnic groups are represented in the firm, and in the past especially, First Nations people from the Kitlaka (from Prince Rupert, northern BC) have come to work....sending relatives to the firm as well. We get 2 to 4 people a week looking for work...even as far away as New Brunswick. We have had a high number of immigrant workers from the Asian subcontinent, India and Fiji. In the early 1980s we hired a lot of Vietnamese boat people... one man we sponsored as a refugee became our plant foreman. Now the children of many original employees work here too. Newton, this area of Surrey, has a high Asian population anyway. Currently... 1 employee from Afghanistan, 1 from Syria...and when we were in Marpole, Mennonites from South America, a 30-year foreman originally from Paraguay." [Note: unique employment patterns and history of diverse ethnic peoples working here; very open to hiring and training minorities.] Mr. Q

Source of data: fieldwork interviews with firm principals

6.3 SKILL FORMATION AND TECHNOLOGY CREATIVITY

This discussion traces technology developments, focusing particularly on links between HRD and technological innovation; and explores the way case study firms form technological skill, mainly by considering how firms interweave human and technological resources. Industry Canada advocates for wood value-added technology skill advancement that includes comprehensive technology development coordinated with knowledge *and* machinery acquisition. Rather than relying on a purely technical or quantitative approach, firms should implement new or retooled production equipment and advanced technologies in conjunction with a range of information technologies and training processes.

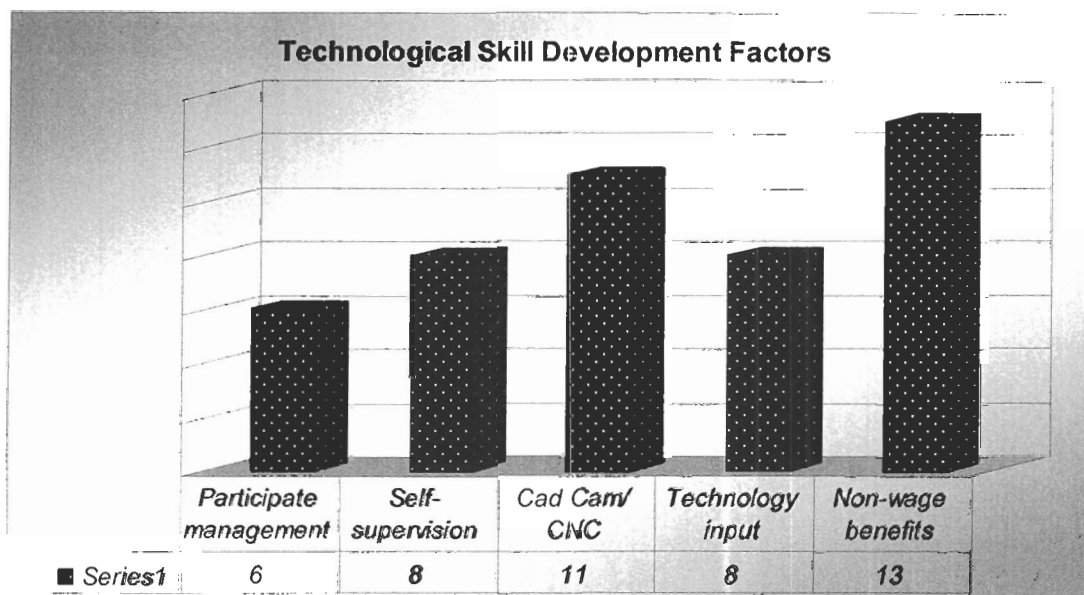
“In smaller mills and remanufacturing operations, technological evolution will also require knowledge and information-based tools, but these will need to be adapted to the economic and practical circumstances of that sector. Equipment manufacturers and software developers have generally focused on the larger mills, but growth in remanufacturing and value-added sectors would seem to create a window of opportunity for equipment and programs adapted to their specific needs. It also creates an opportunity for suppliers of services as many of these operations will be unable to maintain all the necessary skills in-house.” (Industry Canada 2004)

This study of technological innovation, or advantages developed by study firms, is guided by the idea that meaningful evidence must show how these firms’ link their human resources and technological skill developments in a comprehensive manner. This discussion also recalls significant contributions to developing product standards and certifications, noted in Chapter 5, that indicate (possible) parallel opportunities for employee participation in technological skills formation (available through technology selection input and by way of firm-specific OTJ skill formation). For example, from machinery selection and purchase to up-grading and maintenance; flexible learning tends to engage professional, management and plant worker in advancing the production, communication and marketing activities of study firms (Figure 6.4). Firm principals state that specific HR practices tend to initiate interest, involve and retain the best skilled and semi-skilled workers in becoming a part of technological developments within their firms. Labor stability, often in the form of non-wage benefits, acts an impetus for long term employee retention and training

potential.¹⁷ Worker participation in management, technology selection, and associated training also sets the stage for more intensive employee commitment to study firms. Overall, firm principals stress the importance of non-wage benefits in connection with long-term involvement and technology participation by employees.

Study firms show strength in CAD computer modeling for product design and production along with computer assisted manufacturing and precision machining across processes (Figure 6.4). The data in Figure 6.4 also report on study firms' technological development and integration of skills in the areas of OTJ training, self-supervision and comprehensive technical input by employees. These technological development initiatives are largely explained by the firms' extensive investments in production line machinery (new, redesigned/altered) and workforce participation in the overall technological innovation process.

Figure 6.4 On-the-Job (OTJ) Technology Skills Participation by Employees



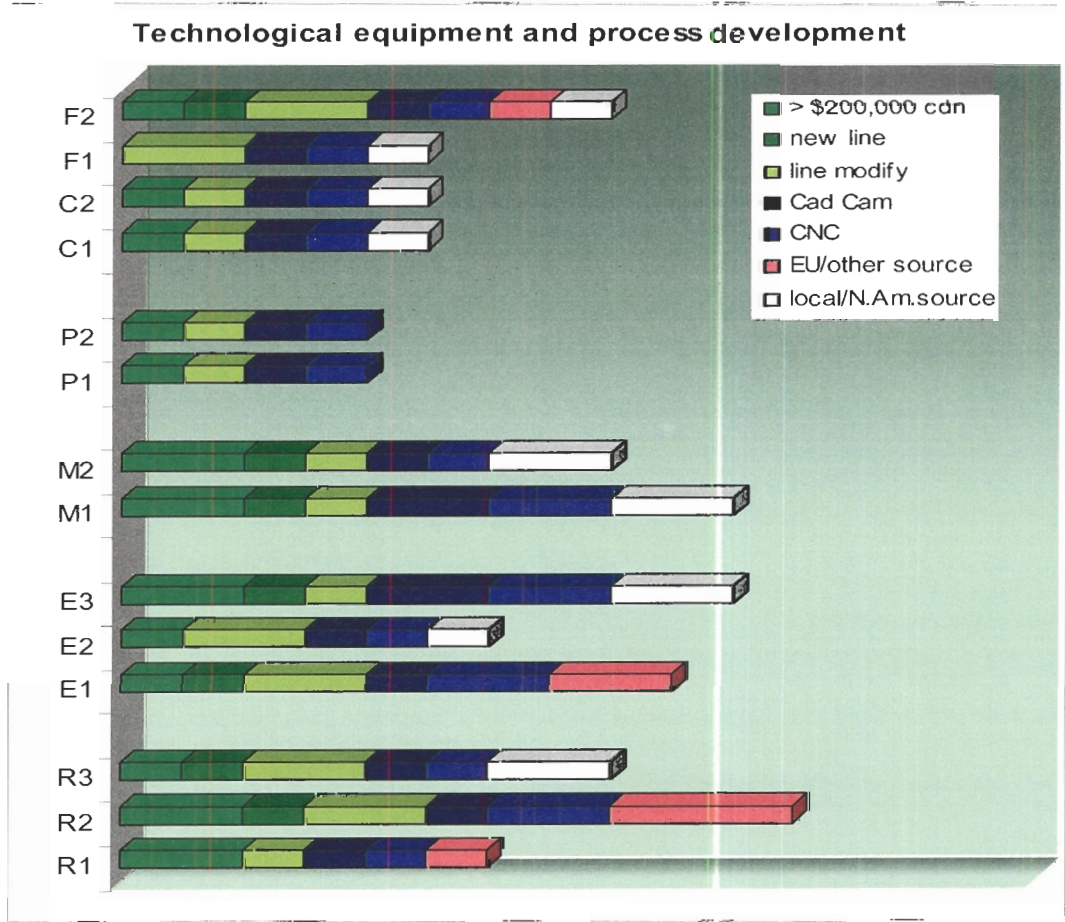
My evidence shows that similar technology investment patterns cross all case sectors for most study firms irrespective of region and unionization (averaging data of 5-year plans to reflect 2002 financing) (Figure 6.5). At the same time, equipment and line expansion, sourcing and diversity of local equipment and support technologies is most highly advanced in firms M1, E3 and M2; although cabinet and furniture sector

¹⁷ Non-wage benefits (e.g. bonus plans, extended vacations, job rotation and flexibility) motivate employees to remain involved and to invest in long term technology development.

firms C1, C2, F1 and F2 show strong participation considering their typically lower capital investments in large-scale machining and milling equipment.

The engineered products and remanufacturing technology applications by study firms in both sectors tend to integrate product and process design technologies more than do other millwork, furniture and cabinet study firms. Although firms R1 and R2 show high capital investment in technology (generally typical of remanufacturing and engineered firms) these firms also rely heavily on European processing technology inputs and supports. All four Okanagan study firms have forged strong alliances with EU (Swedish and German) equipment and technology providers, and with EU software suppliers and engineers.

Figure 6.5 Characteristics: Investment, Process and Source



Note: length of color bars shows comparative contributions among firms

Firm-specific technology and process innovations of seven selected study firms (R1, R2, R3, E1, E2, E3 and M1) (Appendix F) are indicated by their selection process and purpose, source and unique production line focus of machinery and equipment acquisitions.¹⁸ As discussed earlier in the chapter on product design, the way study firms' develop their professional and technology skills, inputs and control of processes are often based on owners' personal knowledge and locally embedded knowledge sources, although three firms in the remanufactured and engineered sectors use European equipment. In contrast, all but one of the seven selected study firms (Appendix F) use some local, and to a lesser degree, other North American equipment technologies or inputs. The type of machinery selected is unique to each firm's production requirements, and thus fulfills diverse functions aimed at flexible processing and facility redesign. For example, frequently-reconfigured production lines use flexible multi-use equipment. Notable are two firms of this group that have recently installed environmental and waste management systems (Appendix F).

Firm-specific technology selection processes and developments reveal the general technological strengths of study firms and their respective industry sectors. All six remanufacturing and engineered wood firms, and millwork firm M1, have made extensive capital investment in technologies, processes and related education. All seven firms in this technologically advanced group coordinate their product quality and production advancement with in-house training and communication. Technology is developed to provide flexibility in production, precision, and lastly, volume (Appendix F).

6.4 CONCLUSIONS

The successful marriage of technological skills and human resources illustrated by these case study firms has enabled enterprise growth and development in their respective locales. However, the geographic basis for employment diversity, skills advancement and training generally favors the lower mainland region. This study highlights the Vancouver region as the home of the greatest number of non-unionized study firms, inherently more flexible according to all firm principals interviewed for this study. However, across both study regions and six industry sectors, my research indicates that the remanufacturing and cabinet sectors

¹⁸ Seven study firms provided detailed information on technology focus, advantage and costs.

(particularly Okanagan firm R1 and lower mainland firms C1 and C2) lead in advancing internal labor creativity. All three firms are non-union, yet adhere to flexible and creative workplace practices in tune with their respective local labor pools, and connected to internal primary activities that advance technological process and skills development. The combined data from this chapter illustrate typical case study firm strengths in four areas: high skills level in firm workforce composition; internal flexibility with opportunities for employee involvement, communication and interaction; high investment in contemporary technology improvement; and comprehensive skill development across firm activities (Table 6.5).

Table 6.5 Summary of Sectoral Labor and Skills Development - 2002

	>60% skilled categories	Internal flexibility, employee participation	Technology investment (5-year)	Technological Skills development
Remanufactured		X	X	X
Engineered	X		X	X
Millwork			X	X
Prefabricated	X		X	X
Cabinets	X	X	X	X
Furniture	X			X

The two cabinet firms excel in all labor and technology creativity characteristics. The engineered wood and prefabricated study sectors both display advantages in all areas of labor except internal flexibility/employee involvement. However, leading Okanagan firm E1 is unionized and structured by union labor specifications. In terms of technological investment and training, comprehensive production line flexibility and skill development have been managed with foresight by all study firms; with high capital investment illustrated by all but the furniture sector cases. The three newest firms, still experiencing early growing pains, are rapidly contributing to their internal labor and skill sets by planning and implementing employee benefit policies that will value employee input, participation and long term commitment.

Innovative labor practices of both union and non-unionized firms across all six study sectors recognize the connections between firm and place through in-house training practices, technology advancement, and links to local and BC programs. The informal basis of labor circulation reported by study firm owners is inter-firm

competition. This chapter has thus qualified the firm-specific, sectoral and union-based arrangements that allow firms in this study to continually reinforce their labor skills and technology systems and resources. The research has shown technological diversity and uniqueness to be the norm for each firm. However, human resources, and their enhancement are common denominators among case study firms.

CHAPTER 7 WOOD SUPPLY AND SUPPLY NETWORKS OF HIDDEN CHAMPIONS

The research subject of this chapter is wood supply, and the sources and procurement strategies of case study firms. High quality forest resources are the lifeblood of the value-added wood manufacturing business. Accordingly, this analysis of wood input type and species distributions amongst sectors and regions tells much about the way that study firms remain competitive in supply management. To ensure access, quality and price, firms must maintain extended supplier-firm relationships to facilitate reliable exchange. The findings in this chapter are organized to qualitatively and quantitatively assess: firms' engagement and access to wood supply; the origins of wood for enterprise-specific supply management; and firm-supplier communications and linkages.

The premise of flexibly specialized wood supply networks is that knowledge-based economic and forest conservation values will flourish in conjunction with value chain refinement and diversification. Firms add value to wood supplied from partly processed, milled or raw log inputs. Internally, firms draw upon their own skill base to obtain wood supply and ensure reliable access and quality. Typically, the 14 case study firms have also created long term supply related relationships. Even the most recent firms demonstrate previous supply chain experience (i.e. related or spin-off firms from the locale). The literature commends particularly innovative firms for their ability to create momentum in product and market development while maintaining a reliable flow of wood fibre. Resource procurement is considered a core value chain activity that firm must manage carefully to maintain their advantage. The focus on forest resources and procurement in this chapter is centered mainly on study firms' connections to local species and local supplier networks.

7.1 WOOD SUPPLY ACCESS AND INTERESTS

Local species are the preferred forest resource for the majority of study firms. Geographically proximate coastal and interior tree species give study firms distinct advantages: reliable supply, along with potential connectivity between product

development and wood supply management and certification. Many study firms, for example, maintain close relationships with forest products research initiatives investigating properties of regional species (e.g. kiln-drying; strength; rot resistance) and related technologies. Firm principals view their own businesses as key players within the localized body of species and sector-specific knowledge. The triad of firms, suppliers and forest products research recreates a local and regional wood culture. The wood supply data first account for three general categories of linkages between study firms and their wood supplies: use of local supply; partial wood supply ownership/tenure involvement; and engagement in forest and environmental management practices that involve procurement activities of study firms. Firm principals state that accessibility of wood supplies (quality; quantity; price; delivery time) is critical for planning and implementing their production-related activities. First and foremost, study firms require quality and dependability of wood supply with timely access to specialized wood components and inputs. Mr. R (Firm E1) reports that such supply certainty is achieved for his firm through long-term understanding and communications built up between firm and supplier parties;

“Our suppliers of wood components are 90% the same suppliers as ten years ago...very stable supply relationships. Wood supply is from local and BC firms... Weldwood; Tolko ... they supply 'lamstock' (laminated inputs) with very good purchasing agreements over 5 year periods - through lumber brokers. We are near (the milled) supply. Little change in suppliers of wood components... and the stability of supplier relations since 1997 is extremely important. For other components... less important. The firm did not cooperate with any other primary or secondary industry sectors for wood supply.¹⁹ Access to wood supplies did not limit firm's sales in 2002.”

For remanufacturing firms in particular, wood supply access is frequently connected to the firms' own forest tenures, agreements, and allied interests extending to include eco-certified timber supply (FSC); wood supplies certified to specified industry market forest management grades (i.e. PEFC, Programme for the endorsement of Forest Certification; CSA, Canadian Standards); and associated interests in forestry and environmental management held exclusively by firms or with supplier agreement. In four cases, firms have developed these types of linkages through forest management, environmental stewardship participation in their own and suppliers' forest tenures (Okanagan firm R1 for example); and via firm-supplier

¹⁹ This engineered wood firm is unique (one of a kind) locally, one of very few Canadian firms producing glulam structural products (two similar firms are located in Alberta and Quebec).

initiatives promoting species-specific quality improvement. Wood inputs supplied to study firms are typically based on two or more local species²⁰ (60%); local /regional suppliers (80% of all suppliers); and limited forest tenure and management (10%).

Over half of firms studied rely exclusively on local species. However, reliable wood supply management varies amongst study firms and sectors (Figure 7.1). Secure wood sources are closely related to access, price and delivery arrangements made between firms and suppliers (and distance factors); level of supplier involvement in study firms' design process (e.g. firm-supplier collaborations or joint initiatives); and study firm and supplier participation in wood certifications and forest management. Regionally, the lower mainland and Okanagan study firm sectors and individual firms differ in terms of species use, supply access and participation in forest management (Figure 7.1). Remanufacturing study firms lead other study sectors in terms of firm-supplier collaboration efforts, forest supply and management participation, the trend carrying across all but 'supplier input' category (Figure 7.1).

A comprehensive approach to supply management is taken by the remanufacturing study sector (Firms R1, R2 and R3). As a group the three firms excel across supply management initiatives; and they tend to be engaged in diverse collaborations (Figure 7.1). The millwork and engineered wood cases are also advancing their wood supply participation beyond simple transaction agreements. The millwork and engineered study firm interests and involvement in forest resources include managing supply access for their own chain of custody (COC) wood certification; safety and standards development; and extended collaborations that involve their suppliers in product and process research and development.

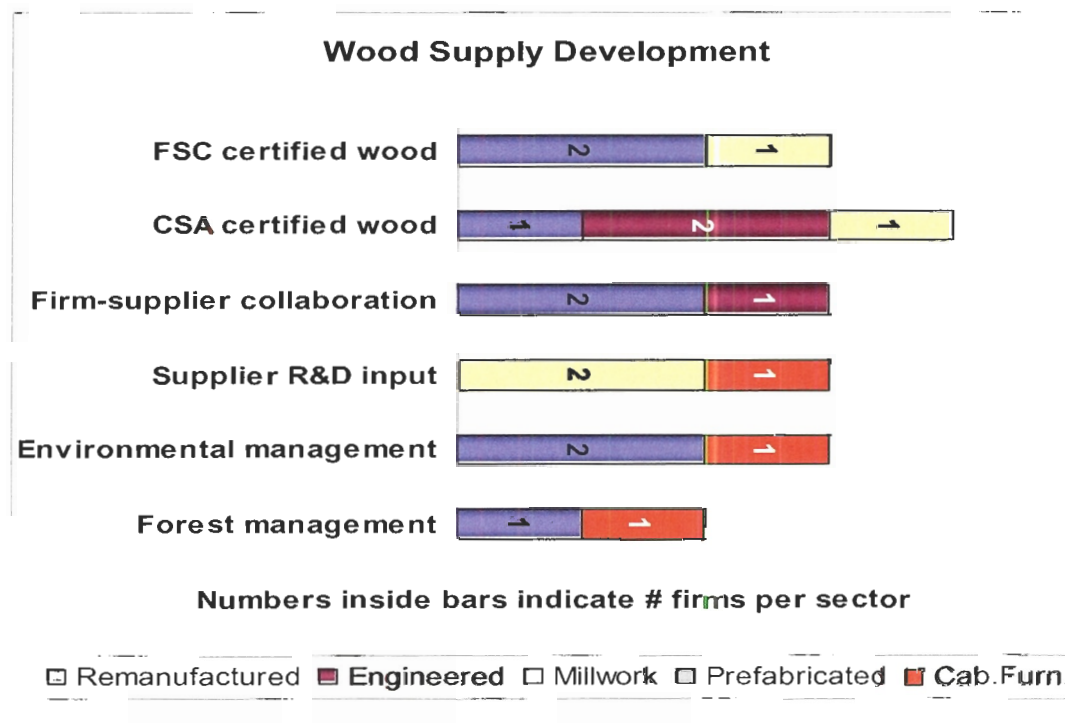
Lower mainland millwork firm M1, for example, has developed complex linkages that ensure firm access to (increasingly rare) clear (typically very old trees) western red cedar eligible for certification by the Forest Stewardship Council. The firm must negotiate a course that addresses the interplay of three factors beyond profit margin: supply of western red cedar (arguably endangered), study firm (and customer) demand for certified wood; and the softwood lumber tariffs applied to M1's exterior cedar millwork exports. At the same time, however, one interviewee reports that local (high quality, i.e. old growth) coast softwood wood supply access is increasingly

²⁰ Coast softwoods: western red cedar, coast western hemlock, (coast) Douglas fir; Interior: Engleman spruce, Lodgepole pine, Ponderosa pine, (interior) Douglas fir, 'spf' that refers to spruce pine fir sawmill grade considered one spp. by interior lumber mills and remanufacturer); BC hardwoods: alder, maple

under duress for certified grades - at any price. Mr. ____ also suggested that NAFTA softwood export rulings should review, or implement, species-specific free trade policy, especially as applied to eco-certified coast softwood products. Overall, study firms with certifications in progress, and/or having legal appeals (reviews of taxes) to softwood duties underway, prefer not to discuss or disclose specific wood supply interests and access, customer details or certifications. Five study firms launched legal group action appeals to NAFTA with respect to import taxation on their products crossing the Canada-USA border.

The cabinet and furniture study sectors' cases differ somewhat from the remanufactured, engineered, millwork and prefabricated study firm sectors; as an industry group, their wood supply interests and collaborative arrangements involve forestry (harvesting, management and practices), environmental management (participation in community and/or industry and certification initiatives that affect forest lands and watersheds), and supplier-study firm design input. As part of an industry sector that completes high level finishing in product value, these four show the capacity to manage supply across all wood input types and arrangements relevant to their more limited range of BC species and access types.

Figure 7.1 Comprehensive Sectoral Wood Supply Development and Input



A contrasting view is represented by the pre-fabricated study sector. Firms P1 and P2 both report no collaborative arrangements; supplier design involvement; certification or forest management instruments. However, data collected for these two firms reveal that their wood inputs are numerous and extremely diverse in nature. Although their interests diverge somewhat with respect to product, process, assembly and finishing, much of the wood input for both firms is milled and/or highly pre-processed before in-house assembly, carpentry and finishing (i.e. floor joist, roof truss systems; exterior cladding). It is important to remember that these pre-fabricated structure firms also include professional trade services throughout primary manufacturing and sales/service related activity. For example, the structural engineering and pre-servicing of the prefabricated sector firms' structures includes fully prefabricates and finished components (e.g. cabinets; hardware; millwork; fenestration and roofing); electrical, plumbing and other installations supplied at the factory. The diversity of wood components supplied to customers in this sector suggests to me that there is great scope for introducing more sustainable forest and environmental practices through customer demand channeled through firms P1 and P2 manufacturing, marketing and construction activities.

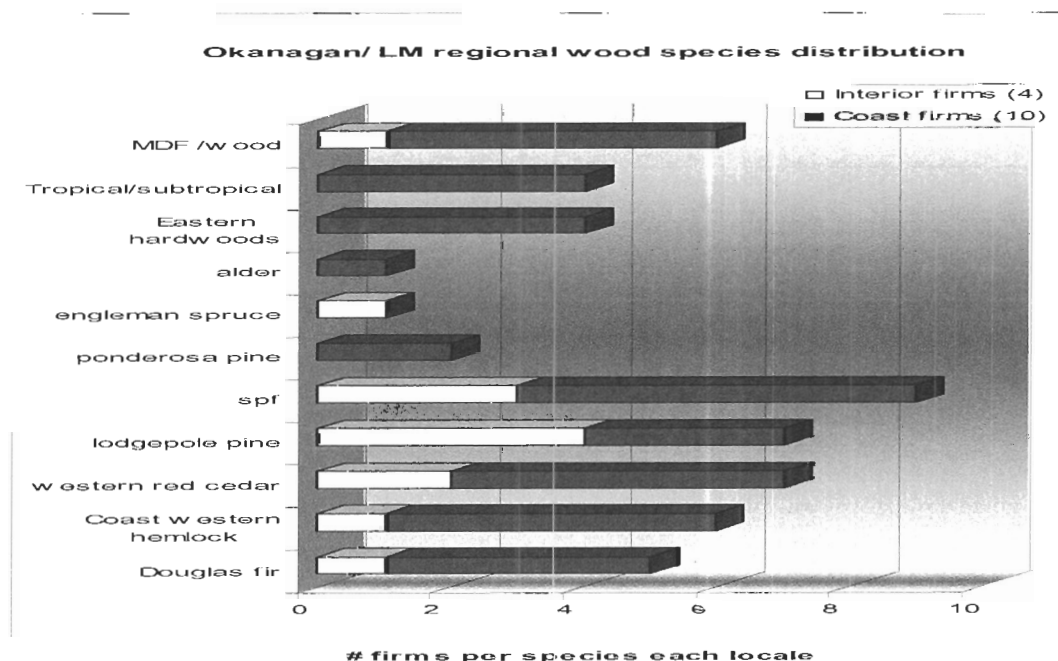
7.2 SUPPLY ORIGINS AND REGIONAL SPECIES

There are differences in species use and diversification among firms in the lower mainland and Okanagan locales. In addition, study firms' access to, and use of local species is integral to their unique product specialties, supply management, and wood certification initiatives. Sectoral variation in species access and use implicates the product development and future viability of these study firms. My results report on species use amongst the fourteen cases, with particular emphasis on inter-regional and inter-sectoral distributions. For most firms, local tree species and locally based suppliers are the basis for competitive advantage. The empirical evidence points to interesting regional and sectoral differences in the way firms use various wood species in primary product lines. First looking at the nature of species diversification between regions, the discussion notes wood input specializations of both lower mainland and Okanagan regions.

The ten lower mainland study firms utilize the entire spectrum of BC coastal and interior softwood species, in addition to diverse imported (tropical and subtropical hardwoods) and composite wood inputs (i.e. medium density fibre board and oriented strand board) (Table 7.1). However, most coastal (lower mainland) enterprises rely primarily on species that form the backbone of BC's coast temperate rainforest (volume of) productivity. Lower mainland case study firms also incorporate imported wood components and wood inputs from other forest types (e.g. tropical, subtropical and plantation species) in their product designs and processing. Coast based firms are generally diversifying their product lines to incorporate both coast and interior species, as well as composites, eastern North American hardwoods; and wood fibre from suppliers outside BC - for example, Alberta and Ontario; the USA; New Zealand and Chile.

As a regional group, disregarding sectoral affiliations, the four Okanagan firms differ somewhat as they generally limit their processing to several species common throughout their locales in the BC southern interior: Engelmann spruce; Lodge Pole pine; and interior Douglas fir. Only two Okanagan manufacturers make extensive use of coastal Douglas fir, Western red cedar and Western hemlock.

Figure 7.2 Wood species: Regional Inputs of LM and Okanagan firms



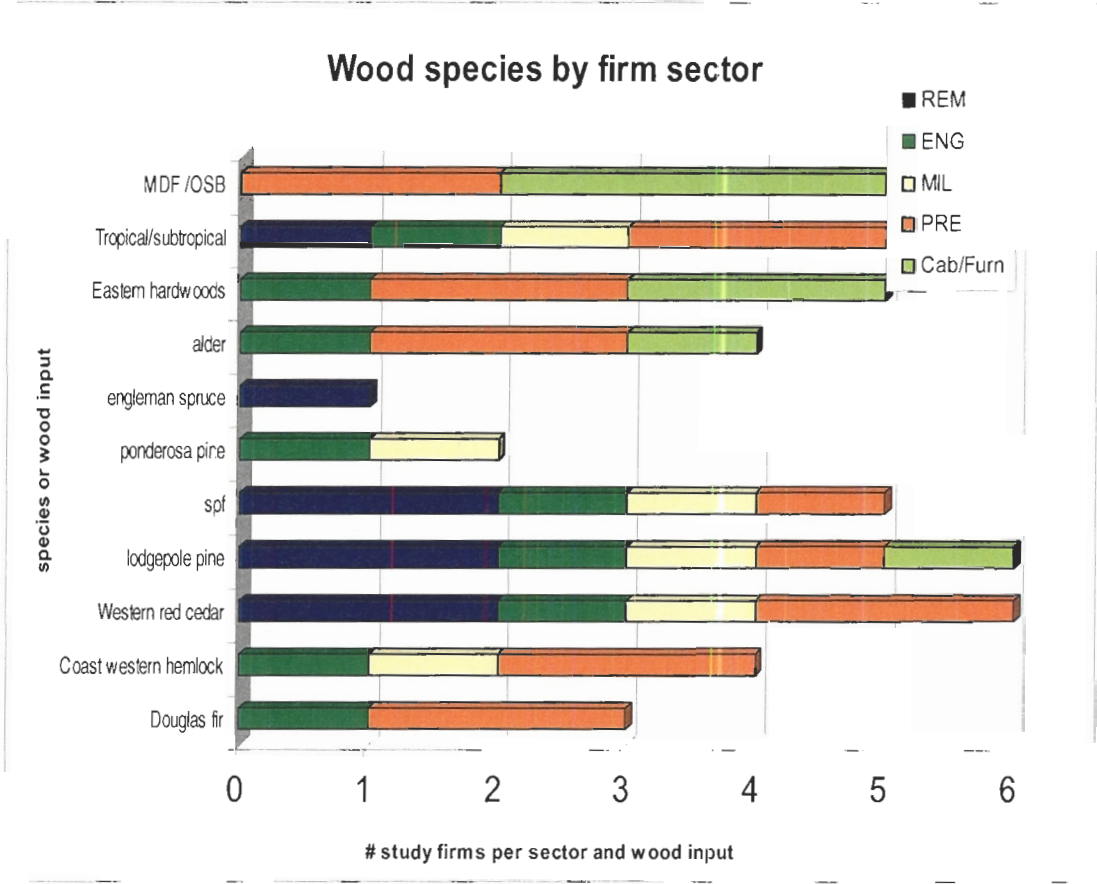
The wood supply opportunities of the study firms are expressed in the types of products designed for specific species processed within highly distinctive production environments. This analysis focuses on local and offshore wood species used by case sectors; and how accessibility of supply promotes production stability and creative primary value chain activity. The data compare the number of firms that are incorporating the eleven species or wood input types identified in Figure 7.3. The study firms in general exemplify a long term approach to maintaining their particular wood supply relationships, and their success in supply management is promising given the constraints of softwood supply.

Two sectors are particularly complex in terms of wood inputs and species diversification: the engineered products sector, represented by study firms E1, E2 and E3; and the prefabricated study firm sector - firms P1 and P2. My findings show that in each of these sectors, firms collectively use nine of the eleven species or wood type identified in this study. The prefabricated group, composed entirely of lower mainland firms, leads in species diversity with nine different wood inputs. Prefabricated firms also make extensive use of eastern hardwoods (e.g. for millwork, mouldings, flooring, solid wood cabinetry); structural oriented strand board (OSB); alder and coastal softwood species. Many different wood inputs are used by the engineered products sector of this research; with three firms (two lower mainland, one Okanagan) carrying out their manufacturing with nine wood input species or types (Figure 7.3).

Inter-sectorally, the varied wood species uses amongst firm sectors are indicative of their manufacturing foci. For example, remanufacturing production is largely based on interior and coast softwood species close to the three businesses (one Okanagan, two Lower Mainland) (Figure 7.3). Compared to other sectors, these remanufacturers locate in close proximity to standing forests that support their high volume processing interests. Supplier proximity is less important for sectors using much smaller volumes of wood components: the cabinet/furniture and millwork sectors in particular. Regarding the millwork case study sector - lower mainland firms M1 and M2 generally prefer BC coast softwoods, although Firm M2 also makes extensive use of imported softwoods for one of its interior architectural millwork product lines. Three of four cabinet and furniture firms are lower mainland based. As an industry sector, these firms use both local BC and exotic species; plywood and

medium density fibre board (MDF) wood input materials for manufacturing, as well as less commonly used local species like alder. The four member group of furniture and cabinet study firms also places considerable reliance on composite materials such as MDF and fibre board (Figure 7.3)

Figure 7.3 Sectoral Species Diversification



Enterprise-specific Wood Supply Development

Enterprise-specific wood supply requirements of the study firms are connected to wood procurement relationships. Each manufacturer has developed specific strategies for creating access to quality wood supply and appropriate communication tools and skills to ensure long term supply continuity. However, the geographic basis for firm-supplier relations goes beyond supplier proximity. Firm principals say that they covet, and carefully nurture, relationships with suppliers. In general, frequent communication, flexible terms and mutual understanding of external factors are

typical for the study firm-supplier interactions discussed in this study.

The species mix utilized by each case study firm is tabulated in Table 7.1. Amongst individual study firms, six stand out in terms of comprehensive species diversification in the quantitative data - those wood supplies procured and managed by Firms E1, E2, and E3; C2, P1 and P2. By using a mix of local and composite wood product inputs and mixtures of hardwood and softwood species from varied sources, these firms have established complex value chain resource procurement advantages within and beyond their business locales. However, my evidence shows that firms which use fewer species have become particularly adept at wood supply management activities and relationships; and compensate for more limited species diversity by forming a great many (often complex) supplier linkages. Remanufacturing Firm R3, for example, has approximately 100 suppliers, yet selects few species, and concentrates production activities mainly on local BC Western red cedar (as well as imported cedar from western USA suppliers).²¹

Table 7.1 Main Species of Study Firms - 2002

	D. Fir	CW. Hem.	WR Cedar	L.P. Pine	spf	P. Pine	Engle-man spruce	Alder	East Hard-wood	Trop. Sub-trop.	MDF	OSB /ply
R1				X	X		X					
R2			X	X	X							
R3			X									
E1	X	X	X	X	X							
E2	X	X	X	X	X	X		X	X			
E3	X	X			X							X
M1		X	X	X								
M2					X	X						
P1	X	X	X	X					X		X	X
P2	X	X	X		X						X	X
C1					X				X		X	
C2					X			X	X		X	
F1											X	X
F2				X							X	

²¹ Okanagan Firm R2 owner Mr. C showed me his Chilean-imported Radiata pine samples as a way to illustrate the superior grain and color properties of local interior BC Lodgepole pine used by the firm.

Flexible and well-understood arrangements advance the wood procurement activities of study firms. These input procurement strategies are reflected in both the types of wood sources and the levels or categories of suppliers amongst individual firms (Table 7.2). Several lower mainland firms, for example, incorporate imported species through import specialty distributors. Supplier types vary in tandem with general wood input types - from local direct access, to import distributors. Supply linkages like local tenured access for raw log inputs, for example, are used by few study firms. BC lumber brokers supply eight study firms, largely through term financing agreements. Direct suppliers are the local sawmills - primary processors that sell directly to eleven study firms through direct supply purchases. Non-local wood supplies create a different tier of distribution channels: these range from Canadian distributors to direct import distributors that sell to firms from international locales (with varied access agreements and certifications). Overall, a local supply and local species focus is favored by most case study enterprises. The most common form of local supply relations involves study firms with suppliers and lumber brokers. However, eastern and imported species and wood inputs, a smaller component of the wood supplied to study firms, are based exclusively on distributors. Study firm owners state the value of their connections with suppliers and other firms, and typically note frequent communications and long duration of both their supplier relationships and inter-industry wood supply cooperation (Table 7.2). The following section of research further discusses the types of firm-supplier communications and supply networking arrangements that enable stable relations between firms and suppliers.

Table 7.2 Wood Input and Supplier Categories

	LOCAL			INTERNATIONAL	
	Own Tenure/ supplier liaison	Lumber broker BC	Direct Supplier Various source	Distributor Canada	Import Distributor
	Raw Log input	Milled/ Semi- processed	Processed OSB/ply/ veneer/MDF	Milled/ semi- processed	Milled US/Tropical Semi-processed
R1	X	X			
R2		X	X		
R3			X		X
E1		X	X		
E2	X	X	X	X	X
E3			X		
M1	X	X		X	X
M2		X	X		X
P1		X	X	X	X
P2		X	X	X	X
C1			X	X	X
C2				X	X
F1			X	X	X
F2			X		

7.3 FLEXIBLY SPECIALIZED WOOD SUPPLY NETWORKS

To understand the locally based and regional networking advantages of value chain organization that promote firm involvement in wood supply management, we must look more closely at inter-firm and industry wood supply supports. As study firms access wood supply, their procurement strategies tend to gravitate towards specific industry associations and trade networks. Findings from my research indicate that the largest number of such wood supply associations and relationships are those formed around local species. One example is the Independent Lumber Remanufacturers Association of BC (ILRMA) that is central to coast and interior softwood species supply dynamics for remanufacturing study firms as well as

millwork and engineered wood cases. Industry wood supply groups such as these facilitate research, information exchange, and development of inter-industry wood certification and standards, softwood trade issues and cost mechanisms. Recent change in supply interactions, costs, terms, and advantages regarding the Canada-USA softwood dispute are cleared through these types of organizations. As knowledge flows and wood resources are linked through the wood procurement activities of study firms, supply networks form the critical counterpoint between standing timber and highly processed value-added products of study firms.

Close and beneficial interactions between firms and wood suppliers are reported by the owner of Okanagan Firm R2. He explains that the softwood tariff has created a niche supply advantage (perhaps a supply disadvantage to less creative firms) for R2, since the firm's product line and differentiation has focused increasingly on design of higher value-added and softwood duty exempt products. Firm R2 has thus been considered a "preferred customer" by local wood suppliers with its higher volume value-added and consistent demand for wood supply. Firm R2's expansion in facility and production enabled the suppliers (within 30km distance) to benefit from the wood flow certainty offered by firm R2. More than one study firm commented on their ability to 'work around' (usually by negotiating flexible financing and delivery certainty terms) recent change in supply interactions, costs terms, and 'problems' surrounding the softwood dispute. As discussed earlier in this thesis, strong local networks of wood component suppliers can 'make or break' these firms vis-à-vis maintaining a core of competitive advantage in the (mostly) global market niches in which all of these study firms participate.

This part of the analysis extends to include cooperative inter-firm arrangements and communications that include suppliers' interactions with the study firms (Table 7.3). The keystone wood supply chain relationships developed by each study firm are often inseparable from local institutions and associations (community based social/political and business networks). However, beyond the immediate study firm locale, firm-supplier and distributor interactions at wider scales also facilitate the wood supply management of cases study firms. The long-established study firms and spin-off firms in particular rely on long standing relationships as supply management tools to build cooperative agreement with suppliers over the short and long term.

Stable supplier relations are considered critical by all the study firm owners. All study firms, excepting one new firm, report that wood supply stability and access was

achieved during the five-year period preceding my study. Specialization in wood species and product development is linked to study firms' communication and negotiation abilities to maintain long term supplier relations. Thus location-based networking advantages centered on wood supply are reported by several firm owners. Their close connections (between study firms and wood suppliers) are most often linked to species-specific product marketing, research and testing institutions, and primary industry manufacturing and marketing organizations. The overlapping interests of industry and research institutions are of greater advantage to the larger value-added study firms; one new study firm owner, for example, reports dissatisfaction with his firm's (poor) access to 'established' wood supply networks (Table 7.3).

However, most longer-established study firms describe how, with well-trying wood supplier networks and through varied use of local and diverse wood species, they are able to produce highly differentiated products, even while using only one or two wood species to advance their product mix. Mr. D of remanufacturing firm R3 in the lower mainland, for example, cites his firm's very broad wood supply/supplier mix. This firm, concentrating primarily on western red cedar products, accesses wood inputs supplied locally and internationally, with approximately 95 suppliers (of which about 60% are local). Mr. D of firm R3, while showing me his yard, production lines and operations, explained that his firm's great diversity of supply types and sources, combined with FSC chain of custody certification, enables this firm to balance and fine-tune wood inputs required for both the prefabricated structures and specialty remanufacturing products lines. This intricate and comprehensive wood supply-supplier network established by lower mainland remanufacturer R3 is interwoven with the firm's successful capture of specialized local, national and export niche markets.

The nature of wood supply advantage varies among study firms (Table 7.3). Long term firm-supplier relationships and frequent reinforcing phone and face-to-face communications with wood suppliers are reported to be vital by most study firm owners. Firm principals demand high quality and supply reliability of their wood sources; and they stress the value of their local connections (with suppliers, cooperating firms and firm purchasing groups) to secure reasonably priced and excellent wood supplies (Table 7.3).

Table 7.3 Study Firms Wood Supply Development and Inter-firm Cooperation -2002

	Inter-firm Supply Cooperation	Firm Principal Statements on Wood Supply-Supplier Relations
R1	X	"Half of the firm's supply is our own tenure... timber supply area (TSA) between Kelowna and the (USA) border... the rest is from other local (Okanagan) suppliers... flexible for managing forest."
R2		"All our suppliers of wood components are local...we became a preferred customer of Tolko and Riverside... with the softwood problems, quotas and tariffs - (in supply) the advantage is for us, as our BC wood suppliers begged for our business. For example...last year Riverside (Forest Products) said 'how much will you take?' and I said 'how much do you want to get rid of?' No changes in wood components suppliers... stable supplier relationships since '97. ...don't cooperate with any other primary or secondary industry sectors for wood supply."
R3	X	"Firm wood suppliers range... geographically, from Alaska to Idaho, New Zealand to Sooke. The firm uses certified wood components... now using more imported from New Zealand. No changes in wood suppliers ...important to keep stability of supplier relations. We have about 60 suppliers in Canada and about 40 in the USA and other countries. The firm cooperates with other primary and secondary industry sectors for wood supply...we are in the ILRA executive. Wood supply limited our sales... USA softwood! Yes, very much... as we are subject to duties... even though cedar should be exempt it has been lumped in with other softwood (hemlock/fir etc.). Competitors have also been affected, Canadian White Pine and West Fraser Mills local shutdowns."
E1	X	Personal contact with suppliers is also extremely important... within the local (Okanagan) region. The complete package is our niche, with the design of structural components, precut ... and a very high quality of all wood (structural) components... a working affiliation... with E Consulting Heavy Timber Group and also liaises with engineers, architects and general contractors."
E2	X	"Supply... we stress the quality of the wood used by the firm...purchase only grade-certified lumber. Certification...the firm's big primary suppliers like CanFor and Weldwood have wood certifications. The softwood trade issues don't impact the firm's truss products. Wood components are all from BC suppliers...main suppliers are 5 or 6 primary forest products companies. In the interior (we get) especially Douglas fir from Kootenays...other woods, local, hardwoods imported."
E3		"We have had some changes in suppliers of our wood components, so it's not entirely stable....why? Because the terms change. Suppliers of other components have been stable. The stability of supplier relations since startup has caused some problems ...so the wood supply did limit the firm's (2002- 2003) sales. The firm didn't cooperate with any other primary or secondary industry sectors for wood supply ...and yes, the softwood dispute affected our operations – not directly, as our product is exempt, but because the wood suppliers' situation and production and terms to us change... an uncertain business environment!"
M1	X	"Wood component suppliers... over 100. The firm is the biggest user (locally)... but the 10 mills supplying firms in the 1980s is down to 1 (mill) now...and the IWA strikes (1996) and forthcoming (2003)... plus the duty to USA on some of our pressure-treated (makes it difficult). (Firm is a) member of supply group Independent Lumber remanufacturers association. Stability in supplier relations is very high in wood components. (There's) a lot of cooperation with other primary and secondary mills near the firm - when the firm's plant was destroyed by fire there was a ton of competition, but other firms helped with the reconstruction. And there is inter-firm cooperation for wood supply... yes...helping one another out. The softwood dispute affected the firm, as export duties to USA, and other demands from the market."

Inter-firm Supply Cooperation		Firm Principal Statements on Wood Supply-Supplier Relations
M2	X	"Wood species from northern California Ponderosa and southern Pine, from Chile, Radiata Pine. There is high availability of this species - it's just like the fast-growing wood from Cochrane Alberta...you can see it grow. Changes in species, diversity, composition? Yes, we get the light core MDF from Chile (much softer than BC softwood). Now you can actually make the MDF with wheat or anything. Our wood suppliers from SE Asia...same since 1998. This is where we get our print-grade species. Importance of stability in our supplier relations? For wood components very important; for paint components we need fewer suppliers. Firm's cooperation with other industry sectors for wood supply... very strong network of internal and external wood supplier relationships. Wood supply (semi-finished wood products coming to this firm) has limited firm's sales...for example, sometimes our suppliers have monsoons; another example...a factory in China ran out of coal, so the firm is very much affected by distant factors. The softwood dispute affects the firm's operations... yes, a positive impact! Did three times the sales as when we're not affected by the tariffs on BC wood products heading south of the border."
P2	X	"Wood components...100% local suppliers. Other components...BC steel; contracted services - USA architectural and engineering services at local sites. Firm cooperated with other primary and secondary industry sectors in a 'buying group' for purchasing wood supply. The firm also formed an association with NRB (consulting engineering and marketing)."
C2	X	"Our raw wood materials run from \$300 000 to \$500 000 per month. Phone and email interaction with suppliers very important. Environmentally certified wood?...in Japan, certification is an important issue from the "green standpoint"... all (cabinet) products must be labeled to ensure products are within tolerance limits (and tested in Japan's labs). Jass certification for wood ensures no formaldehydes used in particle board production. So (we) have to pick carefully for suppliers...not an issue for most N. American customers...spent \$50 000, hired 3 green product consultants in Tokyo, 14 in Japan. I also work with industry groups and inter-industry on supply issues. All wood components are Canadian (except a very few from Japan)... no changes in suppliers since startup...most wood door components from Toronto... about 30% wood supply from Calgary, 65% locally or Kelowna. (Six suppliers other components...all hardware supplied by Canadian suppliers (door handles) Stable supplier relations of highest importance for firm's business...was at UBC yesterday working with other industry reps on the supply problems."
F1		"The firm did use environmental certification... Q-Base Canada (from New Zealand like ISO)... less involved and cheaper, and production-oriented...We no longer know the sources of fibre in our board materials, since companies like Weyerhaeuser are now sourcing from outside BC, and may also be mixed content of wood fibre. We used to know the wood source, but now we don't even know if it's from Canada. Suppliers of wood components are 90% local...packing materials, 100% local. Canadian wood supply...we buy board prefinished from Alberta and Ontario. Weyerhaeuser closed their local board mill at the end of 2001. There has been an explosion in the number of boards and finishes. Now the demand is for variety and not every board manufacturer can supply (the range we use). The assembly is the same - not every one can do same processes. Main wood species used for our particle board, K3 and MDF (medium density fibreboard) used to be from BC forest, but now... no way of knowing the origins of the wood components. For example, chips used to manufacture board we buy may come from Chile, NZ or eastern USA. Changes.. MDF (suppliers)...shifted to more 'outside' (local and BC) suppliers. Wood moldings...mostly from Calgary. Change in species composition and source of other wood component (supply)...Now always get papers from Japan where there are over 2000 walnut grain papers. Stability of supplier relations important...but even major USA manufacturers are importing finished components from China (even though) it costs \$100 more for solid wood in China."
F2	X	"wood components 100% local and BC (Macblo now Weyerhauser), Riverside Forest Products up the road...An agreement with Riverside, and we have a fine tolerance of the primaries...our firm processes several million board feet of Lodgepole annually. We have built, and depend on, long term relationships with the primaries... 'constant supply pricing' because of the USA softwood dispute, and 5 year agreements for our supply. So even if they (prices) fluctuate up and down we have a reliable supply. We could shop around but we don't...No changes in our wood components... stability of supplier relations since 1997 is very important. The firm cooperates with any primary industry sectors for wood supply by having long term agreements. (This arrangement) gives 'certainty' over ups and downs (of the softwood agreement) over time...local markets for suppliers. Wood supply problems did not limit firm sales. With the shift to increased Canadian markets, the softwood dispute has given the BC primaries a reliable market with this firm."

7.4 CONCLUSIONS

The wood supply procurement advantages of study firms reveal the nature of their reliance on local species, suppliers, industries and institutions. Most firms in both regions rely on local species; and thus firms remain connected to industry associations and species-specific wood and product research. Lower mainland firms are the only users of tropical and subtropical species. However, most firms in both regions are processing all the commonly available species that originate close to their manufacturing plants. The diversity of species used by firms varies regionally - with the lower mainland leading in complex wood input strategies and sources. However, in both regions and across sectors, stable and well-advanced study firm/supplier and inter-firm relationships help to explain the considerable local knowledge advantages captured and retained within the milieus of lower mainland and Okanagan firms. The resource procurement strategies of these firms tend to contribute to the development and retention of species and industry specific knowledge.

Deeply embedded local wood supply networks have been established by thirteen study firms. The material and communications of wood supplier relations facilitate their own, and possibly group industry, advantage within each region. Wood supplier/study firm relationships created by most firms are characterized overall by complexity, stability and interrelatedness. Varied degrees of complexity relate to species, supply type, product focus and regional location. Typically, many study firm-supplier relationships and networks are of long term duration, flexible and fluid though durable, and founded on mutual trust and long term sharing of information (not subject to daily whims of wood market price fluctuations).

Evidence from this research shows that the key wood supply relationships of study firms are generally based on locally available species and local-to-regional suppliers. Significant forward linkages are being forged by the lower mainland and Okanagan study firms as they develop more complex product lines with diverse local wood inputs mixed infrequently with offshore species, and as they source more varied local and regional supply and purchasing relationships to accomplish these objectives. Some firm owners, however, comment off the record that global competition in the technology/processing side of manufacturing is only intensified (worsened) by increasing competition for imported wood sources (e.g. USA western

red cedar) that are available globally.

The Okanagan case study remanufacturers, in contrast, are secure in their local wood supply access, with R1 maintaining forest tenures for half of firm wood inputs, and R2 having developed very long term supplier relationships in the locale. However, their (spf) wood inputs are threatened by Mountain Pine beetle infestations (Wookey 2004). So, although these two interior firms have successfully captured local species specialization in product and production, and have established secure access to quality wood inputs, a different perspective on their wood supply and product sales may well have evolved since the time of our discussions in 2003. All study firms have remained steadfast in their species selection over the time of their business operations. Sectoral and enterprise-specific species knowledge and specialization is therefore well advanced within each firm and industry type. Furthermore, these enterprises have continued to develop highly specialized and unique products on the basis of firm-specific wood supply utilization and knowledge of local species. Firms are also engaged in wood support technologies and processes unique to particular species and industry sectors. These firms are of particular interest for their ability to integrate value added production and local wood resources.

CHAPTER 8 AT THE CUTTING EDGE OF VALUE CHAIN INNOVATION

“Competing with other companies in BC or Canada just is not the problem in our market place. Engineered wood products are becoming globally competitive and it is the world we need to be able to compete with. Competing globally requires a high quality of wood, a high quality of manufacturing, production efficiencies to compete, and a focus on customer service... we want to ensure that we sustain growth and employment and introduce the newest technologies we can afford. In the long term, we want very high value added....Packaged, finished work is the ultimate in value-added! We intend to do more custom work... assemblers like ___ are less dependent on suppliers, unlike this firm. With more flexibility we can add much higher value” (Firm R2)

This thesis has examined the contributions of 14 firms to flexibly specialized production in six BC forest industry value-added sectors. Institutionalized support mechanisms have enabled these case study firms to create important export-oriented market niches in wood value-added industries. The defining success factors for these firms are deeply rooted in local knowledge/industry agglomeration advantages and, within firms, innovative approaches that effectively utilize human and physical resources. This group of firms particularly values geographical and communicative proximity to markets; workplace social and spatial organization; and close engagement with, and commitment to, local knowledge and wood supply networks. The conceptual touchstones for this study are the theory of flexible specialization and Porter’s (1998) related model of the value-added cluster. In Porter’s view, value chain creativity encompasses intra-industry firms in developing R&D, supplier and market channels, and incorporates skill development and certification institutions. This chapter reviews the overall progress made by study firms in achieving such goals.

My study has magnified the local geography aspects of SME innovation suggested in Porter’s (1990) conceptual value chain as a way to focus on details of localized networking mechanisms specific to study firms’ product and skill development. The investigation of SME innovation processes has relied on a firm-centered frame of reference to understand the progressive development of value chain attributes by the firms, and to facilitate inter-firm comparison of competitive advantage. The synergies connecting related study firms and local institutions have promoted the study firms’ product and market growth, supply management and skill

formation. Geographic and organizational characteristics of case study enterprises illustrate a high level of competency in R&D and internal labor management; and horizontally, in conjunction with related involvement in local resource industry networks, institutions, and global markets.

The flexibility advantages demonstrated by study firms hold the promise of more advanced value chain development. However, as this chapter points out, internal skill development and links between firms, industries and institutions do not guarantee the case study group's ongoing competitive advantage in a dynamic global forest resource milieu. Accordingly, this chapter reviews the varied development perspectives of study firms in their respective sectors to create a portrait of common advantages and challenges they have experienced. The economic contributions made by the study firm group (> 10% sales and employment) exceed the group's 2% numerical representation within BC's wood value-added industries; so these firms are important indicators of local manufacturing potential within BC's wider forest resource production environment. A unified picture of firm location dynamics emerges in this chapter, albeit with unique variations noted in value chain development across support and primary processes.

8.1 FLEXIBLE SPECIALIZATION AND PRODUCT-MARKET INNOVATION

The theme of flexible specialization encompasses location advantage and value chain evolution, and focuses in this thesis on potential flexibility benefits of study firms' product and market creativity. Pesonen's (2002) value based marketing model expresses a model of the way case study firms practice R&D; that is by directing locally based assets, skills and resources to fulfill market specifications and services. The case study group has fostered parallel export product and market research and development initiatives that anticipate customer communication, collaboration and interaction. At the same time, many firms are committed to the betterment of wood supply origins: certification, forestry and environmental management. The scope of interest among the remanufacturing, millwork, furniture and cabinet case study sector firms indicates that firms in these sectors are most engaged in the construction of strong local value chains. According to firm R2 respondent Mr. C,

“All (of our operations) must be done in an environmentally sensitive fashion that is not only demonstrated by our actions but proven through our ISO 14001 environmental management system. Yet the job is not yet done. Forest Certification to proof our harvesting practices and same label identification and consumer acceptance is yet to be realized. Securing fair, reasonable and long-term access to the US market place has not yet been achieved. The government is correctly reviewing... and that includes the Forestry in BC. Participating in the Forestry review process is forefront on our agenda. Yet the real challenge is that by the time we finish this latest capital program our equipment and technology will have been made obsolete by the next generation. The business cycle is never finished, you must always be willing to challenge yourself to do better. We have a world class labor force and a world class wood basket. What we really need to do is ensure they have the necessary tools to deliver that timber into the market place competitively.” (Firm R2)

Although the nature and extent of value chain advantage and challenge varies between firms and sectors, common to all firms in this study is a reliance on industrial, community, and institutional networks. Local knowledge and market knowledge are significant promoters of firm growth. Internally, product-to-market development draws upon a base of locally embedded tacit knowledge. Enterprise-specific market knowledge among study firms is generally developed in conjunction with industry market research initiatives, in-house hiring and training practices, and extended social/business networks. Product R&D approaches of study firm typically blend market-specific knowledge, in-house design engineering, collaborative institutional support of industry and educational research, and inter-firm competition and cooperation that allow firms to compare, contrast and select appropriate capabilities from the local industrial network (Table 8.1). In contrast, wood and equipment suppliers tend to be underrepresented in the design collaboration process; although trust, flexibility and long term stability characterize the industrial wood supply networking arrangements of study firms. Advanced job training and technological skill formation are valued by the case study group. However, the findings indicate that the region lacks indigenous equipment and machinery manufactured for production lines. EU and USA import sources account for the majority of large equipment supply;

Here in BC we have mastered three of four production factors. (I) rated highly in this province...great labor, good wood. Here we are stable politically, but very (in equipment development terms) technologically disadvantaged compared to the EU. (Firm R2)

Innovative product design/development pursued by case study enterprises is typically supported by industry-specific customer-led engineering processes and applications. However, the nature of product and production creativity or significant development is diverse and ranges from in-house and locally-exchanged knowledge

within local networks to adaptations of codified knowledge and special forms of shared knowledge between local study firms, institutions, and related international SMEs. Study firms have advanced their internal capacity and capabilities across a range of value chain 'strands' or interrelated primary and support activities. At the same time, the case study firms have captured advanced and institutionalized informal knowledge in the milieu. Table 8.1 summarizes six areas of capability or knowledge capacity developed internally and through inter-firm and firm/institutional exchanges. The framework for Table 8.1 categorizes knowledge enhancing advantage across six capability groups demonstrated by the cases. The six capabilities are within: similar firm; complementary firm; internal workplace/HR; local innovation; wood supply; and export markets (Table 8.1).

Capabilities shown by the case study firms commonly comprise a significant fund of knowledge about local labor, production technology and resource flows within local wood industry networks. Through local business and industrial institutions, international and export development product certification and processing relationships, the case study group has enhanced internal and regional sectoral growth. Firms show flexibility in production by informal exchanges of local know-how, and by adapting and selecting ideas and resources from similar and complementary firms and institutions. Knowledge has been institutionalized within complex local industry networks. However, to sustain local product-to-market growth, labor and supply flexibility, the firms note demands on personal capital and a balance of stability, trust and innovation within the forest industry environment (Table 8.1). In general, the trend to market-led product development is augmented by flexible workplace design where collaborative internal labor and spatial arrangements are most common.

Table 8.1 Flexible Specialization Capabilities of Case Study Firms - 2002

CAPABILITY Characteristics	KNOWLEDGE ENHANCING/ INSTITUTIONAL ADVANTAGE	CHALLENGES
SIMILAR FIRM CAPABILITY • Selection • Comparison • Adaptation • Variation	Location and cognitive proximity are institutionalized via inter-industry networks. Study firms lead local and provincial industry organization. Networking arrangements unite study firms and other firms within similar industry sectors across the lower mainland, Okanagan and BC. Inter-firm relations and tacit knowledge exchange is most advanced between remanufactured and engineered wood firms.	Inter-sectoral relations less cohesive in the lower mainland. Decline in local direct competition. Most study firms lack direct competitors locally, are 'one-of-a-kind' regionally. More reliance on national/ international 'similar' firms.
COMPLEMENTARY FIRM CAPABILITY • Specialization • Interaction • Exchange • Collaboration	Trust is institutionalized throughout technological equipment supply and labor pool interactions; training and skills programs and development. Inter-firm collaboration differentiates production line technology, with in-house engineering and design collaboration/adaptation.	Fragmented wood supply relations institutionalized. Strong between firms/direct suppliers, weaker across and between industries - barriers for new entrants.
INTERNAL WORKPLACE CAPABILITY • Communication • Flexibility • Collaboration	Job rotation, internal skill development and liaison with industry training well developed. In-house and in the locale. Diversity of skills promoted among firms; inter-firm skill transferability increased locally. Knowledge and application of HRM well-developed internally. Institutionalized through inter-firm labor pool exchange.	Firm-institutional training decline in BC. New firm capital and ownership structure more vulnerable/ sole ownership. Municipal policy constraints to production line innovation.
INNOVATION BASED GROWTH CAPABILITY • Internal innovation • Market knowledge • Flexible, informal • In-house design	New markets created; established markets strengthened in local cluster. In-house product design/differentiation; technology adaptation and collaboration are institutionalized within the local network. International industry and technological support relations are diverse. Skill development - OTJ training; and liaison with local industry and tech. institutions.	Wood certification/product standards developed at varied institutional jurisdictions. Design solutions for specific export market products are one-of-a-kind; firms rely on institutional support from customer region/industry
WOOD SUPPLY CAPABILITY • Trust • Inter-dependence • Flexibility • Long term interactions	Stability, trust and flexibility maintain long term and stable wood supply relationships. Study firms have established a position as 'preferred' customers for local wood suppliers.	Limited supplier input to design and production processes (lowest wood fibre price of lesser importance).
EXPORT TRADE CAPABILITY • Market knowledge • Customer collaboration • Communications • Design differentiation	Future market knowledge enhanced by feedback of face-to-face, web and phone communications. Proximity to largest market (USA) and other export locations generates firm growth. Development of cultural, social and language skill in local agglomeration. Certification and standards of marketplace increase local wood marketing capacity. Knowledge of BC products established in export marketplaces.	High dependence on (proximate) USA market: three interrelated problems: dollar exchange; restrictive softwood import tariff; cross-border shipping since 2001.

Looking towards the customer side of value chain development, the results show the preponderance of USA export markets for the study firms. However, export trade relationships, and interactions between case study firms and USA, EU and Asian customers, vary geographically and culturally. Study firm-market relationships

tend to be comprehensive, and involve the firms, industry marketing, and provincial/national trade networking institutions (e.g. Export Development Canada). Informal local and export community connections promote trust between firms, customers and local networks. Regionally, institutionalized trust mechanisms extend to include the USA marketplace in particular; as study firm/industry market knowledge crosses the international border. Case study firms are intentionally orienting wood product standards development, manufacturing and customer communication activities to capitalize on market place and communicative proximity. The set of knowledge capabilities shown by the study firm group qualifies the group in part as 'local champions.' A review of study firm characteristics helps to identify their status as local champions.

8.2 CHAMPION FIRMS

We are committed to advancing the understanding of our products. (The firm looks for design opportunities...making the most of glulam's unique structural and aesthetic attributes...the end result, a pleasing structure)...we stress ideas, motivation and entrepreneurship. (Firm E1)

The case study group has interwoven elements of entrepreneurial, professional, labor and business development assets with wood product and market R&D and supply chain management. Seven attributes of champion firms typically expected among leading local firms are also largely knowledge based: rapid sales and employment growth within the locale; financial capital acquisition; in-house product R&D; delegation of management and flexible HRD during growth; flexible workplace organization of union firms; technological skills development; and export market-led product development (advanced form of market growth noted in the literature) (Porter 1990, Pesonen 2002). Furthermore, export product innovations have connected the study firms in local and broader scale networking arrangements. Does rapid local growth demonstrate innovative capacity? It would be difficult to claim that study firms' general or individual local growth successes are entirely innovation based. Rather, entrepreneurship and financial capital, sales ability, wood supply access or export business connections have undoubtedly contributed to some successful activities.

However, in the contemporary period, the 14 study firms (including two recent

lower mainland firms C2 and E3) have generally formed industrial location advantages that can not easily be transplanted to other world regions with cheaper labor or larger, faster machines. The local knowledge exchanges among firms and individuals create a more resilient industry considered key by many owners, although they note the rise in potential global competition. Yet individual study firms are unique across 'champion firm' characteristics, so my chapter summaries are used as a qualitative basis for comparing labor, technological and supply management assets among the 14 firms (Table 8.2). These characteristics are significant during the contemporary period, when all firms within equivalent industry sectors are subject to similar labor and supply advantages and constraints. Similarly, regions and sectors have noteworthy 'competitive advantage' across the production areas examined in this thesis. However, this summary of firm qualities does not choose regions. The four innovation characteristics of champion firms are: internal labor creativity (combining assets discussed earlier chapters); technological skills development; market-led design; and wood supply access (Table 8.2)

Table 8.2 Summary of Labor, Technological and Wood Supply Innovation - 2002

	Internal labor innovation	Technological skills development	Market-led design innovation	Wood supply access development
R1 Okan	X	X	X	X
R2		X	X	X
R3 LM	X	X	X	
E1		X	X	X
E2		X	X	X
E3	X	X		
M1 LM	X	X	X	X
M2				
P1			X	X
P2	X			X
C1		X		
C2 LM	X	X	X	
F1				
F2				X

Note: four leading firms highlighted in gold cells (labor and 2-3 other innovations); study firms with >2 innovation types, green cell highlights.

By reason of growth in sales and local employment position, all study firms are assumed to have managed finances and business skills. However, the flexible specialization advantages established by four particularly competent case study firms include a combination of 'lead firm' assets that distinguish them from the remaining cases, and possibly from BC's wood value-added population. Okanagan firm R1, and lower mainland millwork firm M1 lead the other two (C2 and R3), by virtue of advanced skills demonstrated in all four creative characteristics. However, lower mainland firms C2 and R3 also look promising, with human resource development and two other leading characteristics. These four study firms highlight the best practices from the case study group in terms of firm growth linked to innovation. Based on capital and knowledge development, all study firms are typically highly-differentiated and use knowledge-enhancing mechanisms across their production, R&D, and skilled technologies for their manufacturing, marketing and service activities.

This summary analysis highlights the overall value chain qualities of two remanufacturers, one cabinet firm and a lower mainland millwork firm. These findings also capture the flexible specialization and networking skills that are circulated amongst study firms, other firms and institutions within the locale. Although the local geographies of the 14 study firms are explained in large part by entrepreneurship, social ties, owner knowledge and capital assets, their longer term (future) industrial advantage is linked to creative strategies and skills that would secure their economic position in the locale. In the context of a globalized forest production environment, this study reveals the contemporary significance of locally important firms, their business cultures and supply networks. Within this group of 14 enterprises are several important champions that exhibit long term commitments to human and forest supplies; yet, the four most innovative amongst these firms stress, above all, flexible human resource management and internal skill development.

Local Knowledge and Skill Formation

Human resource development and knowledge circulation are reported to be central to the design, development and production activities of the 14 cases. The study firms are actively engaged in promoting the requisite industry knowledge, skills, training and research at various scales: neighborhood public schools and high school co-op programs; in-house and collaborative education at national and international

institutions. Such long term education-centered networking partnerships establish future labor skills and stability for study firms. For the fulfillment of promised growth of value-added production, firm principals' perspectives converge on the vital necessity to disseminate value-added (product and production) and forest industry knowledge to a wider audience that includes the indigenous consumer base. Human resource development is at the crux of design, development and market growth. Yet firm owners note declining provincial policy and funding support for technological education, apprenticeship programming, and technological liaison with industry.

Skill strategies of the leading study firms incorporate the most developed technologies currently available within BC's wood value-added SME sectors. In addition to creating greater employment opportunity locally, these particular enterprises are focused on introducing quality and refinement to the local industrial and technical knowledge systems, especially those related to: production line construction; modification; and operation and training. Such internal initiatives pursued by individual study firms extend to like industry sectors and inter-industry networks. Notwithstanding local challenges and global competition, the 14 case study enterprises as a group demonstrate skill development and diversification advantages. Their growth (sales and employment) initiatives provide a large source of jobs (> 11% of wood manufacturing in BC) and local development to the Okanagan and lower mainland of BC.

In practice, the much heralded value-added model reveals that during two decades of turbulent regional restructuring, these study firms have propelled their local value-added production towards economically and environmentally sustainable business development. The two (possibly four) champion case study firms fit at the leading edge of importance within the case study group of value-added industries. However, the study firm group faces challenges. Most study case firms rely on the USA market for the bulk of their exported products; some firms sell almost exclusively to American customers. Notwithstanding softwood import barrier uncertainty from the perspective of remanufacturing and millwork study firms, the geographically and culturally proximate American market promises to provide an ideal customer base for diverse, high-end value-added industrial forest products.

8.3 REFLECTION AND FUTURE RESEARCH

This study has investigated the nature of local knowledge and production processes among large SMEs of the BC forest economy. During the research process I considered the future prospects for the BC forest industry, its ongoing restructuring, and for the many value-added SMEs throughout the Okanagan, lower mainland and other regions of the province. The value-added locales represented by the 14 case study firms are regions of immense importance to the forest industry restructuring process, and where the key resources - humans and natural forests - may not remain fixed in these locales. The study firms have revealed locally based strengths through their strategies, activities and plans. They have also expressed concern for their vulnerability to global competition for markets, supplies, products and skills. The challenge for these large SMEs and their cohorts is to remain competitive by instituting value-added growth, and by intensifying their local and distant business relations to fix their economic position locally. For some firms, expansion and takeovers will be an option; while family firms may decline as subsequent generations get out of the business.

The firm operates in a changing (complex) environment. We need to understand trade policy and forest policy. Looking back to the 1960s, there was high growth and a large housing boom and demand. Then, for example, Fraser Mills used to make doors and windows (higher value-added). Now, there are six Wal-Mart buyers in China, and we have to deal with USA anti-dumping. We need a much greater vision within the BC forest industry. There will always be opportunities in value added wood products. **The important part is human resources** - it doesn't matter about how good the wood (supply) is here, without the people, it's nothing...

...We need increased input and responsibility from the forest industry (in value added)...instead of reacting! The firm has plans to diversify - we have some requests for products now from Scandinavia and Belgium. So, the firm's vision for the future is linked with government policy, and education and training in BC. (Mr. D Firm R3)

The future is uncertain for value-added study firms. The prospects of propagating and strengthening the case study model of wood value-added in British Columbia depends upon a coordinated approach that situates value-added policy at the nexus of industry, forestry and consumer involvement. First, more champion firms would achieve a critical mass of flexibly specialized networks to sustain and create access to diverse markets; to expand and diversify industry networks locally; to create high value local SME markets for BC wood suppliers; to increase the skill base and employment opportunities of wood value-added industries; and finally, to increase

the local profile and market for BC's resource dependent industries. Second, a critical mass of champion firms (i.e. many large creative firms) would create the diverse mix of firm types recommended in the literatures of SME innovation and flexible specialization (Piore and Sabel 1984). According to the results of my thesis, future research on BC wood value-added industries or policies would look at specific value-added supports for SME innovation and growth; study value-added skill developments, consumer education and marketing; and would research the relationships between local value-added firms and BC wood and equipment suppliers.

Originally, this thesis drew inspiration from the aesthetic beauty of wood products we label value-added, particularly the genres created by BC First Nations' artists. In a parallel vein, the findings of this study indicate that several champion value-added wood firms are selecting and promoting quality and high value through distinctive product innovations and production process adaptations. Common interests in advancing forest and human resources create a point of intersection for value-adding networking and interactions among study firms. This study reveals how the case study firms from two regions and six industry sectors are indeed nudging the leading edge of local innovation and diversification within a multi-scaled forest industry restructuring environment still highly dependent on raw and minimally-processed natural forest resource export production.

APPENDICES

APPENDIX A CASE STUDY FIRMS AND INDUSTRY SECTORS

Industry Sectors or Categories

1. R=Remanufactured
2. E=Engineered
3. P=Prefabricated
4. M=Millwork
5. C=Cabinets
6. F=Furniture

Study Firms, Year and Location

1. Remanufactured wood products - 3 firms
 - FIRM R1 (1951) south Okanagan
 - FIRM R2 (1983) south Okanagan
 - FIRM R3 (1988) Lower Mainland
2. Engineered wood products - 3 firms
 - FIRM E1 (1962) south Okanagan
 - FIRM E2 (1992) Lower Mainland
 - FIRM E3 (2000) Lower Mainland
3. Prefabricated and/ or premanufactured/factory-built structures - 2 firms
 - FIRM P1 (1961) lower mainland
 - FIRM P2 (1977) Lower Mainland
4. Millwork - interior and exterior architectural applications
 - FIRM M1 (1974) Lower Mainland
 - FIRM M2 (1995) Lower Mainland
5. Cabinets and furniture - 4 firms in total (2 from each industry sector: cabinets and furniture)
 - FIRM C1 (1979) Lower Mainland
 - FIRM C2 (1997) Lower Mainland
 - FIRM F1 (1961) Lower Mainland
 - FIRM F2 (1986) south Okanagan

APPENDIX B SEMI-STRUCTURED INTERVIEW SCHEDULE

INTERVIEWS - WOOD VALUE-ADDED FIRMS

Answers may indicate: Y=yes; N=no; S=somewhat

Name, address of this firm _____

Owner _____

Name of respondent _____ Title/position _____

How long have you been with this firm, since startup? _____

1. FIRM AT STARTUP

Date and location of this firm's incorporation _____

Original owner(s)/partners: of this firm at startup date _____

Training, former forest industry/mfg. background, business skills/languages

Existing facilities/plant _____ acquisitions _____ Built own/
facilities _____

Original vision of owner, motivation and entrepreneurship _____

Approx. Sales 1st year <\$1M \$1M-\$5M \$5M-\$15M >\$15M

Geography of sales (approx.%) BC Canada USA Asia other

Startup financing: owner _____ other _____

Initial product/idea/process of this firm at startup _____ product mix _____ and
distinctiveness _____ custom? _____

Original product R&D: owner/in-house _____ academic inst/other _____ Niche
market _____

Communications: was personal contact with customers important? locally _____ in BC _____

Was personal interaction with suppliers imp?: local (firm region, i.e. lower
mainland) _____ BC _____ other _____

Were local _____ BC _____ Canada _____ USA/oth sources of wood supply critical for
firm startup? Y S N n/a _____

Competing firms? in BC _____ Local _____

Is initial product(s) still part of firm product line? _____

Number of employees at startup: union/non-union - fulltime____part
time____temp/seasonal____contract____co-op students____other____
Job categories at startup: professionals____administration____Skilled trades____semi-
skilled____unskilled____technologists____
Profitsharing (Y/N)____starting unskilled wage____

2. 2002 OPERATIONS

Location or facility changes____

Ownership/partnership changes:____

Sales in 2002 <\$1M \$1M-\$5M \$5M-\$15M \$15M-\$30M >\$30M

Main product____product mix____

Distinctiveness____

Product line____categories a)____
b)____c)____

What % of your sales is 'custom production' (filling project order)____

Do you serve niche markets %____mass%____

Geography of sales for each category (%)

a) BC Canada USA Asia other____
b) BC Canada USA Asia other____
c) BC Canada USA Asia other____

- Source of product distinctiveness/R&D: owner/in-house____academic
inst.____government____other____Niche market or mass____

Any competing firms: local____BC____USA____Asia____other____

2002 additions to product line, expansion____

Is initial product still part of firm's product line?____% of sales____

MANAGEMENT, PLANNING AND HUMAN RESOURCES

- Total # employees 2002:____Union____Non union____
- #hired in 2002____#layoffs 2002____
- # Fulltime____part time____temp/seasonal____contract____co-op students____
- Employee turnover: voluntary____retirement____layoffs____

Fulltime 2002:

- # Management professionals____
- Engineers____Designers____technologists____other professional____

competitive pay _____ job security _____ seniority _____ benefits _____
 geography of recruitment _____ employee turnover _____
Skilled trades _____ qualific. _____ start pay _____ (compared to other
 industry?) _____ job security _____ seniority/pay raise _____
semi-skilled _____ qualific. _____ start pay _____ job security _____
 seniority/pay raise _____
unskilled _____ qualific. _____ start pay _____ job security _____
 seniority/pay raise _____

Part time 2002:

- Management professionals _____
 Engineers _____ Designers _____ technologists _____ other professional _____ job
 security _____ seniority _____
- Skilled trades/or skilled categories _____ qualific. _____ start
 pay _____ compared to other industry _____ job
 security _____ seniority/pay raise _____
 semi-skilled _____ qualific. _____ start pay _____ job security _____ seniority/pay
 raise _____
 unskilled _____ qualific. _____ start pay _____ job security _____
 seniority/pay raise _____

Does firm use: job rotation _____ flextime _____ shares _____ profit-sharing _____ on what
 basis/job class _____ bonuses _____ non-monetary incentives _____ production
 teams _____

Comments on worker productivity re. workspace, physical layout/ building _____

Internal communications between workers _____

- How many employees have industrial first aid certification _____ on job _____
- How many employees have grading ticket _____
- How many employees have other specialized certifications (CAD, CAM, CNC,
 transportation equipment) _____ on job _____ other _____ firm pd. _____
- Are any firm educ/training programs offered to employees _____ describe _____
- Do you use training centres: CAWP _____ BCIT _____ BCWood _____ other _____

Do you hire from other firms in this area? _____ BC _____ Canada _____

Comments on advantages/disadvantages of local pool or other _____

Have there been any significant changes in firm business, employment and training practices

over the past five years _____

2002 PRODUCTS, R&D and TECHNOLOGY

- 1) Main PRODUCT research and design activity in 2002 _____ focus _____ budget (formal or other) _____ Market _____ How is product design planned and done _____ any liason with university/training inst. _____ why _____
- 2) 2002 patents _____ and applications _____ adaptations of previous firm products _____ expanded product line _____ Product acceptance _____ REASON _____ (customer request, customer design/involvement, or other motivation) _____ Source _____ Cost _____
- 3) ...Then what main product innovations since 1997 _____ patents _____ applications _____
- 4) Any minor changes since 1997 _____ why _____

How effective? in cost _____ non-cost terms _____ e.g. product simplified firm operations _____ marketability _____ ease of production _____ how _____
Products offered first in BC _____ Canada _____ USA _____ other _____
Adapted by other firms if not patented? _____ location _____
Changes in facility needed _____ Reason _____

TECHNOLOGY PROCESSES

- 1) Major capital improvement or equipment acquisition, adaptation, change or improvements in 2002 _____ Was it an adaptation (by firm) _____ off-the-shelf _____ custom design _____ other _____
- 2) TYPE: Description of machinery/equipment change (innovation), or manufacturing technology _____
- 3) Do you use CAD, CAM, CNC _____ Why _____ (e.g. lower cost, higher quality, simplify production) _____
SOURCE: of this equipment/machinery (software etc.) _____
PURPOSE _____ COST _____ funding _____
Success of implementing process _____
- 4) How are (if) employees involved when firm introduces a new technology or process - in selecting _____ operating _____ installing _____ if new skills required, where trained _____ funding _____ why _____
- 5) Major process investment over last five years _____ cost _____
Do other local _____ BC _____ other firms using the process _____ e.g. shared information re. equipment operation _____ locally shared, rented or co-op

facility_____why_____

Changes in firm's facility needed? Reason_____

COMMUNICATIONS AND MARKETING

Market initiatives in 2002_____

Changes in export destinations in 2002_____

Has your export business changed since 1997_____

How addressing concern if any_____

How important is personal communication with customers_____ Y S N n/a

Do your staff communicate in language of export country? Y N other_____

Source of marketing information_____

Main transportation and shipping changes 2002_____

Source of marketing information_____

Did firm use BC marketing support in 2002: source_____associations_____

BC_____Canada_____government market programs_____

Has firm been included in 2002 Canada trade missions/fairs/programs_____other_____

Year	Organization	Participation
------	--------------	---------------

- Did any employees participated in market education?_____source of training: in-firm_____other institution_____ (e.g. BCWood market readiness programs)

- Did firm use marketing consultants in 2002_____ why_____

Any related firm location or facility changes in 2002?_____

Did firm maintain a website in 2002_____significant since 1997_____

How significant is firm's web/email interaction: with customers_____

Suppliers_____

- Most significant 2002 marketing and communications change or improvement made by this firm_____
- Since 1997_____
- What is the main source of your firm's competitive advantage_____ (product diversity, quality, durability, etc)

ENVIRONMENT AND SUPPLY

1. Does this firm use any certified supplies, products or processes?_____

2. Describe any certifications _____

3. Did firm participate in resource/land management programs?___type_____

4. In 2002, was this firm a member of any local or other environmental or conservation

associations?_____

5. In 2002, did this firm use energy-efficient methods or devices?_____ describe_____
6. In 2002, did this firm used any product or method to recycle materials?_____
7. In 2002, did firm used any air_____ water_____ land_____ pollution control or pollution reduction devices/processes?_____ describe type_____ cost_____ efficacy_____
8. In 2002, did firm use any products, devices, methods_____ to reduce/protect workers' exposure to environmental hazards at work. Describe_____ union _____ or non-union mandated?_____
9. Did firm respond to specific environmental problems related to customer demands in 2002 (e.g. changed awareness, marketing, government policy, NGOs, others)_____ describe firm response_____

Suppliers - 2002: Sources of wood fibre_____ # of local _____ # BC _____

#Canada_____ #USA _____ #Asia_____ other_____

Sources of equipment/component supplies #local _____ # BC _____

#other_____ Equipment suppliers important?_____ Y S N n/a

Changes in suppliers 2002: wood fibre_____ other components_____

How important was stability of supplier relations in 2002: wood fibre_____ other components_____

In 2002, did the firm cooperate with other industry sectors for wood supply_____

Did wood supply constrain firm's 2002 sales _____ marketing_____

Did the softwood dispute affect this firm's 2002 operations_____

NETWORKING WITH OTHER FIRMS

In 2002, was firm a member of industry groups/marketing associations_____ BC_____

Canada_____ North American_____ wood species (e.g. WRC)_____ equipment supplier networks_____ other_____

Industry Association	Type & location	Benefits to firm
----------------------	-----------------	------------------

Describe other 2002 professional networks: inter-firm_____ professional associations:

AIBC_____ FORINTEK_____ CWC_____ construction_____ imp. of membership_____

Was local competition an advantage/disadvantage to this firm in

2002_____ how_____

What are the main 2002 location advantages for this firm? _____ e.g. rent _____
 facility design _____ near supply _____ good transportation access _____ proximity for
 employees to amenities _____ owner startup decision _____
 Firm 2002 cooperation/ initiatives with other value-added? _____ primary industries? _____
 Any planned location changes made by this firm _____ to improve
 production _____ market access _____ supply advantage _____ other _____ If so, why
 would firm consider moving head offices _____ R&D _____ manufacturing _____ to another
 location? _____
 Vision of firm owner; motivation, opportunities and challenges _____

INTERVIEW THEMES

Firm characteristics - background, growth, export orientation and stage

- Initial startup location, relocation
- Entrepreneurship characteristics, how/who started
- Initial idea or product, financing, facilities, personnel, local trials
- Growth characteristics, partnerships/ownership, labor (skills), pay and job flexibility strategies
- Innovation and firm location growth, market niches, product diversity strategy
- Local to export market trends

Product and Process Innovations

- Radical or incremental change, adaptation
- Design in-house, NRC, FRBC, association, other firm, supplier, education institutions, research, employees, other
- Acceptance of innovation (disruptive technology) and ease/difficulty of implementation
- Funding sources, implementation, availability
- Manufacturing technologies (CAD, CAM, CNC re. education, availability)
- Firm application of technologies and access to equipment
- Market intelligence importance
- Product marketing/firm location - response to supply/environmental constraints (market, government, NGO, other)
- Flexibility and information - regarding customer demands

Value Chain Organization and Innovation:

- Importance at various stages of growth, of:
- Infrastructure, administration
- Human resource management and delegation: labor input, education, skills access, flexibility how used in firm relations with local networks, suppliers, marketing sales,
- Technology development
- Resource procurement

Local Networks:

- Sources (and sharing) of knowledge/information inter-firm or with associations and institutions; Communications type
- Local networks advantages
- What aspects of local networking have changed
- Group industry (sectoral) advantages in developing markets/supplies
- Networking location advantages

APPENDIX C CASE STUDY BUSINESS CHARACTERISTICS - 2002
PRODUCT LINE, SALES, FTE, MARKETS AND WOOD SUPPLY

Firms R1; R2; R3; E1; E2; E3; M1; M2; P1; P2; C1; C2; F1; F2 U=unionized

FIRM R1 Remanufactured

R1 Okan.	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
Est. 1951	1" specialty spf boards	Sales (60)	1. Quality	BC	Y	Lodgepole pine Engleman spruce Douglas fir
location same as start-up	Fingerjoint and moulding stock	FTE (300)	2. Uniqueness in N. Am. highly specialized product	Canada	18	
Canadian owned	Pattern stock		3. Service, reliability	USA	62	
Owner Family				Japan	Y	
USA tariff	Tax on all products			Asia	Y	
Competit. Location	Scandinavia			EU	Y	
	Austria					

FIRM R2 Remanufactured

R2 Okan.	Product line	2002 sales \$M cdn FTE (#emp) U=Union	Core competitive advantage	Main Market	%	Main local Species
Est.1983	Edge Glue Laminated panel	Sales (22)	1. Service (big inventories) > 1 month	BC		Lodge- pole pine
Location same as start-up	T&G edge glued Wall panel	FTE (95) U	2. Quality	Canada	35	
Canadian owned	Wainscot Moulding Wall System		3. Price	USA	60	
Owner Partner- ship				Japan	Y	
USA tariff	Tax/some products			Asia	Y	
Competit. location	Chile Scandinavia			Hong Kong	Y	
	New Z. Australia			UK	Y	

FIRM R3 Remanufactured

R3 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
Est.1988	Reman. Specialty sawn timber	Sales (30)	1. Uniqueness	BC	Y	Western Red cedar
Location within region in 2000	RTA prefabricated structures	FTE (90)	2. Supplier range	Canada	12	
Canadian owned	Siding, decking fencing		3. Price	USA	70	
Owner Partnership (2)	ornamental fascia		4. Integrated with firm's pre-built structure company	Japan and Asia	10	
USA tariff	Tax on sawn products, no tax structures		5. Reputation			
Compet. location	0 local			Hong Kong		
				UK, EU	5	

Firm E1 Engineered products

E1 Okan.	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
Est. 1962	Glulam and heavy timber packages	Sales (8)	1. Design Innovation	BC		Douglas fir; CWH
Location same as start-up	Wood products and services	FTE (60) U	2. Quality	Canada & other	20	
Canad. owned	Cross-arm Poles stock beams		3. Technological expertise	USA	70	
Owner Indiv.	Arched Members		4. Comprehensive service/ project coordination	Japan	Y	
USA tariff	exempt		5. Certified for export markets (JAS)	Japan & Asia	Y	
Competit location	Canada: 3 USA: 25 EU: n/a			Hong Kong		
	1 local			UK		
	1 Alta			EU	Y	
	1 Quebec			Other	Y	

Firm E2 Engineered products

E2 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Spp.
Est. 1992	Engineered wood products	Sales (38)	1. High quality	BC	15	CDF
Location same as start-up	Engineered truss and structural Agricultural, Commercial, Residential	FTE (200)	2. Integrity	Canada	Y	CWH WRC
Canadian owned	MSR resawn		3. Marketing & management excellence	USA	80	
Owner Individual	pallet		4. Manufacture own MSR lumber	Japan		
USA tariff	Truss products: exempt			Japan & Asia	Y	
Competitor location	Local: 18 BC: 6 USA: >100			Hong Kong		
	Asia: 0			UK		

Firm E3 Engineered products

E3 Lower main- land	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Spp
Est. 2000	Engineered wood SIPs prefabricated structural insulated building panel system	Sales (4)	Precision, quality, custom manufacturing	BC		OSB KD exterior & interior
Located within region 2002	2002 (also panelization product for mobile structures)	FTE (30)	2. Service efficiency, reliability	Canada	15	D. fir; CWH; Interior/ Exter- ior grade OSB
Cdn. owned			3. Engineering & design technologies	USA	80 Alaska, west states	
Owner sole			4. Innovative 'green focused' product - local	Japan		
USA tariff	exempt			Japan & Asia	5	
Compet location	Local: 0 Canada: 1 (east) USA: 4 (3 in east)			Hong Kong		

Firm M1 Millwork

M1 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
Est. 1974	Interior and exterior millwork Posts Rails	Sales (18)	1. Service	BC		CDF CWH WRC
Location Regional move	Banisters Spindles Columns Stair/ Furniture/ Hemlock Fingerjoint flooring	FTE (120)	2. Price	Canada	25	own custom milling, remanuf. For millwork supply
Canadian	Millwork accessories metal		3. Factory packaging for customers	USA (western states and Hawaii)	50	(In-house component mfg.)
Owner Partnership			4. Diversity of product component combinations	Japan		
USA tariff	Tax on some millwork product			China		
Competitor location	Local: 0			Hong Kong		
	Canada: n/a			UK and Australia	Y	
	USA: <10			EU & other	Y	

Firm M2 Millwork

M2 Lower main- land	Product line	2002 sales \$M cdn FTE	Core competitive advantage	Main Market	%	Main local Species
1995	manufactured wood/mdf mouldings interior and exterior doors panel products coordinated packages	Sales (10)	1. Unique product for both USA and Canada market	BC	Y	BC & other spp. (rad. Pine) in composite product
Location LM Same as start- up	Prefinished Wood products Prefinished MDFproduct	FTE (95)	2. Product packaging services	Canada	25	wood composites and other spp.
Canada	Full service supplier mouldings, doors, panel products		3. Low cost	USA	75	
Owner Individu al/ family			4. Only Canadian supplier	Japan		
USA tariff	exempt			China		
Compet. location	Local: 0			Hong Kong		
	Canada: 0			UK		
	USA: 5 Wisconsin and west coast			EU		

Firm P1 Prefabricated and factory-built structures

P1 Lower main- land	Product line	2002 sales \$M cdn FTE (#emp) U=Union	Core competitive advantage	Main Market	%	Main local Species
Est. 1961 Ontario BC 1997	prefabricated structures	Sales (23)	1. Precision, quality, custom manufacturing	BC	Y	CDF CWH WRC
Location LM same as 1997 BC start-up	design, engineer & manufacture custom home packages	FTE (100) U	2. Service innovative design and engineering staff architectural efficiency, reliability	Canada	9	Own milling, custom wood shops
Owner Canada n owned at start- up 2001 TSE			3. Uniqueness in world market struct. integrity designed to Japanese market earthquakeproof	USA (western states and Hawaii)	9	
Owner family				Japan	80	
USA tariff	exempt			China	Y	
Compet. location	Local: 0			Hong Kong		

Firm P2 Prefabricated and factory-built structures

P2 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
1977	prefabricated structures 40% residential 60% commercial	Sales (40)	1. High quality; uniqueness of service; diversity of export geographies innovative products	BC		CDF CWH WRC
Location Regional move 1979 1980 1988	manufactured commercial, industrial, residential structures & custom design	FTE (150)	2. Unique comp. services: design- build, site dev., project mgmt and after-sales service	Canada	48	Coast s'wd supply in firm's structural engineered framing, sheathing component
Canadian			3. Factory energy efficient construction	USA (western states and Hawaii)	49	
Owner Partnership (2)			(diversity of export geographies, product for severe climate conditions)	Japan other	Y	
USA tariff	exempt			China		
Competitor location	Local: 0		4. Integrated with leasing division	Hong Kong		
	Canada: n/a			UK		
	USA: <10			EU		
				Russia	1	

Firm C1 Cabinets

C1 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
1979	Cabinetry: Solid wood Doors (1500 combinations) Front, component Counters	Sales (10)	1. Quality Production flexibility & communication	BC		Soft Woods Pine Hemlock
Location relocated 1997 amalgam. 4 divisions	(1500 door combinations) 80% sales custom	FTE (90)	2. Price	Canada	70	MDF & Composite Panel board
Canadian			3. Service efficient, design in-house studio innovation	Other, incl. USA (north west)	20	
Owner Partnership (5)			(proximity to suppliers and customers)	Japan/other	Y	
USA tariff	Exempt			China	Y	
Competitor location	Local: no direct competition			Hong Kong		
	Canada: n/a			UK		
	Other			EU		

Firm C2 Cabinets

C2 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp.)	Core competitive advantage	Main Market	%	Main local Species
1997	Commercial, industrial residential cabinets	Sales (4)	1. Design quality, customer access, Production flexibility; communication	BC	20	BC Soft- wood hard- wood
Location Regional move 2002	Solid wood	FTE (28)	2. Design and service Vancouver and Japan studios	Canada		
Canadian				USA Calif. Hawaii	20	
Owner individual				Japan	60	
USA tariff	exempt			China		
Compet. location	Local: 0			Hong Kong		
	Canada			UK		

Firm F1 Furniture

F1 Lower mainland	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
1961	wholesale furniture manufacturer & distributor	Sales (12)	1. "ideas, innovations" (revolutionary in this product & production sector)	BC	15	Composi tes and laminate
Location Regional move 1980	promotional bedroom and occasional furniture	FTE (100)	2. Unique product design/ variety (finishes)	Canada	55	Compos- ite Board product* Origins of wood fibre unknown
Canadian	master bedroom suites, youth dressers; chests; computer desks; mates, sleigh beds		3. Quality and low cost	USA	26	Ply; mdf Particle board
Owner 2 families			4. Service, reliability	Japan	Y	
USA tariff	exempt			China	Y	
Compet. location	Local: 0 BC: 0			Hong Kong		
	Canada			UK		
	USA			EU		
				Carribean Mid-east	3	

Firm F2 Furniture

F2 Okan.	Product line	2002 sales \$M cdn FTE (#emp)	Core competitive advantage	Main Market	%	Main local Species
1986	RTA (ready to assemble) solid wood manufact/ distributor	Sales (20)	1. Very high product quality	BC		Lodgepole pine
Location Same as start-up	12 categories promotional household, bedroom, shelving dining room bunk& bedroom no custom	FTE (140) U	2. Service	Canada	60	Composite s/ Wood Board product
Canadian Owned/	wardrobes Writing desks Furniture Fixtures &components		3. Time (management of delivery)	USA	25	
Owner Partners (3)			4. Style and innovative design features incl. low price/ long term product integrity	Japan	Y	
USA tariff	exempt			China	Y	
Compet. location	Local: 0 BC: 0			Hong Kong		
				UK	Y	
				EU	Y	
				Other	Y	

APPENDIX D ENGINEERED WOOD TECHNOLOGY DEVELOPMENT

Existing Technology

Engineered wood products by their very nature require process and quality control procedures at every step in the manufacturing chain, at least if the manufacturer has made it its goal to optimise product performance against product input. Process control may need to cover a variety of factors such as species, moisture content (average and variations), dimensions, geometry and natural defects, stiffness and other mechanical properties, surface characteristics, temperature of the wood, grain orientation, adhesive characteristics, adhesive application rate, piece positioning, pressing conditions (temperature, pressure and time). Once the products have been glued, information is needed on bond and overall product quality. Metal-plated products need to be subjected to similar quality control procedures.

To a large extent, quality control operations are currently performed manually, with operators taking samples off the line at more or less regular intervals to check product quality. Sampling is not statistically significant, and results are usually not known until several hours later, so that flaws in the process can be very costly. Solutions to this problem, and to improved reliability, include an array of non-destructive techniques and computer-based vision systems. Many of these systems are still under development, and they may prove costly for smaller manufacturers.

With ISO 9000 and 14000 registration becoming a significant business, plants manufacturing engineered wood products may have to consider registration. This involves a significant investment, but experience has shown that, when the exercise is treated as an opportunity to streamline processes, the investment can be recouped quite rapidly through reduced production costs and improved product quality or service credibility.

Incremental Technological Improvement

- Develop on-line scanning and image analysis equipment or other technology to control geometry and natural characteristics prior to assembly.
- Develop and implement an on-line non-destructive quality control system to ensure total quality and eliminate the need for manual tests.
- Develop and implement testing methods to evaluate creep and duration-of-load characteristics of engineered wood products.
- Develop quality control protocols and tools that could be used widely by industry to increase product reliability and credibility.

Breakthrough Technological Improvement

- Develop and implement a centrally-integrated process control system incorporating feedback from the various operations, as well as economic and market input, to automate machine set-up, optimise production in real time, and provide tools and data for simulations and process optimisation decisions.
- Develop expert systems and decision aids capable of integrating information collected by the quality control equipment in order to alert operators to problems, and to guide their machine setup and production decisions.

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APPENDIX E FIRM E3 EXPORT SALES/MARKET DEVELOPMENT

Table 1: Firm sales 2000-2003

Year	Sales
2000	\$1 000 000
2001	\$2 000 000
2002	\$4 000 000
2003	\$8 000 000

Table 2: Geography of sales 2000-2002

Year	Location	% of firm market
2002	BC	5
2002	USA	80
2002	JAPAN	15

Table 3: Geography of labor recruitment 2000-2002

Year	Geog. of recruit	# employees	% turnover	#CadCam technologists	#mgmt/prof.
2000	Local	2	0		
2001	Local		80		
2002	Local	30	60	7	4

Table 4: Year 2002 Organization Liaison - professional, government, industry

1. Timber-frame Guild of North America
2. Japan Home Trade Show Association
3. Structural Insulated Panel Association
4. Built Green Master Builders Association
5. King/Snohomish Counties USA
6. Greater Vancouver Home Builders Association
7. Oregon State building code certification
8. Energy and Environmental Builders' Association
9. Energy Star Program member
10. Log Builders Industrial Association BC (LBI)
11. International Log Builders Association
12. BC Wood Specialties Association
13. Forintek Canada Corp.

Table 5: E3 Certifications

1. ICC-ES/NER-467: published by ICC evaluation service (ICC-ES) USA evaluation/bldg. codes, products, bldg. technologies - has certified that E3 SIP and building system will meet USA code requirements, including those previously regulated by ICBO.
2. UL532 Fire resistance rating: Underwriters lab certification of 1-hr. fire resistance with type C gypsum board (UL file R18708)
3. PFS 3rd party approval of E3 as certified mfg. of SIP, QC program complies with building code requirements
4. California Title 25: Calif. State certifies E3 as an approved mfg. of SIPs
5. Oregon compliance No. M-462 PC: Oregon State certified approved mfg. SIPs
- 6.
7. CCMC - application pending

APPENDIX F Technological Skill Innovation of Selected Study Firms - 2002

	Capital cost (\$M) F= formal budget	Equipment Source Design, Technology Owner= Own/ adapt	Equipment Purpose P=process F=facility E=Environment. Management C= communication	Product Quality Focus=1	1=OTJ training 2=other Training	1= own maintenance	1=design Collabor. with Customer	Focus/use F=flexibility A=precision (CadCam CNC) Q=quantity
R1		Europe		1	1	1	-	F A
R2	1.3 (F)	Denmark Japan, North America	P F E	1 1 1	1 1 1	1 1 1	1 1 1	F A
R3	- -	BC Sask. Owner	P F C	1	1	1	1	F A
E1	-	EU Owner	F P	1	1 2 (UBC)	1	-	F A
E2	-	Owner Owner	P C	1	1	1	-	F A Q
E3		Owner Owner	P F C	1	1	1	-	F A Q
M1	0.5	EU Owner	P E C	1	1	1	1	F A

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