CHAIN OF CUSTODY CERTIFICATION ADOPTION, INNOVATION, AND CHANGE MANAGEMENT IN THE BRITISH COLUMBIA VALUE-ADDED WOOD PRODUCTS SECTOR

by

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Abstract

This study investigated the chain of custody certification adoption, the state of innovation, and change management in the BC value-added wood products sector. To achieve this goal, a survey was conducted in the fall of 2013 to determine attitudes, motivations, and barriers of a selection of value-added wood products manufacturers with regard to their current and potential participation in CoC certification. In addition, the innovativeness of the firms, as well as the change management attributes using the ADKAR (awareness, desire, knowledge, ability, and reinforcement) model, were assessed. The study revealed that 41% of the respondents were certified, with remanufacturers having the highest adoption level.

Another 13% of the companies were interested in becoming certified in the next 5 years and the remaining 46% were not certified and were not interested in certification citing a range of barriers including lack of customer demand, high costs, and a lack of price premiums. Certified and interested companies seemed to be ambivalent about the motivations regarding certification. For certified companies, improved corporate image and participation in LEED building projects were the two biggest motivations for adopting certification. However, for interested companies, the ability to command price premiums was the top motivation.

To assess value-added wood products industry practices with respect to innovativeness, an indirect self-evaluation scale was used to assess the propensity to create and (or) adopt new products, processes and business systems. Respondents rated themselves more innovative with respect to business systems innovation as compared to product and process innovations. The two-cluster solution in cluster analysis found that companies in the cluster with the greater proportion of certified companies had more positive views about innovativeness although no statistically significant relationship was found.

The ADKAR model for change management revealed that the ability to implement the change was a significant barrier for value-added wood products manufacturers in adoption of CoC certification. Suggestions made for policymaking and change management include strategies for the creation of awareness, desire and knowledge for CoC certification. Others include providing resources to enhance the ability of companies to adopt certification, and reinforcing the change through recognitions and rewards systems.
Preface

The author of this thesis, Haris Gilani, was responsible for the research design, data collection, data analyses, and thesis writing. I developed the research questions, designed the framework of the manuscript, reviewed all the literature on the subject and conducted the surveys and testing. I wrote most of the manuscript including the discussion and the conclusion. Dr. Innes drafted the research process and the items to rate in this survey questionnaire. Dr. Rob Kozak helped outline the methodology to conduct the survey to the value-added wood products manufacturers in British Columbia and refined the interpretations of the survey results. Dr. Ian de la Roch provided support in identifying the collaborators for this research and editing the manuscript.

Chapter 3, Chapter 4 and Chapter 5 were based on a survey conducted in British Columbia, Canada in 2013 which was approved by the Behavioural Research Ethics Board (BREB) of the University of British Columbia (UBC). The Certificate Number is H13-01598.

The thesis contains three chapters (Chapter 3, 4, and 5) that are being prepared for three publications.
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1 Introduction

Forests are British Columbia’s (BC) largest renewable natural resource, and forestry is one of BC’s major economic engines. Forests cover approximately 60 per cent of British Columbia’s landscape (Ministry of Forests, Mines and Lands, 2010). Many of British Columbia’s families and rural communities depend on forests as their primary source of income. Forests are also an important part of BC’s culture, tradition and history.

BC is the world’s leading exporter of forest products such as softwood lumber, newsprint, wood pulp, and secondary wood products which together account for $9.95 billion, and accounted for 30.3% of BC total export value in 2011 (Shu 2012). The direct economic contribution of BC’s forest industry, as measured by GDP, totaled $6 billion in 2012, representing 13% of the province’s goods-producing GDP. Within the forest industry, wood products manufacturing accounted for 49% of total forest GDP in 2012, followed by forestry & logging (27%), pulp & paper manufacturing (16%), and support activities for forestry (8%) (McDonough 2012). Forestry also provides roughly 53,000 direct jobs, and accounts for 11.9% of BC goods sector employment and 2.3% of B.C. all-industry employment (Shu 2012).

In the recent years, BC forest sector has been struggling to maintain competitiveness due to a number of economic, environmental and social factors. The high value of the Canadian dollar vis a vis the industry’s largest trading partner (United States), the collapse of the U.S. housing market since 2008 and continuing weakness in demand for lumber exports, significant reductions in demand for newsprint, altered markets and consumer preferences, changing demographics, and emerging low-cost Asian producers, notably China, have resulted in a significant number of plant and mill closures across BC, company bankruptcies, and the loss of 32,000 jobs – more than one-third of the industry workforce – since 2001 (McDonough 2012; BC Government 2009a; Innes 2009).

Due to the complexity of these challenges it has become increasingly difficult for BC primary forest products companies to compete in the global market. Kozak (2007) suggests that the over reliance of the BC forest industry on the production of commodity goods has led to a culture of “replication” as opposed to innovation”, which implies that the forest sector has been complacent
with respect to differentiation, specialization and new product development. Martin and Porter (1990) posit that Canadian firms may not be prosperous into the 21st century unless they embrace innovation, uniqueness and differentiation. Maintaining the long-term economic contribution from forests will require not only diversification but also a maximization of the value of each unit of fibre harvested (Stennes et al. 2008). Many timber producing jurisdictions including Scandinavia, Chile, New Zealand, and US Pacific Northwest are attempting to strengthen the development of value-added wood manufacturing in order to cope with job losses due to declining annual allowable cut levels, increasing global competition and decreasing prices of commodity lumber products (DeLong et al. 2007; Kozak et al. 2003). Statistical data support the view that a value-added wood products sector can add jobs with fewer timber inputs. The rate of employment creation from forests is represented in terms of the employment coefficient\(^1\) (jobs per 1,000 cubic meters of timber harvested) for a jurisdiction. The employment coefficient for BC has generally trended downward, dropping from around 1.3 jobs/1000 m\(^3\) in 1993 to less than 0.8/1000 m\(^3\) in 2011 (Shultz et al. 2013). In Finland and Denmark, the same amount of wood creates employment for 2 and 37 people, respectively (Mäkinen and Selby 2006). Despite being classified as a country dominated by large-scale primary wood producers, Finland has a relatively large number of small and medium woodworking enterprises. On the other hand, Denmark has only a small domestic forest industry, concentrating on secondary value-added manufacturing based on imported semi-finished wooden products (Selby and Petäjistö 2002). When compared to other Canadian provinces that have established value-added wood sectors and active value-added wood strategies, BC’s employment coefficients are noticeably lower. In Ontario, Quebec and Manitoba the employment coefficient in 2011 were 4.7, 3.3, and 4.7, respectively (Shultz et al. 2013).

For value-added products manufacturers, economic success is achieved not only through technological innovation to reduce production costs while expanding raw material options and product specifications but also through continuous adaptation to market requirements through innovative design and aggressive marketing. Achieving third-party certification has become an important tool for demonstrating sustainable forest management and creating socioeconomic benefits within the forest products industry (Vlosky et al. 2003). Many wood products companies

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\(^1\) These coefficients include both forestry/logging employment and wood product manufacturing employment.
are changing their corporate strategy by addressing environmental issues through initiatives like third-party environmental certification (Wagner and Hansen 2005).

In the context of British Columbia, however, the uptake of chain of custody (CoC) certification has been slow among the value-added wood products manufacturers (Jayasinghe et al. 2007). Previous research has identified a number of factors that have hindered further development of certified forest products markets, including higher costs of obtaining certification (Chen et al. 2010), limited supply of certified wood (Halalisan et al. 2013), and low levels of awareness of forest certification (UNECE 2009). It is important to note that barriers to adoption of CoC certification may be different depending on a jurisdiction. Previous value chain research on certification attitudes, awareness, and perceptions includes primary solid wood manufacturers (Espinoza et al. 2012; Montague 2011; Vidal et al. 2005; Vlosky and Ozanne 1998), retailers (Chen et al. 2011), home builders and architects (Ganguly et al. 2013; Vlosky and Ozanne 1997), and end-consumers (Elliot 2014; Kozak 2004; Vlosky et al. 1999). Only a few studies focused on value-added wood products sector (Vlosky et al. 2003; Jayasinghe et al. 2007), including one paper that provides a picture of the situation in Canada as of 2004 (Jayasinghe et al. 2007), but they are now nearly a decade old. This research endeavors to provide up-to-date information specific to the BC value-added wood products sector. By restricting this research work to one geographic region, major economic, social, and environmental differences are controlled that affect the factors that influence the adoption of certification.

1.1 Research objectives and research framework

The broad aim of this research is to study the value-added wood products sector in British Columbia in the contexts of CoC certification adoption, innovation, and change management. In order to achieve the broader objective of the research, the following specific objectives are developed:

1. To create a profile of BC value-added wood products manufacturers (size, scope, markets, products) and determine the current status of CoC certification adoption among value-added wood products manufacturers
2. To assess the attitudes of value-added wood products manufacturers toward CoC certification and towards the benefits and challenges of adopting CoC certification

3. To examine the current state of innovation in the BC value-added wood products sector and assess the current innovation focus of the sector

4. To study key characteristics of value-added wood products companies according to their degree of innovativeness

5. To develop a change management framework using the ADKAR (awareness, desire, knowledge, ability, reinforcement) model to assist government, industry, certification policymakers, and industry associations to facilitate adoption of chain of custody certification in the value-added wood products sector

6. To identify, explore and discuss the factors which organizations viewed as acting as barriers or facilitators to change

This interdisciplinary research draws upon forestry, business management, marketing and social sciences. Rogers (2003) Diffusion of Innovation theory is utilized to study attitudes of value-added wood products manufacturers towards CoC certification. Using the ADKAR model (Hiatt 2006) for change management and by looking at CoC certification through the lens of diffusion of innovation theory, barriers to CoC certification were identified and subsequently a change management framework was developed. Figure 1 below identifies the research problem, and a systematic way of discovery of a solution.
The following sections of this chapter continue with an overview of value-added wood products industry in British Columbia, followed by an introduction to forest certification with a focus on CoC certification and trends. Next, a review of the theoretical background to the research is provided where Rogers (2003) Diffusion of Innovation theory and ADKAR (Hiatt 2006) change management are discussed. The chapter concludes with a conceptual framework of the research.

1.2 Value-added wood products sector

There is no universally accepted definition of value-added wood products, but the term is usually applied to products made from lumber such as mouldings, siding, engineered wood and completed articles constructed primarily from wood. Engineered wood products include glued laminated timber (or glulam) and laminated veneer lumber. Articles made from wood can include doors, windows, prefabricated houses and furniture (BC Stats 2003). Kozak and Maness (2001) define value-added or secondary manufacturing as production activities that transform primary products (lumber and panels) into other wood products. Products such as engineered wood products (EWP), finished building products (FBP), mouldings and millwork, furniture, pallets, containers, and shakes and shingles come from value-added producers. The value-added products usually generate more economic value per unit, but their manufacturing is typically marked by low volumes of output.
In Canada, secondary manufacturing activities tend to be smaller, capital intensive and more urban-based as opposed to the primary lumber-producing sector (Kozak et al. 2004). Although, Ontario and Quebec have the greatest concentration of value-added firms in Canada, British Columbia and Alberta are also becoming important in the house-building and EWP sectors, respectively (DeLong et al. 2007). In contrast to the primary wood product sector, the BC value-added wood products manufacturing industry has not flourished to an extent that matches its enormous potential. Despite having numerous competitive advantages such as strategic geographic proximity to robust markets such as the USA, China and Japan, strong supply chain infrastructures, state-of-the-art technologies and thoughtful market intelligence (Shultz et al. 2013), previous studies have shown that value-addition in BC’s wood products industries is critically lacking (Kozak and Maness 2001; Kozak et al. 2003; DeLong et al. 2007).

Given the geographic location and potential availability of high-quality fibre, BC value-added products have significant export opportunities that are currently underutilized. For example, British Columbia supplies only one per cent of the $200 billion U.S. value-added market, compared to 30 per cent of the $35 billion commodity market. Together with other growing global markets, these present opportunities for growth in manufacturing operations that could add significantly more value to the underlying fibre than traditional commodity production (BC Govt, 2009b).

Delong et al. (2007) conducted a survey of the Canadian value-added producers and found that most respondents believed that their main competitors were local. However, the furniture and component segment believed China to be a significant competitor. Also, the larger firms tended to be more concerned about increasing competition simply because they have a wider market reach, where they are more sensitive to competition. Despite the increasing competition from low-cost Asian producers, Shultz et al. (2013) believe that with unique attributes such as high quality, smart design for urban spaces, mass customization, after-sales service and a strong track record in BC of environmental stewardship, BC value-added producers could differentiate themselves from low cost producers in China and Southeast Asia.

A survey of 41 small value-added firms in Metro Vancouver was done by McIlneey (2013) to address claims that the value-added wood industries contribute towards an economically and
environmentally sustainable forest economy in British Columbia. The interviewed firms produced a varied range of products for their primary sales destinations i.e. BC and the USA, complemented by secondary sales links to the rest of Canada, Japan, and Europe. The study also highlighted an important trend i.e. an increased dependency on BC markets between 2005 and 2010, where more than half of the interviewed firms had 75-100% sales within BC, a reflection of the US housing market crash. The relative importance of other markets remained almost the same from 2005 to 2010. Firms showed little or no interest in exporting to more uncertain markets such as India, China, or the Middle East.

Value-added wood products manufacturers play an important role in the supply chain of certified wood products market by being both buyers and sellers of wood products (Figure 2). Assessing their attitudes towards CoC certification can therefore provide critical information for further development of the markets for certified wood products.

![Simple supply chain diagram for forest products](image)

Figure 2: Simplified supply chain diagram for forest products
Source: Jayasinghe 2005

Following are a number of reasons to study the value chain segment of value-added wood products manufacturers:

1) The absence of up-to-date and valid research on BC value-added wood products in the context of CoC certification. The last survey of value-added manufacturers was done in 2004 to assess their attitude towards CoC certification (Jayasinghe et al. 2007), however its findings are no longer valid as CoC certification is a rapidly evolving field and research that may have been valid five years ago may not be relevant (Chen et al. 2010).

2) Previous research in the context of CoC certification and value-added manufacturers attributed lack of awareness as one of the main reasons why companies were not adopting
CoC certification (Vlosky et al. 2003; Jayasinghe et al. 2007). Further research (Kozak 2004 et al.) shows that there is a great potential to develop markets for certified value-added products in Canada, especially if further efforts are made to improve consumer awareness of CoC certification. This research attempts to accomplish this through a change management model.

3) There have been significant structural changes in the value-added forest products industry over the past five years mainly due to the increase in the value of the Canadian currency relative to its largest export market combined with the housing market collapse in the US and increased competition from low cost Asian producers. Thus the timing of this survey is critical to gain insight about these perceived changes in the value-added wood products sector of British Columbia.

1.3 Forest certification

Forest certification is a mechanism that has its primary objective of the improvement of forest management through marketing incentives (Upton and Bass 1996). The emergence and interest in non-state market-driven forest certification programs can be traced to the economic and political trends in the early 1990s in which market-oriented policy instruments have been given increasing salience domestically and internationally (Cashore 2003). The purpose of introducing forest certification was to address concerns about deforestation and forest degradation and to promote the maintenance of biological diversity, particularly in the tropics. Initially pushed by environmental groups, it quickly evolved as a potential instrument to promote sustainable forest management (SFM) (Rametsteiner and Simula 2003).

Many governments have made legislative provisions for voluntary certification. This has established a clear link between national regulations and international criteria for SFM, which is highly desirable because it avoids the imposition of parallel criteria on Forest Management Units (FMUs) and the risk of creating confusion among forest owners and managers (ITTO 2008).

There are many international and national forest certification schemes, among which the Program for the Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC) are the most widely implemented (Aguilar and Vlosky 2007). The process of forest certification results in a written certification being issued by an independent third-party, attesting
to the location and management status of a forest that is producing timber (Baharuddin and Simula 1994). There are normally two components of forest certification (Elliot 2000).

1) Forest management certification involves inspection of forest management on the ground against specific standards, and a review of relevant documents such as management plans, and inventories. Certification of forest management can be carried out at different levels ranging from the forest management unit, to the region or country.

2) Chain of Custody (CoC) certification involves tracing round wood and processed timber products through the CoC (or supply chain) which runs from the forest floor through processing and distribution to the final purchaser. This involves tracking the certified material through log transport and processing, shipping and further processing.

Forest management certification applies to forest owners and forest managers to promote and encourage sustainable forest management (SFM) whereas chain of custody certification applies to companies further down the supply and demand chain, on those value-added industries wishing to purchase and sell certified products (Cashore 2003). It is important to note that in some literature related to certified forest products, the terminologies of CoC certification and forest certification have been used interchangeably (e.g. see Jayasinghe et al. 2007; Chen et al. 2011b).

1.3.1 Chain of custody certification

According to Dykstra et al. (2002), the ownership and control aspect of the wood supply chain is referred to as the “chain of custody”—the custodial sequence that occurs as ownership or control of the wood supply is transferred from one custodian to another along the supply chain. A “chain of custody system” comprises a set of technologies, procedures, and documents that are used to provide information useful for managing the wood supply chain. CoC certification is being employed by wood products manufacturers and other businesses in the value chain in pursuit of benefits such as access to new markets and gaining acceptance from environmentally sensitive customers (Owari et al. 2006; Hubbard and Bowe 2005). Examples of companies who may adopt CoC certification include primary manufacturers, secondary manufacturers, brokers, distributors, paper merchants, printers, and retailers/wholesalers. Once a company has a CoC system in place, they may label their products as “certified” provided the input materials used in those products
originate from a certified forest. These labels provide a guarantee to the customers that the product they purchase comes from a certified source.

A well-designed CoC system provides the manager of a wood supply chain with information about the origin of wood, the location of wood at any point in time, where it is intended to go and when it is scheduled to arrive there. A CoC system also provides information about species, volumes and quality grades. An effective CoC system for logs and value-added products must have the following elements 1) physical evidence (such as documents, tags, and labels) that the goods originate from a particular source and 2) an auditable data recording and communicating system that runs in parallel with, and links to, the physical evidence identifying each product (Viana 1996).

A simplified version of the wood supply chain is given below in Figure 3, starting from the forest being converted into logs during primary processing, through the secondary processing, to the final end consumer.

![Figure 3: Schematic representation of a wood supply chain](source: Dykstra et al. 2002)

It is evident from this figure that CoC for this (or any other type) production has two aspects. The first is CoC **within** each processing stage (i.e., the forest, the mill, and each subsequent processing stage such as a furniture factory or paper plant). These processing stages are represented in Figure 3 by the boxes on the left. The second aspect is CoC **between** processing...
stages as products are moved from one stage to the next. Here, “products” may include logs, sawn timber, pulp, board products, or manufactured products (Dykstra et al. 2002).

There is a significant body of literature that evaluated the costs and benefits of CoC certification. One of the commonly cited benefits is that certification could help with public relations by enhancing the public image of the company (Trishkin et al. 2014; Chen et al. 2010; Hansen and Bratkovich 2000). Another benefit of CoC certification, through the improvement of brand image, is the improvement of marketing and sales of the company’s products (Chen et al. 2010). For instance, B&Q – one of the largest retailers in the UK has committed to selling FSC and PEFC certified wood products (B&Q 2014).

Certification also may help companies access new markets and protect current market share (Haener and Luckert 1998; Owari et al. 2006; Montague 2011). Many European companies prefer only certified products (Cashore et al. 2005) and buy only from companies who are certified.

One of the major barriers in adoption of certification is the cost of achieving and maintaining certification (Montague 2011). The cost also may vary depending on the region or country in which the assessment occurs. In regions where the COC process is more developed, direct costs may be lower than that of a region where COC is fairly new. Companies located in regions with significant legal or political conflicts also may experience higher COC costs (Howe et al. 2005). The length of the certification process may also discourage domestic buyers from buying timber from tropical and developing countries. The presence of several different certification schemes also increases the cost of certification since companies may have to pursue more than one certification (Oliver 2004). In response to the high costs of certification, the Forest Stewardship Council developed Group CoC certification guidelines to enable smaller firms to certify their forests and forest products collectively (Oliver 2004). Similarly, the Program for the Endorsement of Forest Certification (PEFC) has also developed Group CoC certification, which is a cost-effective way for small firms to become certified. Under the new PEFC CoC scheme, certified wood can be procured from different countries using different national certification schemes with only one CoC system. The certified material then bears the logo of PEFC (PEFC 2004). For instance, in the UK forest management standard is based around the UK Woodland
Assurance Standard (UKWAS). The UKWAS does not provide a product label or chain of custody certification by itself but it has been designed to fit into other labelling systems such as the FSC and PEFC (UKWAS 2014).

1.3.2 Chain of custody trends

Over the past decade CoC certification has seen tremendous growth on a global scale (UNECE/FAO 2012). This indicates that despite the recession there has been steady growth in CoC certification and it remains a powerful marketing tool for companies to differentiate their products and improve their competitiveness in the market. The main factor driving growth in CoC certification is the commitment of large publishers and other customers of the paper and packaging sectors. Public-sector procurement policies, green building initiatives and legislation in the United States and European Union to prevent illegal logging are becoming more significant drivers of demand for certified forest products (UNECE/FAO 2012; Chen et al. 2010). Nevertheless, the numbers of CoC certificates and the volumes that they account for are still insignificant in relation to the volumes of wood products traded globally.

As of June, 2014, PEFC has 10,074 CoC certificates globally with 84% of its certificates issued to European companies (Figure 4). France is the world leader in PEFC CoC certification with 2,069 certificates, followed by Germany (1,536), and UK (1,159). North America has only 425 PEFC CoC certificates (PEFC 2014).
SFI tends to be a predominantly used in North America and has issued 2,800 CoC certificates (SFI 2014). FSC has issued 28,313 CoC certificates globally, with 3,080 CoC certificates in North America (FSC 2014).

As of December 2013, Canada had 964 FSC CoC certificates, 186 PEFC CoC certificates, and 133 SFI CoC certificates (Figure 5) (Certification Canada 2014). It is important to note that certification is extremely fast-moving, and even studies undertaken in the 2012 may be out of date for some aspects of certification. For instance, PEFC is rapidly catching up with FSC in Asia, and the decline into insignificance of CSA.
1.3.3 Consumer awareness of certified products

Market pull is considered to be an extremely important factor in adoption of CoC certification by the secondary manufacturers. Several studies have been conducted to assess consumer awareness regarding CoC certification and certified products. However most of these studies are outdated because CoC certification has evolved rapidly in the past decade. The only recent study in North America was done in 2014 in North Carolina in which 100 individuals were surveyed to determine their preferences for printer paper, how much a typical household consumer knows about forest certification, and whether or not they would prefer certified forest products over non-certified products (Elliot 2014). The results indicated that 48% of respondents had not heard of forest certification and only 3% knew a lot about it. Respondent were then given a hypothetical purchasing scenario to determine their choice between certified and non-certified papers, 73% of the respondents preferred the certified paper over non-certified and, on average, respondents were willing to pay $2.67 more for a ream of certified paper.

Kozak et al. (2004) assessed western Canadian customers’ attitudes towards certified value-added products in a qualitative study and the results indicated that most participants had little knowledge about the environmental labeling/certification of wood products, value-added or otherwise. Furthermore, all of the participants indicated they would be willing to purchase
certified value-added wood products in the future. Participants were willing to pay a small premium for certified value-added wood products, assuming equivalent quality and design.

Ozanne et al. (2000) attempted to determine the relative importance to consumers of environmental certification as compared to other wood product attributes. Conjoint analysis data were collected from New Zealand consumers for product bundles with price, environmental certification, warranty, type of forest, and country of origin attributes. For wooden outdoor furniture in New Zealand, conjoint results indicate that environmental certification is just one of a number of important attributes, which also include origin of the wood, with New Zealand being preferred over imported, and forest type, with plantation-grown wood preferred over wood sourced from natural forests. Price and warranty were less important attributes.

1.4 A survey of relevant market research

Results from previous survey-based research highlight some of the emerging questions and expectations surrounding the future of CoC certification. Within the forest products marketing arena several studies have examined CoC certification and certified wood products. Considerable research has been conducted across the world involving value-added manufacturers and CoC certification. Below some key surveys done in North America and elsewhere are highlighted.

Montague (2011) studied primary hardwood manufacturers in the Appalachian region to determine their attitudes towards CoC certification. The study found that the majority of the producers surveyed were small, non-certified manufacturers. Although certification levels were low and many of the producers held negative attitudes towards certification, many of the producers felt that they were environmentally conscious. Those companies who pursued certification did so primarily for their customers and to gain some type of market advantage.

Espinoza et al. (2013) surveyed U.S. hardwood lumber manufacturers, with the objective of learning about the industry’s awareness and perceptions about forest certification and green building systems. Responses show that industry participants were more familiar with forest certification systems than with green building standards. Among forest certification systems, the Sustainable Forest Initiative (SFI) was the most recognized, followed by the Forest Stewardship Council (FSC). Almost 30 percent of respondents reported holding some type of chain of
custody (COC) certification and 26 percent stated that obtaining certification was in their plans. Only 25 percent of certified respondents reported having benefited financially from it.

Vidal et al. (2003) conducted a survey of the solid wood sector in North America to determine the current status and level of knowledge about forest certification. The survey was conducted through mail questionnaires and the results indicated that at the time of the survey, 39% of the primary wood products companies in North America were certified, 12% were planning on implementing CoC strategies within the next 5 years, and 49% had no intention of becoming certified in the near future. The researcher concluded that acquisition of benefits from CoC certification may be a key factor in increasing adoption levels in future as on average, certified companies did not perceive that they were receiving benefits from CoC certification.

Owari et al. (2006) examined the strategic importance and marketing functions of CoC certification in the Finnish wood products industry, as well as the benefits of certification to suppliers. In this nationwide survey, personal interviews were conducted with 50 Finnish companies that supply primary and value-added wood products. The results showed that in Finland, 79% of primary wood producers were certified but only 16% of value-added wood producers were certified. Certified companies were more export-oriented, with the main country of export being either the United Kingdom or Germany. These two countries are considered to be the leading markets for certified forest products in Europe. The results of this particular survey were also in agreement with Vidal (2003) in that larger companies were more likely to become CoC certified than smaller companies.

In another study, Jayasinghe et al. (2007) surveyed value-added manufacturers in Canada in 2004 and found that majority (68.8%) of firms in the value-added sector were not interested in CoC certification and only 17.6% were involved with CoC certification at the time of the survey. Almost 25% of the respondents who were not certified indicated that the reason for not being interested in CoC certification was that their customers were not demanding certified products. Lack of information on certification and lack of awareness of certification were stated as second and third reasons, with values of 15.7% and 14.2%, respectively. The cost of certification was cited as a reason by 14.9% of the respondents.
Vlosky et al. (2003) conducted a survey of a selection of value-added wood products manufacturers to determine their attitude with regard to current and potential participation in forest certification. Results indicated that respondents did not have a very clear understanding of certification or of chain-of-custody requirements. Nearly half of the respondents were unwilling to pay a premium for certified raw materials with an additional 20% of respondents stating that they would be willing to pay a premium of 3% or less.

Outside North America, China is attracting attention for its increased use of certified wood in wood products manufacturing. Yuan (2007) conducted a survey of FSC (CoC) certified companies in China to investigate the basic issues related to CoC certification and their influence on the international trade of forest products in China. The results showed that the two biggest export markets for certified wood products were Europe and the United States, accounting for 54.6% and 29.8% of exports, respectively. The results also showed that certified companies obtained an average 6.3% price premium for certified wood products in European markets, a 5.1% price premium in the United States and a 1.5% price premium in Canada. The survey revealed common problems that certified companies face in China, including a lack of certified raw materials, increased costs associated with certification and an absence of domestic accredited certification bodies.

In a similar survey in China, Chen et al. (2011) explored the knowledge and views of managers at selected Chinese wood products firms regarding CoC certification in China. The study was conducted through personal interviews with twenty companies to gain insights into the views and attitudes of Chinese wood products manufacturers towards CoC certification. The authors identified low levels of awareness and acceptance of CoC certification among wood products manufacturers in China. Out of 20 interviewees, more than half of the respondents had heard of CoC certification but only one had actually obtained certification. The study also showed that a majority of the participants were unaware of the potential benefits associated with certification. The barriers that hinder the adoption of CoC certification in China include a lack of customer demand for certified wood products and low levels of awareness.

The situation regarding adoption of CoC certification in Malaysia is not very different to China or elsewhere. Ratnasingam (2008) conducted an assessment of Malaysian wooden furniture
manufacturers’ readiness to embrace CoC certification. The study was conducted through direct interviews, with 215 manufacturers participating in the survey using open-ended questionnaires. Only 7% of the respondent firms were CoC certified. A majority (85%) of those that were not certified had no intention of becoming certified within the next five years. Non-certified firms identified the lack of tangible benefits as the most important reason why they were not becoming certified. A majority of the companies surveyed received few, if any, customer requests for certified wood products throughout the year.

Owari (2007) conducted a nationwide survey in Japan of 132 companies that had obtained a CoC certificate to examine the benefits of CoC certification within the forest products market. The results showed that most companies did not receive a price premium, with only 11% reporting a price premium on their certified products in 2004. The result is similar to other studies of certified companies in Europe and North America, where little or no premium has been associated with certified products (Owari et al. 2006; Chen et al. 2010), however, the results are in variance with Yuan (2007) that reported some price premiums commanded by certified companies in China.

1.5 Theoretical foundation

The theoretical foundation of this research is based on Rogers (2003) theory of Diffusion of Innovations. CoC certification is a relatively new concept in forestry and requires several new activities to be performed in order to facilitate widespread adoption of CoC certification. Auld et al. 2008, described forest certification as a significant and innovative venue for standard setting and governance in the environmental realm. Therefore it is reasonable to conceptualize the adoption of CoC certification as an innovation under the theory of diffusion.

To establish an appropriate theoretical foundation for this study, a review of literature was performed on the diffusion of innovations, rate of adoption of innovations, perceived attributes of innovation, and change management. This has helped to develop a conceptual model for the study.
1.5.1 Concepts of innovation and diffusion of innovations theory

The social process by which new ideas and patterns of behaviour spread and are accepted or rejected has been the subject of research by many academic disciplines. Understanding the process of new product adoption and diffusion is extremely important for the effective marketing of new products. Traditionally researchers have conceptualized the adoption decision process by examining distinctive characteristics of adopters and non-adopters and opinion leaders, perceptions of the attributes of the innovations, rates of adoption and diffusion, and the channels of communication during the various stages of the adoption decision process (Marra et al. 2003).

Rogers (2003) describes diffusion as a process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. There are four main elements of diffusion 1) the innovation, 2) the communication of the innovation from one individual to another, 3) the social system or social structure in which communication takes place and 4) the period of time over which communication takes place.

The innovation can take various forms. It may be an improvement in the product itself, a new concept or belief, or the creation of a unique and, to a significant degree, unprecedented, mental construct or idea. Shumpeter (1934) characterized innovation as “…technological change in the production of commodities already in use, the opening ups of new markets or of new sources of supply, tailoring of work, improved handling of material, setting up of new businesses such as departmental stores”. Rogers (2003) defined innovation as an idea perceived as new by the individual and diffusion as a process by which an innovation spreads. Drucker (1985) defines innovation as a specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. This tool generally involves a process that begins with an idea, goes through a research and development phase and is then finally adopted (Innes 2009). Drucker (1985) argues that new services, products and ways of doing things are all innovation, but only if they meet an existing demand (which may be latent). If there is no demand for an item, then it cannot be considered to be an innovation.

The forest products industry, particularly in Canada, has a lower rate of innovation than the manufacturing sector as a whole (Schaan and Anderson 2002). There are many reasons for this
including, risk aversion, cost, a policy environment that fails to encourage innovation, and a deficit in the training necessary to encourage the forestry community to engage in innovation. Many of the problems can be traced back to the demand, reinforcing Drucker’s (2005) point that innovation must be led by a need from those who will utilize an innovation. According to Wagner and Hansen (2005) larger companies are more likely to adopt a process innovation, but smaller companies may neutralize this competitive advantage by being more adoptive of product innovation and business system innovation.

1.5.2 The innovation decision process

Diffusion of Innovations theory (Rogers 2003) states that diffusion is a process that occurs over time and can be seen as having five distinct stages:

1. Knowledge (gathering knowledge about the innovation);
2. Persuasion (evaluating the innovation and forming attitudes towards the innovation);
3. Decision (deciding to adopt or reject);
4. Implementation (adopting or rejecting); and
5. Confirmation (continuing to adopt/reject or not)

According to this theory, potential adopters of an innovation must learn about the innovation, be persuaded on the merits of the innovation, decide to adopt, implement the innovation, and confirm (reaffirm or reject) the decision to adopt the innovation. Rogers (2003) separates the participants in the innovation adoption process into five adopter classes: innovators, early adopters, early majority, late majority, and laggards. These classes reflect how quickly or slowly a person or business owner would adopt and implement an innovation, with innovators being the quickest and laggards being the slowest.

1.5.3 Rate of adoption

The “relative speed with which an innovation is adopted by members of a social system” is known as the rate of adoption (Rogers 2003). Some innovations diffuse from first introduction to widespread use in a relatively short time, whereas others may require an extensive time period to be adopted at a wide scale. Furthermore, Rogers (2003) emphasizes that it is the potential adopter’s cognizance (perception) of these characteristics that affect the rate of adoption.
The rate of adoption is usually measured by the length of time required for a certain percentage of the members of a social system to adopt an innovation (Rogers 2003).

Rogers (2003) claimed that the relative speed with which an innovation is adopted goes through a slow, gradual growth period before experiencing a period of dramatic and rapid growth. According to the pattern (Figure 6), only a few individuals/social systems adopt the innovation initially. As time goes by and awareness and knowledge of the innovation increase, a relatively larger number of people adopt the innovation. At the final stage, the trajectory of the diffusion curve slows down and levels off at the upper asymptote, where the diffusion ends, making an S shaped graph. Rogers (2003) diffusion of innovation theory has been widely used in the organizational context (e.g. Völlink et al. 2002; Zhu et al. 2003; Osayawe and McAndrew 2005).

1.5.4 Attributes of innovation

The attributes of an innovation affect the rate at which it is diffused and becomes widely used. Rogers (2003) concluded that certain consumers perceive characteristics of a product or innovation that affect the rate at which it diffuses and becomes widely used. He suggests several important attributes, namely relative advantage, compatibility, complexity, divisibility and communicability. Innovations, which individuals see as having higher relative advantage, compatibility, trialability and observability, and less complexity, have a higher rate of adoption (Rogers 2003). These attributes are explained further below.
1.5.4.1 Relative advantage

Relative advantage is the degree to which an innovation is perceived as better than the product or idea used before. The speed of diffusion of an innovation depend upon the ease with which the adopters become aware of its particular merits (Rogers 2003). The relative advantage of an innovation is a matter of perception and it is the value of an innovation as perceived by the potential adopters that counts. The innovation will be widely adopted if it is considered superior to existing products or ideas in saving time, labour, money, space, or if it possesses any other advantage. In the context of this study this theory may help to determine advantages in terms of improved efficiency due to the CoC certification process, price premiums, market access and public perceptions about certified wood.

1.5.4.2 Compatibility

Compatibility is the degree to which an innovation is consistent with existing values and the past experience of adopters. An innovation that is not compatible with the cultural beliefs and values of a group will not be adopted so rapidly as one that is (Rogers 2003). Katz and Shimp (1983) developed an oligopoly model in which consumers value a product more highly when it is compatible with other consumer products (i.e. products used by the consumers). They called it network externalities. In this framework they analyzed the social and private incentives for firms to produce compatible products or to switch from incompatible to compatible products. They find, for example, that a dominant firm may choose to remain incompatible with a rival because it will suffer a substantial decline in market share if it becomes compatible, since that would increase the value to consumers of its rivals products. In this study this will help to determine the compatibility of CoC certification schemes with other policy mechanisms such as LEED certification, FLEGT, and the Lacey Act.

1.5.4.3 Complexity

Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers 2003). Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. In this research, perceptions of respondents will be gathered on perceived complexity of CoC certification such as additional resources, technical knowledge, and staff training.
1.5.4.4 Trialability

Trialability is the degree to which an innovation may be experimented with to determine its suitability for adoption. Innovations that can be economically tested before large scale deployment have usually a higher rate of adoption than those that cannot be tried. Rogers (2003) argues that new ideas or techniques that can be tried on a limited basis reduce uncertainty for potential adopters, and this experience may be particularly important for early adopters who do not have the benefit of other organizations’ experience to draw upon. In this study, this attribute will be used to determine whether CoC certification provides opportunities for adopters to implement the certification program on a limited time basis and to test its market performance. For example, companies may be able to get certified on one-off basis and then check the market performance. Project certification designed by FSC aims at achieving certification for new building or renovation projects, or production of a specific product on a one-off basis. An example of project certification is the London 2012 Olympic Park (FSC-UK 2014).

1.5.4.5 Observability

Observability is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it (Rogers 2003). Innovations that are harder to see tend to diffuse more slowly, although there may well be other factors involved. For example, vendors spend large amounts of money to make their products visible at trade shows and professional meetings. Product demonstrations at such meetings enable prospective purchasers to see these devices.

Rogers (2003) emphasizes that these five factors are the most important attributes that explain the rate of adoption of innovations however relative advantage and compatibility are the two most important constructs that explain an innovation’s rate of adoption. These five attributes will be utilized in this study to develop questions that seek to determine the barriers and needs of the value-added manufacturers regarding adoption of CoC certification.

1.5.5 Change management and innovation

Innovation and change management support each other. Change management can be seen as a way of increasing productivity and incorporating innovative ideas into the organizations (Hornstein 2008). The ADKAR model for change management allows organizations to focus
their activities on specific business results. This model was initially used as a tool for
determining if change management activities are having the desired results during organizational
change (Hiatt, 2006). The outcomes defined by the ADKAR model are sequential and
cumulative, which means that an individual must obtain each element in sequence in order for a
change to be implemented and sustained. Figure 7 below shows the five key building blocks of
the ADKAR model, which are awareness of the need to change, desire to participate and support
the change, knowledge of how to change, ability to implement the change on a day-to-day basis,
and reinforcement to keep the change in place. The ADKAR model breaks down change into its
component parts in order to be able to understand where the change is failing and to address that
impact point. Key findings in this research will be integrated with the factors that influence the
behaviour of the people working in value-added companies with respect to the ADKAR model to
develop final adoption framework for the value-added manufacturers.

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<th>THE ADKAR MODEL</th>
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Figure 7: Change management model
Source: Hiatt, 2006

Awareness of the need to change is the first step to enable a change. Awareness is achieved when
a person is aware of and understands the nature of the change, why it is needed and the risks of
not changing (Hiatt, 2006). Awareness knowledge may encourage an individual to seek further
information about the innovation i.e. ‘how to’ knowledge. Change agents normally desire to
speed up the process of innovation adoption. To achieve this, they strive to convey information
about the new ideas in a more accurate and quicker way and to shorten the innovation-decision
process time after people have become aware of a new idea (Rogers 2003). In the context of CoC
certification, lack of awareness has been cited as one of the biggest barriers in adoption (UNECE
This study sought to determine appropriate ways to disseminate the message of the value of CoC certification.

Desire represents the motivation and ultimate choice to support and participate in a change. Unlike awareness-building, where one can take definitive steps to generate awareness of the need for change, creating desire to change remains elusive and, by definition, not under our direct control. For example, some value-added producers may be aware of certification. However this does not mean that they are going to pursue certification, but they could be made aware of the potential benefits so that they could make the best business decision. Understanding the underlying factors that may influence an individual’s desire to adopt certification would be an important step in achieving this element of the ADKAR model.

Knowledge is the third building block in the ADKAR model. Once awareness and desire are achieved, knowledge is the next step to enable change. Knowledge refers to the learning process, which includes learning about the change and information about how to change (Hiatt, 2006). The factors that influence the possibility of attaining knowledge in the ADKAR model include the current knowledge base of the potential adopter, the potential of the individual to gain additional knowledge, the resources available for education or training, and access to, or existence of needed knowledge. In the context of this study, having adequate knowledge base is an indication that adopters may be able to manage the CoC certification adoption process successfully.

Ability to implement the change on a day-to-day basis is the fourth building block in the ADKAR model. It is the demonstrated capability of potential adopters to institute change and attain satisfactory results (Hiatt, 2006). To successfully implement a change, the factors that influence the ability of potential adopters to adopt have to be known. These are psychological blocks to change, physical abilities, intellectual ability, the availability of time for developing the necessary skills and the availability of resources to support the development of new abilities. An example of a psychological block is the current perception by many organizations that certification standards are too technical and difficult to understand.

Reinforcement to keep the change in place involves any action or event that helps to consolidate and reinforce the change that has been implemented (Hiatt, 2006). There are many factors that
are critical in reinforcing a change. Some of these factors include the extent to which the reinforcement makes sense to adopters, the association of the reinforcement with actual demonstrated progress or accomplishment, the absence of negative consequences and the accountability system in place to reinforce the change. These elements of the ADKAR models will be used to discuss the results of the survey and develop a change management model for the adoption of certification.

1.6 The conceptual framework and thesis structure

The perceived attributes of innovation, the concept of change management and an extensive review of the literature has helped develop appropriate variables for this study. Based on the objectives and the theoretical foundation, the overall conceptual framework of this study is illustrated in the Figure 8 below:

![Figure 8: Conceptual framework](image)

The left side of Figure 8 shows the attributes of innovation that explain different barriers to an innovation and the potential benefits it can offer. Another variable innovativeness was introduced since innovativeness is generally characterized as a function of adoption (Rogers
2003), creation (Gebert et al. 2003) or a combination of the two. In other words, an innovative individual or firm tends to be an early adopter of new concepts, products and technologies, and tends to develop or create new ideas, concepts and products, or some mix of the two (Hansen et al. 2014). The change management approach proposed by (Hiatt, 2006) will be used to identify strategies and to develop a management framework for adopting companies.

The remainder of this dissertation is organized into five chapters. Chapter 2 contains an overall methodology of the survey including population, sample frame, survey design and data collection methods, data analysis techniques, and testing for non-response bias. Chapter 3 examines the demographics of the BC value-added wood products industry and discusses the CoC certification status and opinions of survey respondents in terms of certification preferences and their experience and or expectations regarding CoC certification. Chapter 4 explores the attitudes of value-added wood products manufacturers towards CoC certification using five attributes of innovation and examines the overall status of innovation within the value-added wood products sector. Chapter 5 uses the results from the survey in conjunction with Hiatt’s model of change to develop change management and policy models for the successful implementation of CoC adoption initiative. The study ends with the conclusions presented in Chapter 6.
2 Methodology

To research certification adoption, innovativeness and change management in the value-added wood products sector in British Columbia, a structured questionnaire was administered to a sample of value-added wood products manufacturers in BC. The questions sought to determine the characteristics of these manufacturers and to identify barriers and needs perceived by the manufacturers that might impact the adoption of certification in this sector. The Tailored Design Method (Dillman 2000) was used to design and administer the survey. The survey (Appendix A) was divided into four sections. Section I contained general questions about the company that addressed some key variables such as location, type of products, number of employees, annual sales revenue, association membership, and sales destination that respondents were asked to scale in order to determine the characteristics of the industry. Respondents were also asked to provide information about their current status and attitude towards chain of custody (CoC) certification. Section II contained questions about the adoption levels and perceptions of companies that were interested in obtaining CoC certification. Section III contained questions geared towards existing CoC certified companies in order to assess their attitude towards certification. Finally, section IV, which was applicable to both certified and interested companies, measured innovativeness and change management attributes.

Before the survey was emailed, representatives from BC Wood and FPInnovations were used to pre-test the survey. This process allowed the survey to be tested under close to actual conditions, helping to ensure that the survey was clear, concise, and met the objectives of the study. This was also an opportunity to address any additional survey questions and concerns and to determine if any important questions or topics had been omitted from the survey. Data collection commenced after the questionnaires were finalized.

2.1 Population, sample frame and sample

There are approximately 700-800 value-added wood producers in British Columbia (McIlhney et al. 2013). Based on the classification of the BC Wood Specialty Group (an industry association for value-added wood products manufacturers in BC), companies were divided into seven subgroups in the questionnaire according to their manufactured products i.e. cabinets, engineered wood products, furniture, log homes and timber frames, millwork, prefabricated housing, and
remanufactured wood products. The population of interest was all value-added wood products manufacturing companies in the province of British Columbia. Lists of companies were obtained from the directory of secondary manufacturing in BC, Log World directory and membership lists of BC Wood, AWMAC BC, FSC and PEFC. Email addresses of companies were obtained either from companies’ websites or by telephoning them. During the telephone conversation with companies’ representatives, it was ensured that the targeted audience for this survey were management representatives of the companies. The final list included 373 value-added producers in British Columbia with valid email addresses, who were contacted via email and invited to participate in an online survey. No sample was drawn from the study population and in order to have more accurate and comprehensive results for the study, the participants included all manufacturers falling within the scope mentioned above.

2.2 Data collection

Ethical issues, including confidentiality, benefits, and potential harms of the study were reviewed and approved by UBC’s Behavioral Research Ethics Board (BREB), who concluded that this research project presented minimal risks to the participants. All communications, including the invitation email, consent form, and questionnaire, were screened and approved by UBC’s Behavioral Research Ethics Boards (BREB). Survey participation was subject to the acceptance of an online consent form, underscoring the voluntary and confidential nature of participant’s involvement.

On October 2013, an initial email (Appendix B) containing a survey link was sent to the 373 identified value-added wood producers in British Columbia. The email explained the objectives of the survey, the importance of participation by companies, and overall value to the sector. It also explained that participation in the survey was voluntary, that it posed no foreseeable risk, and that participants could withdraw at any time or refuse to answer any questions. In addition, the cover letter guaranteed anonymity and confidentiality. Non-respondents were sent follow-ups three times after every two weeks. This was done as multiple contacts are more effective than using other techniques to increase the response rate for the surveys (Dillman 2000). Of the 373 companies, 123 companies completed the survey, representing a 33% response rate to the survey. For industrial surveys, an overall response rate of 15% is considered acceptable (Kanuk and Berenson 1975).
2.3 Data handling and analysis

Completed responses were reviewed and then saved on a password-protected computer. Most questions were pre-coded before the survey was administered. However, questions that were not coded before data collection were post-coded after the survey administration. Data were analyzed using SPSS version 22.0, 2014. In addition to responses being analyzed in aggregate, data were also disaggregated to perform analyses pertaining to three groups based on the certification status of the organizations. The scale and categorical data are largely presented as frequency distributions. Contingency tables were created to analyze the relationships between certification adoption and factors such as geographic location, annual sales revenue, types of products manufactured, and number of full-time employees.

Using Rogers’ (2003) Diffusion of Innovations (DOI) theory, perceived attributes of an innovation, including relative advantage, compatibility, complexity, trialability, and observability were measured in order to determine factors that inhibit or facilitate CoC certification adoption. A five-point Likert-type scale ranging from 1= strongly disagree to 5= strongly agree was applied to assess these perceived attributes that were treated as interval in nature. The following constructs and corresponding items were used to measure these attributes:

a) Relative advantage – the degree to which an innovation is perceived to be better than the idea it supersedes (Rogers 2003). The higher the perceived relative advantage, the more likely the innovation will be adopted.
   - Using certification enhances effectiveness of the production process
   - Certification leads to increased price premiums
   - Certification helps access new markets
   - Certification improves the corporate image of our company
   - Certification provides my company with improved communication with customers

b) Compatibility – the degree to which an innovation is perceived to be consistent with existing values, past experiences and needs of potential adopters (Rogers 2003). If the innovation is perceived as an extreme change, then it will not be compatible with past experiences and is less likely to be adopted.
   - The idea of CoC certification is compatible with my company’s value proposition
- The requirements of certification standards fit well with our existing processes and procedures
- Certification helps in meeting requirements of other policy instruments such as LEED, Lacey Act and FLEGT.
- Certification requires significant changes in our current procedures

c) **Complexity** – the degree to which an innovation is perceived to be relatively difficult to understand and use (Rogers 2003). Innovations that are perceived to be complex are less likely to be adopted.
  - The certification standards are easy to understand
  - The contents of the standards are clear
  - The choice of standards is easy to make
  - The requirements of the standards are relevant to the industry
  - Significant resources are needed to train the staff on the requirements of the certification standards

d) **Trialability** – the degree to which an innovation may be experimented with on a limited basis (Rogers 2003). This may include trying out parts of a program or having an opportunity to watch others using a new program. Trialability is positively associated with the likelihood of adoption.
  - CoC certification can be adapted or modified to suit the production process within my organization
  - The certification can be adopted on a limited basis to test the market performance

e) **Observability** – the degree to which the results of an innovation are visible to others (Rogers 2003). If the observed effects are perceived to be small or non-existent, then the likelihood of adoption is reduced.
  - The benefits of using the certification within my company are obvious/visible and measurable
  - The evidence regarding the impact of using the certification are available
Means and standard error of the means (SE) were computed in order to position the relative importance of each item listed above. Ninety-five percent confidence intervals were also computed for the means of each statement. Mean values of each statement were also tested against a mean value of 3 (at alpha = 0.05), which represents a neutral attitude for each variable. This significance test was used to verify whether means were significantly different from a neutral attitude level.

Firm innovativeness was measured using an indirect self-evaluation scale to assess the propensity of value-added manufacturers to create and (or) adopt new product, process and business systems (Knowles et al. 2008). This scale was composed of 9 items and was assessed using five-point Likert scale, with 1 being “strongly disagree” and 5 being “strongly agree”. The 9 items were equally divided to measure the propensity to create and (or) adopt new products, new manufacturing process, new business systems.

The following constructs and corresponding items were used to measure innovativeness:

\( a \) \textit{Product innovation}
- Our company is always seeking ways to develop new products
- Our company takes leading role in research and development for new products
- Our company has a diversified product line

\( b \) \textit{Process Innovation}
- Our company is always ready to install new processing equipment
- Our company is very efficient in raw material use
- Our company take advantage of innovative processes from other leading industries

\( c \) \textit{Business Systems innovation}
- Our company is ready to look for new customers
- Our company is ready to bear the cost of marketing for products promotion
- Our company is ready to train new marketing managers

A one-sample t-test was used to determine if the means for the scales above were significantly different from the midpoint of the scale (3). The midpoint of this scale (3) indicates a neutral position regarding firm innovativeness, therefore testing to determine if the values are
significantly different from the scale midpoint gives an indication that respondents have strong opinions regarding innovativeness of their firms.

Using the ADKAR model (Hiatt 2006) of change management, data were collected to measure change management constructs, namely, awareness, desire, knowledge, ability, and reinforcement. A five-point Likert-type scale ranging from 1= strongly disagree to 5= strongly agree was applied to assess the organization’s perception on each of the change management constructs. The following constructs and corresponding items were used:

a) **Awareness**
- Our company understands the business reasons for introduction of CoC program
- Our company understands the issues that are being addressed by the CoC certification
- Our company understands the impact of the CoC certification
- Our company understands the goals and objectives of the CoC certification

b) **Desire**
- Our company is environmentally conscious
- Our company believes certification has environmental benefits
- Our company feels pressured by our customers to supply certified wood
- Our company feels pressured by outside groups (other than customers) to produce environmentally certified products

c) **Knowledge**
- Our company has access to information about benefits of certification
- Our company has participated in other certification/quality management programs before

d) **Ability**
- Our company has sufficient resources to implement CoC systems
- Our company has adequate certified raw material supply

e) **Reinforcement**
- Our company believes Chain of Custody leads to public recognition
- Our company believes increased sales or new customers can be results of adopting CoC certification
Means and standard error of the means (SE) were computed in order to position the relative importance of each item. A one-sample $t$ test was used to determine if the means for these scales were significantly different from the midpoint of the scale (3). Based on ADKAR model, a change management framework was developed that aims to facilitate adoption of CoC certification by the value-added wood products sector.

Cronbach’s Alpha tests were also conducted on internal consistency for the scale item questions used in the survey (see Appendix III).

### 2.3.1 Cluster analysis

Cluster analysis was conducted to identify similar characteristics of companies with respect to their degree of innovativeness. Cluster analysis is a term applied to a group of empirical techniques used for classification of objects without prior assumptions about the population (Punj and Stewart 1983). Cluster analysis attempts to identify and classify objects or variables so that each object is very similar to others in the cluster. Objects within clusters would exhibit high internal homogeneity and high external heterogeneity with those outside their cluster. Unlike theoretical statistics, cluster analysis does not provide precise rules for choosing a solution (Dess and Davis 1984). According to Hair et al. (1992), “In the final analysis, however, it is probably best to compute solutions for several different numbers of clusters (e.g. two, three, four etc.) and then to decide among the alternative solutions based upon a priori criteria, practical judgment, common sense, or theoretical foundations”.

In cluster analysis, there are many methods available for cluster formation. In this study, a K-means cluster analysis was used to develop and describe companies segments for their degree of innovativeness. The K-means cluster analysis is a useful technique when there is a priori idea about how many groups may make sense (Delong et al. 2007). This procedure attempts to identify relatively homogeneous groups of cases based on selected characteristics and is frequently used in marketing research when there is a need to group the firms or consumers in homogenous groups in order to find comparable segments to test the market (Ketchen and Shook 1998). Using SPSS 22.0, a K-means clustering procedure was undertaken. Solutions for two and three clusters were explored and are reported in the results. Ten iterations were required to minimize variability within clusters and maximize variability among clusters.
The following variables were chosen to study the companies’ characteristics in both two and three-cluster solutions:

1. Company size – Number of full time-employees were used as indicators of company size. Previous research has shown that larger companies tend to be more innovative than smaller companies (Rametsteiner and Weiss 2004). Therefore it is assumed that the size of the company can affect its propensity to adopt and (or) create innovation.

2. Proportions of sales in international markets – companies are more likely to be innovative if they are export oriented as it represents a form of business innovation (Wagner and Hansen 2005). Markets for value-added wood products are more advanced in USA and Europe as opposed to the Canadian market (UNECE 2013). Therefore, sale proportion in international markets, particularly in the USA and Europe could be a reason for companies to become more innovative. Since the data representing the average sales volumes in the USA and European markets was in percentages between 0% and 100%, it was transformed using the arcsine transformation i.e. \( x' = \text{arcsine} \sqrt{x\%} \), in order to normalize the data.

3. Proportions of certified companies and companies interested in certification - addressing environmental issues through third-party certification is an example of business systems innovation as many wood products companies are changing their corporate strategy by addressing environmental issues through initiatives like third-party environmental certification (Karna et al. 2002). Adoption and/or interest in certification is therefore a direct indication of business systems (market) innovation. A Z-test was performed on the proportion of respondents who were certified. In the three-cluster solution, a Bonferroni adjustment was applied to the pair-wise proportion comparison in the Z-test. Therefore, each comparison was conducted at alpha level of 0.017 to maintain an overall alpha level of 0.05.

In the three-cluster solution, means and proportions were compared using one-way Analysis of Variance (ANOVA) and Z-test, respectively. In the two-cluster solution t-test was used to
compare the means of number of full-time employees and percentage of sales volume in USA and Europe and Z-test was used to compare the proportion of certified companies in two clusters.

2.4 Non-response bias

Non-response bias is a major problem for surveys. It is caused by those people who fail to respond to the survey or cannot, for some reason, be contacted (Dillman 2000). As this part of the population may be different from the rest of the population with respect to the questions asked, appreciable levels of non-response can cause substantial bias in the results. Comparing early (initial) respondents to respondents of follow-up mailings (later respondents) is one method of testing for such bias (Armstrong and Overton 1977). In order to test for non-response bias, the data were divided into two groups according to the completion dates of each response; responses from the first two email invitations were considered early respondents and the respondents from last two email invitations were considered late respondents. Data from the early respondents were combined and tested against the data from the later respondents on three key variables: proportion of certified and non-certified companies, average number of full-time employees and average percentage of sales volume within BC.

Table 1: Variables tested for non-response bias

<table>
<thead>
<tr>
<th></th>
<th>Early respondents (n = 56)</th>
<th>Late respondents (n = 67)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certified</td>
<td>27.9%</td>
<td>37.5%</td>
<td>.25</td>
</tr>
<tr>
<td>Non-certified</td>
<td>49%</td>
<td>50%</td>
<td>.91</td>
</tr>
<tr>
<td>Average number of full-time employees</td>
<td>39.79</td>
<td>53.72</td>
<td>.47</td>
</tr>
<tr>
<td>Average percentage of sales volume within BC</td>
<td>55.27%</td>
<td>36.06%</td>
<td>.93</td>
</tr>
</tbody>
</table>

A two tail t-test was conducted for average number of full-time employees and average percentage of sales volume within BC. Since the data representing the average percentage of sales volume within BC was in percentages between 0% and 100%, it was transformed using the arcsine transformation i.e. \( x' = \arcsine \sqrt{x\%} \), in order to normalize the data. Z-test for proportions of certified and non-certified companies (since the sample sizes in each group exceeded 30) were
used to test the hypothesis that there was no significant difference between the population parameters.

Table 1 summarizes the means and the proportions as selected for each variable, as well as the p-values ($\alpha = 0.05$) obtained by testing the differences between each set of means and proportions. In the t-test and z-test analysis, no between-group mean differences were found at the 5% level for any of the variables in the study between early and late respondents. Thus, it may be concluded that non-response bias was not of specific impact in this research.

To test the non-response bias further, an existing study published by the Canadian Forest Service (CFS) (Stennes and Wilson 2008) was used as a benchmark as it was derived from a large population survey conducted in 2006. This benchmark study represents the BC value added wood producers population as the CFS may have the broad industry-wide reach. Three variables including the firm size (measured by the average number of full-time employees and annual sales revenue), proportion of domestic sales, and types of species consumed were used for comparison in order to find similarities or differences in the results (Table 2). The selection of variables in this analysis was done with regard to both theoretical/conceptual and practical considerations. The three variables used in this analysis characterize the BC value-added wood products sector since the previous research has identified the firm size, domestic sales and species consumed as some of the key characteristics of the sector (Stennes and Wilson 2008; DeLong et al. 2007; Kozak et al. 2003).

Table 2: Comparison with Stennes & Wilson (2008)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Current research</th>
<th>Stennes &amp; Wilson (2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean employment</td>
<td>38.3</td>
<td>25</td>
</tr>
<tr>
<td>Annual sales revenue</td>
<td>28.7 % up to $1$ million</td>
<td>33 % up to $1$ million</td>
</tr>
<tr>
<td>Sales within BC</td>
<td>95%</td>
<td>97%</td>
</tr>
<tr>
<td>Species consumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>21.5 %</td>
<td>55 %</td>
</tr>
<tr>
<td>Western red cedar</td>
<td>23.2%</td>
<td>53 %</td>
</tr>
</tbody>
</table>

Both studies have confirmed that the sector was primarily made up of small and medium sized enterprises as evidenced through the average number of full time employees, with the current study having a mean of 38.3 compared to 25 in Stennes and Wilson (2008) study. In 2006 one-third of the value-added wood products manufacturers had up to $1$ million sales (Stennes and
Wilson 2008) which was found to be roughly the same in the current study with 28.7% producers having up to $1 million sales.

The trends in the proportion of sales to domestic market do show similarities when compared with Stennes and Wilson (2008) survey. Comparison between the percentages of domestic sales volume between the two surveys revealed that British Columbia was the major market and that almost all companies in both surveys reported some sales into the British Columbia market. For instance, the current study found that 95% of the respondents had reported some sales in BC. Similarly, Stennes and Wilson (2008) found this proportion to be only slightly higher i.e. 97%.

In both surveys Douglas-fir and western red cedar were the two species that were most likely to be used by the responding companies, with 55% of respondents using Douglas-fir and 53% using cedar in Stennes and Wilson (2008) survey, compared to 21.5% Douglas-fir and 23.2% western red cedar in the current study. Even though the proportions in the two surveys do not match closely, there is a similarity in both surveys insofar as the trend shows that the two most common species used by the respondents in both survey are the same.

Although there have been similarities in both studies, significant differences were also observed between the two studies indicating that there may be potentially non-response bias in this study. However, it can be argued that these observed differences are merely temporal differences as previous research showed that the secondary wood products manufacturing in Canada is changing rapidly (DeLong et al. 2007). The secondary wood manufacturing sector in Canada began to decline in 2007 because of the U.S. recession of 2007-2009 combined with the collapse of the U.S. housing market (Natural Resources Canada 2015). The recession heralded a period of slow global demand which significantly affected British Columbia’s lumber output (Statistics Canada 2013) that in turn has changed the size, focus and the very nature of the value-added wood products sector. Shultz et al. (2013) reported that from 1990 to 2012, BC’s share of the Canadian export market for almost all sub-sectors in the value added wood sector has declined, with only window manufacturing gaining share. Despite the negative trends in the secondary manufacturing sector, it has done relatively better compared to the primary wood products sector, and has thus helped buoy the overall forest sector through persistent negative changes since 2000 (Natural Resources Canada 2015).
3  A Description of the BC Value-Added Wood Products Sector and the Status of Chain of Custody Certification

3.1  Introduction

Global markets for certified wood products continue to grow as consumers are becoming increasingly conscious about environmental issues and are beginning to understand the significant role that third-party certification can play (FSC 2012). Certified wood products have now become the industry standard and a defacto rule of engagement for companies wishing to access international markets and large retail outlets (Kozak 2014). According to the latest Annual Global Forest Products Market Review by the United Nations Economic Commission for Europe (UNECE 2013), chain of custody (CoC) certification has experienced a steady growth over the past few years with the global number of chain of custody certificates (FSC & PEFC) exceeding 35,000, which is an indication that CoC certification remains a powerful marketing tool for companies to differentiate their products and improve their competitiveness in the market (Moore et al. 2012).

In Canada and in British Columbia (BC) in particular, great efforts have been made to achieve sustainable forest management. Certification Canada (2014) reported that as of December 2013, Canada has certified 72% (152 million hectares) of its commercial forest land by one or more of the three globally recognized certification standards currently used in Canada i.e. Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI) and Canada's National Sustainable Forest Management Standard (CSA). BC has more independently certified forest land than any jurisdiction in the world, with the exception of Canada as a whole (AEBIOM 2013). BC has a total of 52 million hectares under one of the three major third-party forest certification schemes (Certification Canada 2014). The move toward certification in Canada is strongly supported by industry groups and the Forest Products Association of Canada (FPAC) committed to have all of its members’ forestry operations certified to one of the three dominant third-party certification schemes, a goal that was achieved by the end of 2006 (Chen et al. 2011).

Relative to the widespread acceptance of forest management certification in British Columbia, chain of custody certification has met with only moderate enthusiasm, particularly among industrial facilities (Jayasinghe et al. 2007). Since its inception, researchers have studied many
facets of certification, such as consumer behavior and purchasing decisions (Testa 2013, Anderson and Hansen 2004; Bigsby and Ozanne 2002), the existence and size of price premiums in the market place (Yamamoto et al. 2014; Aguilar and Vlosky 2007; Kozak et al. 2004; Owari and Sawanobori 2007; Ozanne and Vlosky 1997; Vidal et al. 2005) and consumer preference for certified products (Elliot 2014; Toppinen et al. 2013). However, research on adoption of chain of custody certification by value-added wood products sector has received scant scholarly attention in recent years. Past research shows that 65% of the Canadian value-added wood producers were not interested in obtaining CoC certification (Jayasinghe et al. 2007). However, it is important to note that much research on certification has become relatively dated in what is an extremely fast-moving field (Chen et al. 2010), and new research in this area is critically lacking, particularly in the context of BC.

Value-added wood products manufacturers, due to their strategic position in the forest products supply chain, have a key role in creating or translating demand from the final consumer as they can be both buyers and sellers of certified products (Ozanne and Bigsby 2003). According to Schultz et al. (2013), BC’s value added wood products sector is incredibly well poised to compete in global markets due to numerous competitive advantages such as high quality wood fibre, geographic proximity to robust markets and strong supply chain infrastructure. Yet, the evidence marshalled in previous studies suggests that BC’s value-added wood products sector is lagging the value-added wood products sectors of other provinces in Canada. For instance, in 2010, Ontario’s value-added industry produced a total of more than $928 million worth of wood products. In Quebec, its value was around $825 million. But in British Columbia, which has the biggest, most valuable forest resource, the value of wood products from the value-added industry was under $345 million (Parfitt 2011).

Given the enormous potential of the value-added sector in British Columbia, as well as the fact that most research on certification has become dated due to rapid changes in the field, this research is intended to provide up-to-date information about the current level of adoption of CoC certification by the value-added wood products sector of British Columbia and identify barriers and drivers in adoption of CoC certification by the value-added wood products manufacturers.
3.1.1 Objectives and research questions

The main objective of this chapter is to create a profile of BC value-added wood products manufacturers and determine the actual status of CoC certification among the sector. The study also aims to identify and better understand the barriers to the CoC certification in this sector. In achieving these objectives following research questions were developed to meet the objectives of this study:

Q1 - What firm attributes are important in adoption of Chain of Custody certification?

Q2 - What is the current level of adoption of CoC certification among value-added wood products manufacturers in BC?

Q3 - What are the perceived value and motivations for acquiring CoC certification for BC value-added wood products manufacturers?

Q4 - What kinds of barriers exist in adoption of CoC certification?

3.2 Methodology

For primary data collection, an online survey was conducted that targeted all BC value-added companies with a valid email address. The target population included both certified and non-certified companies. To address different levels of understanding about CoC certification, the survey contained a brief definition of CoC certification. The definition used in the survey was as follows: “Chain of Custody certification is a mechanism for tracking certified material from the forest to the final product to ensure that the wood contained in the product or product line can be traced back to certified forests.”

The questionnaire was designed and administered based on the Tailored Design Method (Dillman 2000) in order to maximize the response rate and reduce non-response bias. The details on survey implementation can be found in Chapter 2.

3.3 Results

3.3.1 Respondents level of involvement with chain of custody certification

Section II, Question 1 of the questionnaire was aimed at determining the certification status of BC value-added wood producers. Based on the responses, companies were separated into three categories:
1- Companies that are currently certified by one or more certification schemes (CC)
2- Companies that are not certified but interested in becoming certified within 5 years (NCI).
3- Companies that are not certified and are not interested in becoming certified (NCNI)

Of the total 121 respondents, 100 companies indicated their certification status. As Figure 9 shows, 46% of the respondents fall into the third category i.e. they were not certified and had no interest in obtaining certification. Companies that were currently certified represented 41% of the respondents while another 13% of respondents were not certified but were interested in becoming certified within 5 years. Given these numbers, it appears that CoC certification has plateaued and that certification adoption will not change much within the value-added wood products sector, at least in the near term assuming the hosting environment remains unchanged.

![Figure 9: CoC certification status of respondents (n=100)](image)

### 3.3.2 Respondents’ profiles

The first section of the survey was intended to collect general information about the respondents. The variables used were location, type of products, association membership status, number of employees, input material categories, species used, annual sales revenues, and final sales destinations.

#### 3.3.2.1 Company location

The province of British Columbia was divided into seven regions based on BC Travel website (2014): Metro Vancouver, Fraser Valley, Cariboo, Thompson/Okanagan, Northern British...
Columbia, Vancouver Island and British Columbia Rockies/The Kootenays. Figure 10 shows the breakdown of seven regions of BC that were considered in this study. Note that Vancouver Coast & Mountains region in Figure 10 was further subdivided into Metro Vancouver and Fraser Valley.

![Regions of British Columbia, Canada](image)

**Figure 10: Regions of British Columbia, Canada**

*Source: BC Travel 2014*

Based on this, respondents were asked to specify the region they operated in. In terms of spatial distribution, value-added producers were predominantly located in Metro Vancouver (27.6%) followed by rapidly urbanizing regions such as Vancouver Island (21.1%), Fraser Valley (19.5%) and Okanagan region (14.6%) (Figure 11).
The locations of respondents were also analyzed based on their status of CoC certification adoption (Table 3). Of the 26 respondents located in Metro Vancouver, more than half (53.8%) were certified while 34.6% were not certified and not interested. Similarly, of the 23 companies located on Vancouver Island, 47.8% of the companies were certified while an equivalent percentage was not certified and not interested. Of the 18 companies located in Fraser Valley, 38.9% were certified while half of the companies were not certified and not interested.

Table 3: Location of respondents based on certification status (n=100)

<table>
<thead>
<tr>
<th>Location</th>
<th>Currently Certified (CC)</th>
<th>Not Certified but Interested (NCI)</th>
<th>Not Certified Not Interested (NCNI)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Vancouver</td>
<td>53.8% (14)</td>
<td>11.5% (3)</td>
<td>34.6% (9)</td>
<td>100.0% (26)</td>
</tr>
<tr>
<td>Fraser Valley</td>
<td>38.9% (7)</td>
<td>11.1% (2)</td>
<td>50.0% (9)</td>
<td>100.0% (18)</td>
</tr>
<tr>
<td>Cariboo</td>
<td>50.0% (2)</td>
<td>0.0% (0)</td>
<td>50.0% (2)</td>
<td>100.0% (4)</td>
</tr>
<tr>
<td>Thompson/Okanagan</td>
<td>33.3% (5)</td>
<td>20.0% (3)</td>
<td>46.7% (7)</td>
<td>100.0% (15)</td>
</tr>
<tr>
<td>Northern British Columbia</td>
<td>33.3% (1)</td>
<td>33.3% (1)</td>
<td>33.3% (1)</td>
<td>100.0% (3)</td>
</tr>
<tr>
<td>Vancouver Island</td>
<td>47.8% (11)</td>
<td>4.3% (1)</td>
<td>47.8% (11)</td>
<td>100.0% (23)</td>
</tr>
<tr>
<td>British Columbia Rockies/ The Kootenays</td>
<td>9.1% (1)</td>
<td>27.3% (3)</td>
<td>63.6% (7)</td>
<td>100.0% (11)</td>
</tr>
<tr>
<td>Total</td>
<td>41.0% (41)</td>
<td>13.0% (13)</td>
<td>46.0% (46)</td>
<td>100.0% (100)</td>
</tr>
</tbody>
</table>

Figure 11: Location of respondents (n = 123)
3.3.2.2 Annual sales revenue

The questionnaire gathered information on respondents’ annual sales revenues. The number of respondents was fairly evenly distributed among annual sales revenue categories. Respondents were asked to select the appropriate range for their annual sales revenue given a list of eight choices. Of these categories, respondents were grouped into five size categories: “very small” (less than $200,000), “small” (200,001 to $1 million), “medium” ($1,000,001 to $5,000,000), “large” ($5,000,001 to $20,000,000) and “very large” (more than $20,000,000). Median revenue from product sales lay in the $2 million to $5 million range, with 21.1% of respondents having annual sales revenues between $2 million and $5 million. Only 14.4% of respondents had gross sales of over US $ 20 million and fell into the very large sized company category. A plurality (63%) had gross sales up to $5 million and therefore fell into the small and medium sized company category (Figure 12).

![Figure 12: Annual sales revenue of respondents’ companies (n = 104)](image)

Sales revenues based on respondents’ certification status were also explored (Table 4). With respect to firm size in terms of annual sales revenue in 2012, 83.3% of the very small-sized companies were in Categories 3 (NCNI) and only 16.7% were in Category 1 (CC). The proportion of certified companies grew as the firm size grew – with the proportion of small-sized certified companies roughly twice as much as the proportion of very small-sized certified companies. Half of the large-sized and more than four-fifths of the very large-sized companies belonged to Category 1; among them this proportion had the maximum adoption level. The trend
was reversed with the appearance of the medium-sized companies where the proportion of certified companies dipped to 27.3%, compared to 29.2% in small-sized companies. However, more than half of the companies that were interested in certification (Category 2) were medium-sized companies, which suggests that even though certification adoption within this group was relatively lower, there was strong interest in certification amongst medium-sized companies.

Table 4: Annual sales revenue of respondents based on certification status (n = 100)

<table>
<thead>
<tr>
<th>Annual Sales Revenue</th>
<th>Certification Status</th>
<th>Currently Certified *(CC)</th>
<th>Not Certified but Interested (NCI)</th>
<th>Not Certified Not Interested (NCNI)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very small</td>
<td>16.7% (1)</td>
<td>0.0% (0)</td>
<td>83.3% (5)</td>
<td>100.0% (6)</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>29.2% (7)</td>
<td>12.5% (3)</td>
<td>58.3% (14)</td>
<td>100.0% (24)</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>27.3% (9)</td>
<td>21.2% (7)</td>
<td>51.5% (17)</td>
<td>100.0% (33)</td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>50.0% (11)</td>
<td>9.1% (2)</td>
<td>40.9% (9)</td>
<td>100.0% (22)</td>
<td></td>
</tr>
<tr>
<td>Very large</td>
<td>86.7% (13)</td>
<td>6.7% (1)</td>
<td>6.7% (1)</td>
<td>100.0% (15)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41.0% (41)</td>
<td>13.0% (13)</td>
<td>46.0% (46)</td>
<td>100.0% (100)</td>
<td></td>
</tr>
</tbody>
</table>

3.3.2.3 Types of products manufactured

Respondents were given a list of seven product categories that were developed based on BC Wood’s – an industry association for value-added producers in British Columbia – classifications for value-added wood producers and were asked to check as many options as were appropriate for their companies (thus the respondent subsample sizes, “n” as indicated in Table 5, when added together, are greater than the total number of respondents in the study). For instance, 18 respondents considered themselves to be both millwork and remanufactured wood products companies. The results indicate that of the different industrial subsectors surveyed, remanufactured wood products constituted the main product of the responding companies (45.1%), followed by millwork (34.4%). Cabinets, Engineered Wood Products and Furniture each represented 12.3% of the responding companies. Log Homes and Timber Frames and Pre-built Housing represented only 10.7% and 3.3% of the responding companies, respectively. One-third of the responding companies manufactured “other” value-added wood products, such as utility poles, fence, and pallets.
Table 5: Types of products manufactured by respondents (n = 121)

<table>
<thead>
<tr>
<th>Type of Products Manufactured</th>
<th>Responses</th>
<th>Percent of Cases (Respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
</tr>
<tr>
<td>Cabinets</td>
<td>15</td>
<td>7.5%</td>
</tr>
<tr>
<td>Engineered Wood Products</td>
<td>15</td>
<td>7.5%</td>
</tr>
<tr>
<td>Furniture</td>
<td>15</td>
<td>7.5%</td>
</tr>
<tr>
<td>Log Homes and Timber Frames</td>
<td>13</td>
<td>6.5%</td>
</tr>
<tr>
<td>Millwork</td>
<td>42</td>
<td>21.0%</td>
</tr>
<tr>
<td>Pre-built housing</td>
<td>4</td>
<td>2.0%</td>
</tr>
<tr>
<td>Remanufactured Wood Products</td>
<td>55</td>
<td>27.5%</td>
</tr>
<tr>
<td>Other</td>
<td>41</td>
<td>20.5%</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

a. Dichotomy group tabulated at value 1. N= 121

The types of products manufactured were also analyzed independently for certified and non-certified companies (Table 6). Remanufactured wood products companies had the highest level of certification adoption among all products categories; with more than half (55.8%) of remanufactured wood products companies were certified. Forty-five percent of responding companies that manufacture other value-added wood products such as utility poles, fence, and pallets etc. were certified. One-third of engineered wood products companies (33.3%) and one-quarter of millwork companies (25.6%) were also certified. In contrast, the majority of responding companies that manufacture cabinets (64.3%), furniture (64.3%), and log homes and timber frames (69.2%) were not certified and not interested (NCNI) in obtaining certification (Category 3) and therefore seemed to have a lower tendency for CoC certification.
### Table 6: Types of products manufactured by respondents based on certification status (n = 121)

<table>
<thead>
<tr>
<th>Type of Products Manufactured</th>
<th>Currently Certified <em>(CC)</em></th>
<th>Not Certified but Interested (NCI)</th>
<th>Not Certified Not Interested (NCNI)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinets</td>
<td>21.4% (3)</td>
<td>14.3% (2)</td>
<td>64.3% (9)</td>
<td>100% (14)</td>
</tr>
<tr>
<td>Engineered Wood Products</td>
<td>33.3% (4)</td>
<td>33.3% (4)</td>
<td>33.3% (4)</td>
<td>100% (12)</td>
</tr>
<tr>
<td>Furniture</td>
<td>14.3% (2)</td>
<td>21.4% (3)</td>
<td>64.3% (9)</td>
<td>100% (14)</td>
</tr>
<tr>
<td>Log Homes and Timber Frames</td>
<td>0% (0)</td>
<td>30.8% (4)</td>
<td>69.2% (9)</td>
<td>100% (13)</td>
</tr>
<tr>
<td>Millwork</td>
<td>25.6% (10)</td>
<td>10.3% (4)</td>
<td>64.1% (25)</td>
<td>100% (39)</td>
</tr>
<tr>
<td>Pre-built housing</td>
<td>50% (1)</td>
<td>50% (1)</td>
<td>0% (0)</td>
<td>100% (2)</td>
</tr>
<tr>
<td>Remanufactured Wood Products</td>
<td>55.8% (24)</td>
<td>11.6% (5)</td>
<td>32.6% (14)</td>
<td>100% (43)</td>
</tr>
<tr>
<td>Other</td>
<td>45.5% (15)</td>
<td>12.1% (4)</td>
<td>42.4% (14)</td>
<td>100% (33)</td>
</tr>
<tr>
<td>Total</td>
<td>41% (41)</td>
<td>13% (13)</td>
<td>46% (43)</td>
<td>100% (100)</td>
</tr>
</tbody>
</table>

### 3.3.2.4 Employment

Figure 13 shows the value-added wood products respondent company size in terms of number of full time employees. In this highly skewed distribution, the median number of employees was 16 and 57.2% of respondents had up to 20 employees in 2012. An additional 26.5% had 21-50 employees. There were a few large firms with more than 100 employees; these make up approximately 7% of the total respondents.

![Figure 13: Number of full-time employees in respondents’ companies (n = 117)](image)

The numbers of full-time employees were also computed for certified, interested and non-certified companies (Table 7). In general, as the company’s size grows in terms of numbers of full-time employees, the proportion of certified companies within a particular full-time employee
category also grew. Companies with up to 20 full-time employees had the lowest proportion of certified companies (29.6%) whereas more than three-quarters (77.8%) of companies that had 51-100 full-time employees were certified. Some 44% of the responding companies with 21-50 full-time employees had certification in place. The greatest percentage of certification was observed in companies with more than 250 full time employees; all such companies were certified. Half the companies with 101-250 full-time employees were certified while the rest (50%) were not certified and not interested in becoming chain of custody certified.

Table 7: Full-time employees based on certification status (n = 96)

<table>
<thead>
<tr>
<th>Full-time Employees</th>
<th>Currently Certified &quot;(CC)</th>
<th>Not Certified but Interested (NCI)</th>
<th>Not Certified Not Interested (NCNI)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20</td>
<td>29.6% (16)</td>
<td>14.8% (8)</td>
<td>55.6% (30)</td>
<td>100.0% (54)</td>
</tr>
<tr>
<td>21-50</td>
<td>44.4% (12)</td>
<td>11.1% (3)</td>
<td>44.4% (12)</td>
<td>100.0% (27)</td>
</tr>
<tr>
<td>51-100</td>
<td>77.8% (7)</td>
<td>11.1% (1)</td>
<td>11.1% (1)</td>
<td>100.0% (9)</td>
</tr>
<tr>
<td>101-250</td>
<td>50.0% (1)</td>
<td>0.0% (0)</td>
<td>50.0% (1)</td>
<td>100.0% (2)</td>
</tr>
<tr>
<td>251-550</td>
<td>100.0% (3)</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>100.0% (3)</td>
</tr>
<tr>
<td>551-1000</td>
<td>100.0% (1)</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>100.0% (1)</td>
</tr>
<tr>
<td>Total</td>
<td>41.7% (40)</td>
<td>12.5% (12)</td>
<td>45.8% (44)</td>
<td>100.0% (96)</td>
</tr>
</tbody>
</table>

The mean numbers of full-time employees were also computed for certified, interested, and uninterested companies (Table 8). Since the distribution was highly skewed towards the smaller companies with up to 20 full-time employees, a confidence interval was not constructed. Certified companies had the highest mean value (79 employees), followed by interested companies and not certified not interested companies (19 employees and 17 employees, respectively).
Table 8: Full-time employees’ descriptive statistics

<table>
<thead>
<tr>
<th>Certification Status</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently Certified &quot;(CC)</td>
<td>79</td>
<td>30</td>
<td>30</td>
<td>700</td>
<td>2</td>
<td>41</td>
</tr>
<tr>
<td>Not Certified but Interested (NCI)</td>
<td>19</td>
<td>16</td>
<td>3</td>
<td>54</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Not Certified Not Interested (NCNI)</td>
<td>17</td>
<td>8</td>
<td>6</td>
<td>110</td>
<td>1</td>
<td>46</td>
</tr>
</tbody>
</table>

3.3.2.5 Membership status

Over 65% of the respondents indicated that they were members of at least one or more industry association. Forty percent of respondents were members of BC Wood. Some 18% of the respondents were members of the Independent Wood Processors Association BC and 23.8% were members of other associations such as the Building Supply Industry Association, North American Wholesale Lumber Association, Truck Loggers Association and Canadian Wood Pallet and Container Association (Table 9).

Table 9: Association membership of respondents’ companies (n = 122)

<table>
<thead>
<tr>
<th>Association Membership*</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>BC Wood</td>
<td>49</td>
</tr>
<tr>
<td>Architectural Woodwork Manufacturers Association of Canada (AWMAC)</td>
<td>5</td>
</tr>
<tr>
<td>Independent Wood Processors Association BC (IWPA-BC)</td>
<td>23</td>
</tr>
<tr>
<td>None</td>
<td>42</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>148</td>
</tr>
</tbody>
</table>

a. Dichotomy group tabulated at value 1.

3.3.2.6 Raw materials use

Companies were asked whether they used panel products (medium density fibreboard, plywood or particleboard) only, solid wood or both panel products and solid wood. The main fibre inputs type was solid wood, as indicated by 74.1% of the responding companies, followed by 23.3% of
the respondents using both panel products and solid wood as raw materials. Only 2.5% of the respondents used panel products only (Figure 14).

Figure 14: Raw material use of respondents’ companies (n = 120)

### 3.3.2.7 Species used

BC value-added wood products manufacturers use a wide variety of species, mostly originating from BC. Figure 15 represents a species breakdown of the proportion of companies surveyed consuming various softwood and hardwood species.

The most commonly consumed species was Western Red Cedar (*Thuja plicata*) followed by Douglas-fir (*Pseudotsuga menziesii*) and softwood species belong to SPF grouping of spruce (*Picea* spp.), pine (*Pinus* spp.) and fir (*Abies* spp.). Maple (*Acer* spp.) was the most commonly used hardwood species, followed by alder (*Alnus* spp.), oak (*Quercus* spp.) and poplar (*Populus* spp.). Exotic hardwoods such as Ipe (*Handroanthus* spp.), Mahogany (*Swietenia* spp.), and Teak (*Tectona* spp.) combined accounted for approximately 1% of the respondents species mix.
3.3.2.8 Markets served

Respondents were asked to estimate (in percentages equaling 100) their sales destinations based on six geographic regions: BC, Canada, United States, China, Europe, Japan, other Asia, and other. The means and standard errors of the means for the sales destination percentages were calculated (see Table 10).
Table 10: Descriptive statistics of sales destination of respondents companies (n=101)

<table>
<thead>
<tr>
<th>Sales Destination</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error Mean</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>98</td>
<td>47.20</td>
<td>3.81</td>
<td>97.02</td>
</tr>
<tr>
<td>Canada</td>
<td>74</td>
<td>19.62</td>
<td>2.17</td>
<td>73.26</td>
</tr>
<tr>
<td>US</td>
<td>71</td>
<td>37.01</td>
<td>3.17</td>
<td>70.29</td>
</tr>
<tr>
<td>China</td>
<td>17</td>
<td>19.06</td>
<td>5.60</td>
<td>16.83</td>
</tr>
<tr>
<td>Europe</td>
<td>22</td>
<td>14.23</td>
<td>2.36</td>
<td>21.78</td>
</tr>
<tr>
<td>Japan</td>
<td>25</td>
<td>17.23</td>
<td>3.69</td>
<td>24.75</td>
</tr>
<tr>
<td>Other Asia</td>
<td>13</td>
<td>14.25</td>
<td>4.70</td>
<td>12.87</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>8.96</td>
<td>3.12</td>
<td>12.87</td>
</tr>
</tbody>
</table>

For the purposes of this study, the respondents were then classified into two categories according to markets served: domestic and global. If the respondents had sales outside Canada, they were placed in the “global” category. If they only had domestic (within BC and rest of Canada) sales, they were placed in the “domestic” category. Of the 123 respondents, 101 indicated their sales destination. Twenty-six respondents indicated they were domestic manufacturers, including 15 respondents with 100% of their sales within BC. Seventy-five respondents indicated they were “global” manufacturers. All respondents except one indicated that they had domestic sales. Of all the global sales markets, respondents most frequently listed the United States as their sales destination (70.2% of respondents with international sales), followed by Japan (24.7%), Europe (21.78%), China (16.8%), other Asia (12.8%), and other (12.8%) (Table 10).

Of the seventy-five respondents who indicated that they had foreign sales markets, 41.3% indicated having one international market, with 93% of the companies with one international market selling to the USA. Twenty-five percent indicated having two, 18.6% percent indicated having three, 8% indicated having five and 6.6% indicated having four (Table 11).
Table 11: Number of foreign sales markets n= 75

<table>
<thead>
<tr>
<th>Number of foreign markets</th>
<th>Number of responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>31</td>
<td>41.3</td>
</tr>
<tr>
<td>Two</td>
<td>19</td>
<td>25.3</td>
</tr>
<tr>
<td>Three</td>
<td>14</td>
<td>18.7</td>
</tr>
<tr>
<td>Four</td>
<td>5</td>
<td>6.7</td>
</tr>
<tr>
<td>Five</td>
<td>6</td>
<td>8.0</td>
</tr>
</tbody>
</table>

3.3.3 Companies involved in chain of custody certification

Respondents were asked directly if their companies were chain of custody certified. Of the 100 responding companies, 41% reported that they were chain of custody certified. Respondents were further asked which certification schemes they were involved with and were provided with a list of four certification schemes and an “other” option.

Thirty-nine percent of the companies reported being certified under the Programme for Endorsement of Forest Certification Program (PEFC), while 29.3% were certified under Forest Stewardship Council, 17.2% under Sustainable Forestry Initiative, with the balance of 13.7% reporting to be certified under Canadian Standards Association (CSA) (Figure 16). It is important to note that while PEFC has a stand-alone CoC certification system; it is also an umbrella organization that endorses national forest certification systems such as SFI and the American Tree Farm System (ATFS) in the USA and the United Kingdom Woodland Assurance Scheme (UKWAS) in the UK. In Canada, the CSA SFM standard, endorsed by PEFC, uses the PEFC chain of custody standard PEFC ST 2002:2010. This gives CSA forest managers the additional option of using the PEFC product label (CSA 2014). Of the 37 certified companies, 35% reported having more than one certification such as a combination of FSC and PEFC or FSC and SFI.
Certified companies were asked to identify the certification body that had assessed their companies for chain of custody certification. Slightly less than half (48.6%) of the respondents were assessed by QMI-SAI Global, followed by SmartWood/Rainforest Alliance (24.3%) and KPMG (13.5%). SCS certified only 2.7% of the respondents, with the balance of 10.8% certified by “other” certification bodies such as PricewaterhouseCoopers (Figure 17).
Certified companies were then asked to identify their initial source of information about CoC certification. Not surprisingly, industry associations were found to be the most important source of information for most of the respondents (30.3%). One-quarter of certified companies received information about CoC certification directly from certification programs such as FSC, PEFC etc. A small proportion (12.5%) of certified companies received information through “word of mouth” from value-added companies already certified (Figure 18).

In order to estimate the source of their raw material inputs, certified companies were asked whether they used materials from both certified and non-certified sources. Nearly three-quarters (76.9%) of the respondents indicated that they worked with both certified and non-certified materials (Figure 19). They were further asked to estimate the proportion of their raw materials that come from certified and non-certified sources. Means were calculated for the proportion of volume of certified materials and the proportion of volume of non-certified materials. Among the 28 companies who used materials from both certified and non-certified sources, an average of 45.9% of the materials was sourced from certified sources, while 54% was sourced from non-certified sources (Table 12). This result is interesting given that of the total 55 million hectares of BC forest land, 52 million hectares have been certified under one of the three major certification schemes used in Canada (BC Ministry of Forests, Mines, and Land 2010). Yet results show that
more than half of value-added wood products manufacturers source their materials from non-certified sources. A further analysis of this discrepancy is done in Chapter 5, section 5.4.4.

Figure 19: CC source of raw material inputs (n = 39)

Table 12: Proportion of volume of certified inputs (CC)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Range</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of volume of certified inputs</td>
<td>28</td>
<td>45.96</td>
<td>1-95</td>
<td>6.76</td>
</tr>
<tr>
<td>Proportion of volume of non-certified inputs</td>
<td>28</td>
<td>54.04</td>
<td>5-100</td>
<td>6.76</td>
</tr>
</tbody>
</table>

Certified companies were also asked to identify the type of customers for their certified wood products. Figure 20 shows that 26.9% of the respondents sell their certified products to other manufacturers. Another 24.3% sell to brokers/distributors, 15.3% sell to end-users and 14.1% sell to retailers.
A list of chain of custody tracking methods was provided to certified respondents who were then asked to specify the tracking methods that they use for their certified products. The results are summarized in Figure 21. The majority of certified companies (58.3%) used conventional labels with barcode information to track their certified inputs and outputs within their production facilities, followed by “other” such as the industry specific LISA software system (19.4%). Interestingly, none of the responding companies used more sophisticated technologies such as Radio Frequency Identification (RFID) labels for tracking their materials.
Excluding any incremental costs for certified raw materials, these companies were asked to estimate the direct costs they incurred for setting up a CoC system within their company facilities. Forty five percent of respondents spent between $5,000 to $10,000 with an additional 34.2% spending between $2,000 and $5,000 to set up a CoC system within their companies. Only 11.4% of the respondents spent less than $2,000 whereas a combined 8.5% of certified companies spent over $10,000 for their initial set up cost (Figure 22).

In terms of annual auditing cost, 48.5% of certified companies paid between $2,000 and $5,000. Thirty one percent paid less than $2,000 followed by 14.2% who paid between $5,000 and $10,000. The remainder 5.7% of the respondents paid more than $10,000 for the cost of annual audits (Figure 23).
Certified companies were asked to indicate any difficulties they faced when they initially obtained CoC certification. Over 35% of certified companies indicated high costs of certification as the biggest challenge in pursuing CoC certification, followed by lack of certified raw materials (26.7%). Employee training was cited as a barrier by 12.5% of certified companies whereas another 8.9% faced problems with material segregation. Fourteen percent of certified companies indicated “other” barriers such as choice of certification schemes and standard interpretation (Figure 24).
3.3.4 Companies interested in becoming chain of custody certified

Respondents who were considering certification were then asked whether they had knowledge about chain of custody certification as it applies to value-added wood products manufacturers. Of the twelve companies that were interested in becoming chain of custody certified, a majority (66.6%) did not have any knowledge of CoC certification which indicates that such companies may not be too committed to the CoC certification. Only 33.3% indicated that they had knowledge about CoC certification as it applied to their companies (Figure 25).
Given the importance of learning about certification programs, respondents were queried about various sources of obtaining information regarding CoC certification. Selections were made based on the following list of possible sources: Internet, certification bodies, industry associations, tradeshows, value-added wood products companies already certified, certification programs and others. Proportions of responses were computed and are plotted in Fig 26: the most common forms of obtaining certification information were through certification programs (36.3%) and industry associations (27.2%). These were followed by value-added companies already certified (18.1%). Certification bodies (9%) were seen to be a relatively less effective source of information in terms of learning about CoC certification.

Respondents were asked to rate their level of knowledge on five basic certification concepts: physical segregation, tracking systems, percentage-based system for CoC, credit based system for CoC and controlled wood. A four point scale varying from “1 = very knowledgeable” to “4 = not at all knowledgeable” was used. Means and standard error of the means (SE) were computed for each response item and are summarized in Figure 27. In this analysis a confidence interval was not constructed due to the very small sample size (n=11).
To further understand the certification trend of respondents that were interested in becoming certified, it was necessary to research certification scheme preferences. Therefore, Category 2 respondents (NCI) were asked to indicate what certification system would be their first choice for the certification of their products out of five choices: Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC), Sustainable Forestry Initiative (SFI), Canadian Standards Organization (CSA), “Other,” and “Don’t know”. Respondents were allowed to choose all that applied. Respondents indicated that Forest Stewardship Council (FSC) was the most preferred certification scheme (54.5%) followed by 27.2% who did not know which certification scheme to choose. PEFC was less preferred certification scheme for companies that were interested in certification as indicated by 9% of the responses (Figure 28). None of the NCI companies indicated CSA or SFI as their preferred certification schemes, however, this may be because of a very small sample size of NCI companies (n=11).
Respondents were also asked to indicate which factors/entities most influenced them to consider adopting certification. They were provided with seven choices and allowed to choose all that applied. Of the seven entities, respondents indicated that customers (37.5%) are the most influential in their decision to pursue certification. Corporate image (31.2%) and participation in LEED programs (31.2%) were the other two influential factors indicated by an equivalent number of respondents (Figure 29).
Respondents were asked about their expectations regarding the cost of setting up chain of custody certification systems and the cost of annual auditing. Five categories of cost ranges were presented for each of the two components. The survey found that there were an equal number of respondents (30%) who expected their cost for setting up the CoC system in each of the three price ranges i.e. less than $2000, $2000-$5,000 and more than $15,000. Only 10% of the respondents expected their set up costs to be between $2,000 and $5,000 (Figure 30). In terms of cost of annual auditing, 40% of the respondents were expecting it to be less than $2,000 (Figure 31), compared to 31% of the certified companies that actually paid less than $2,000 (Figure 23).
Companies that were interested in becoming CoC certified were also asked to estimate the proportion of raw materials inputs that would be coming from certified sources. Out of thirteen companies that were interested in becoming CoC certified, ten companies answered this question. Mean proportion of certified raw material was calculated and showed that on average 76% of raw materials would be coming from certified sources for companies interested in becoming chain of custody certified (Table 13), compared to 45.9% of certified raw materials sourced by certified companies (Table 12).
Table 13: NCI estimated proportion of certified raw materials

<table>
<thead>
<tr>
<th>Estimated proportion of certified raw materials</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated proportion of certified raw materials</td>
<td>10</td>
<td>5</td>
<td>100</td>
<td>76%</td>
<td>9.24</td>
</tr>
</tbody>
</table>

Interested companies were provided with a list of seven types of customers and they were asked to choose the ones that they considered to be potential customers for their certified wood products. As Figure 32 shows, 21.6% of the respondents expected that end-users would be their potential customers for certified products, while 18.9% considered builders to be their potential customers. An equal proportion of respondents (16.2%) expected brokers/distributors and retailers to be their potential customers for certified products.

Figure 32: NCI potential customers for certified products (n = 11)

3.3.5 Companies not certified and not interested

Forty-six percent of responding companies were not currently selling certified wood products and had no plan to proceed with a chain of-custody certification within the next five years. The
biggest barrier for companies not certified and not interested (NCNI) in becoming CoC certified was that the demand for certified timber or paper was currently lacking in their markets, indicated by 29.2% of the NCNI respondents (Figure 33).

Figure 33: NCNI barriers to certification (n = 45)

As many value-added wood producers were small-sized companies, the high cost of certification was another main barrier, cited by 16.8% of NCNI companies. The results also show that 15% of NCNI companies believed that certified value-added wood products do not command any price premium, which is an indication that buyers are not willing to pay more for certified products. Nine percent of the NCNI companies attributed the general lack of knowledge about certification to be a significant barrier in the value-added sector while another 8.8% indicated constraints in supply of certified material. Difficulty in the implementation of the requirements of the CoC standard was considered a barrier by 7% of the NCNI companies, with the balance of 13.2% of NCNI stating “other” barriers such as the amount of time required to implement and comply with CoC standards, specific manufacturing orders are too difficult to produce, etc.
3.4 Discussion

3.4.1 Sector profile

The value-added wood products sector in British Columbia is diverse and tends to be made up primarily of small- and medium-sized enterprises, with less than $5 million annual sales and fewer than 20 full-time employees. However, there are also some larger firms, notably remanufacturers. There are of course important geographical nuances. The survey found that the Metro Vancouver area clearly led the other regions of the province in terms of the number of value-added wood products companies. McIlhenney et al. (2013) found that growth of value-added activities has been strongly concentrated in Metro Vancouver and to some extent in the rapidly urbanizing Okanagan region of BC’s southern interior, not in more remote forest-commodity-based communities. The Council of Canadian Academies (2009) posited that innovation is fostered by the close personal and supplier linkages that occur in certain geographic concentrations, creating local innovation “ecosystems”. In several countries, major benefits to the woodworking sector have been obtained by regional concentrations of SMEs. For example, in Denmark and Italy, woodworking enterprises have obtained considerable benefits from concentration into particular industrial districts (Mäkinen and Selby 2006). The question as to why the value-added manufacturing companies tend to locate near urban areas of BC rather than near wood supply has not yet been empirically investigated and may be relevant for future research. However, McIlhenney et al. (2013) assume that the reasons for the clustering of value-added activities in Metro Vancouver is due to the supply of entrepreneurship, skilled labour, accessibility to fibre supplies especially to desired coastal species, and access to local and US markets.

It is evident that BC Wood and the Independent Wood Processors Association (IWPA) are the two main industry associations to which value-added wood products manufacturers are affiliated in BC. The survey found that 65% of the value-added wood products manufacturers in BC were members of at least one industry association. These results are consistent with Delong’s (2007) survey in which over 60% of the respondents were members of at least one association. McIlhenney et al. (2013) also found in their survey that BC Wood was the most often used association. The benefits of membership are strongly related to marketing and sales, particularly related to support for contacts in foreign countries, organizing seminars/workshops, sponsoring
tradeshows, market intelligence, advertising and cost-sharing marketing, certification and accreditation, lobbying governments and networking. BC value-added wood producers have strong local/practical support for their development, which is an opportunity to obtain a competitive advantage by these producers. The value-added manufacturers in BC are closer to industry associations (e.g. BC Wood) and research institutions (e.g. FPInnovations, Centre for Advanced Wood Products, etc.) than to the provincial and federal governments. The industry associations are said to play a mediator role between the secondary industry and policy makers in the government (Spetic 2009). Therefore, it may be suggested that value-added producers are practicing lobbying to a certain extent, which may help them gain some support at both provincial and political levels. Delong et al. (2007) analyzed the relationship between the membership status and profitability and concluded that being a member of an industry association increased the odds of company being profitable by almost three times.

The survey results, as well as other available literature (e.g. Delong 2007 et al.; Grace 2013), corroborate the view that the majority of businesses in the BC value-added wood products sector are small to medium enterprises (SMEs). Certification can play a major role in expanding market share for value-added producers if they use CoC certification as a marketing tool and incorporate environmental issues into their marketing strategies and practices (Karna et al. 2002). However, one of the challenges associated with SMEs in the value-added wood products sector is that they lack the scale and capacity to make marketing a business priority (Schultz et al. 2013).

In terms of raw material use, they consumed mostly solid wood coming from a range of softwood species, including Western red cedar, Douglas-fir, SPF, and Western Hemlock that are readily available in BC. Again, the results are consistent with McIlhenney et al.’s (2013) survey which found that most interviewed firms used wood from coastal (softwood) species, especially Douglas-fir, Western red cedar, and Western Hemlock. Access to coastal species may explain why value-added firms are clustered in the Metro Vancouver area, aside from other factors such as proximity to international markets and availability of skilled labour. Kozak et al. (2003) surveyed BC value-added wood products sector to uncover the impediments to wood supply relationships between secondary and primary manufacturers. They found that 75% of the value-added manufacturers surveyed primarily consumed softwoods in their production, most
originating in BC. The most commonly consumed softwood species belong to the SPF grouping of spruce, pine, and fir, followed by Douglas-fir, larch, and Western red cedar.

The results of this survey also revealed that BC value-added wood products manufacturers are typically domestic oriented. However, approximately 75% of the respondents also indicated that they served global markets. This trend may be a reflection of the fact that the respondents included a large proportion of remanufacturers (45%), a subsector that exports many of its products around the world for further custom manufacturing. DeLong et al. (2007) studied business-related issues faced by the value-added wood products sector, as well as the factors that limit their growth. One of the key findings related to factors limiting the growth of value-added producers was their heavy focus on domestic markets and inability to export their products to global markets. Delong et al. found that 90% of the respondents indicated that they sell their products domestically and 50% of all respondents sell 90% of their products locally. An overreliance of the value-added wood products sector on the domestic market is also evident in previous research (Stennes 2008; Jayasinghe et al. 2007). BC’s domestic market is relatively small and geographically fragmented. Small markets offer lower potential reward for undertaking the risk of innovation and tend to attract fewer competitors, thus providing less incentive for a business to innovate in order to survive. On the other hand, the innovation success of countries like Finland and Sweden shows that the disadvantage of a small domestic market can be offset by a strong orientation toward innovation-intensive exports (Council of Canadian Academies 2009).

3.4.2 Certification status

This study has confirmed that the uptake of CoC certification has increased in the value-added wood products sector in the past decade. The survey found that 41% of the value-added wood products manufacturers in BC had adopted CoC certification, compared to only 17.6% in 2004 in Canada. A breakdown of responses by the geographic location revealed 18.2% were certified in western Canada region (British Columbia and Alberta) in 2004 and 25.5% were interested (Jayasinghe et al. 2007).

The overall increase in this survey may be because approximately 25% (sample size of 53) of the value-added wood products manufacturers were not certified in 2004 but they showed their
interest in certification at that time, so it is likely that those interested companies have now obtained certification, hence contributing to an overall increase in the proportion of certified companies. However, it is important to note that the results of 2004 survey covered a larger geographic area i.e. British Columbia and Alberta, whereas this study only focused on British Columbia. The survey also revealed that a significant proportion (46%) of value-added wood products manufacturers were not certified and had no intention of becoming certified. This points to a need to examine the barriers to the uptake of CoC certification.

3.4.3 Barriers to certification

3.4.3.1 Customer demand for certified wood products

This study of the BC value-added wood products manufacturers illustrates the range and complexity of the market barriers to the uptake of certified material. Market pull factors were considered to be an extremely important factor in adoption of CoC certification by the value added wood products manufacturers. The survey found that lack of customer demand for certified products was the biggest reason why non-certified companies were not interested in pursuing certification. Several studies have been conducted to assess the demand for certified wood products. Chen et al. (2011) surveyed Canadian retailers to examine their perceptions related to forest certification and its impacts in the market place and found that one-third of the respondents surveyed had received requests for certified products from less than 10% of end users, indicating a general lack of demand for certified wood products among consumers. Concerns regarding the lack of consumer demand for certified products have been previously cited as a deterrent for the use of certified wood in other parts of the world, including the United States. For instance, Ganguly et al. (2013) studied the role of green building programs in enhancing the use of environmentally certified wood in the U.S. residential construction industry and found that lack of customer demand emerged as the dominant reason for not using certified wood, as more than 90% of the aware-non-users (respondents who were aware of FSC certified wood but have never used it) of FSC certified wood cited lack of customer demand as being the top reason for not using FSC certified wood products.

A general lack of awareness regarding certified wood products may be one reason for low demand by the end consumer (Chen et al. 2011). Kozak et al. (2004) assessed Western Canadian
customers’ attitudes towards certified value-added products in a qualitative study and the results indicated that most participants had little knowledge about environmental labeling/certification of wood products, value-added or otherwise. Furthermore, all of the participants indicated they would be willing to purchase certified value-added wood products in the future. Participants were willing to pay a small premium for certified value-added wood products, assuming equivalent quality and design. Due to the rapid evolution of certification in the past decade, new research is needed to assess the change in Western Canadian customers’ attitudes towards certified wood products since 2004.

3.4.3.2 Cost of certification

As most companies, certified or not, were concerned about the high costs of certification, this phenomenon of low CoC participation is linked to the affordability issue of CoC certification by small companies. The costs of CoC certification are not trivial, and the process is not always simple. Estimates of actual certification costs to manufacturers vary widely and depend on several factors (Innes and Hickey 2005). These include the size of the company, the number of employees, the number of sites to be certified, the level of effort required by the auditor to audit the CoC system, and whether the company is being certified against one or more certification schemes. For instance, FSC costs between $2500 and $10,000 to join and then there is annual fee plus paperwork and the possibility of inspections (McIlhenney et al. 2013). Chen et al. (2011) analyzed the costs and benefits of forest certification and found that certification can be prohibitively expensive for small- and medium-sized forest companies. High costs of certification can also cause an equity challenge in an increasingly international trading regime, particularly for small producers. This creates an exclusionary mechanism that can have negative social and economic consequences (Marx 2011). Research is needed to evaluate whether CoC certification hinders trade and acts as a non-tariff barrier for small producers, particularly in developing countries. As such there is no evidence that this is the case in BC.

3.4.3.3 Price premiums

Non-certified companies perceive the inability of certified products to command price premiums as a significant barrier. The survey revealed that certified companies did not believe that certified products command price premiums, while those thinking of adopting certification believe it does.
This finding is consistent with previous studies, which have indicated that suppliers were absorbing the additional costs incurred by certification (Halalisan 2013; Vlosky and Ozanne 1997; Humphries et al. 2001; Owari and Sawanobori 2007). Theoretically, certified wood products should command a premium due to the extra costs incurred in achieving certification, which means that additional costs should be passed on to consumers in order for the companies to operate in a profitable and viable way. However, most frequently, this price premium is not being realized in the market place, as price, quality and convenience are still the determining factors in actual purchasing behaviour of the majority of customers, despite their increasing environmental awareness (Chen et al. 2011). The issue of price premiums on certified products has been widely criticized by some researchers, as it tends to provide an incentive to forest companies to behave badly and eke out more market share by selling cheaper products (Kozak 2014). Instead, alternative models, based on the polluter pays principle, have been proposed such as charging an environmental levy—in effect, a price premium—on non-certified wood products (Kozak 2014). How this environmental levy will impact the market for certified wood products is an area of future research.

3.4.3.4 Company size and certification

It can also be generalized from the survey results that the larger the company, the greater the likelihood of CoC certification adoption, and vice versa. For example, from the total number of “NCNI” companies, 95% were small companies with fewer than 50 employees. Moreover, based on their annual sales revenue, a majority (57%) of “large” and “very large” companies were certified. Montague (2011) conducted a survey of primary hardwood manufacturers in the Appalachian hardwood region of United States and analyzed the relationship between firm size and CoC certification adoption, finding no significant difference between firm sizes in terms of certification adoption. However, this study did not research other factors related to a firm’s size (i.e., type of technology, management structure, firm structure); this could be an area of future research. Previous research (Vidal 2007) has found that the larger the company, the higher the chance of being chain of custody certified. Smaller firms are less likely to have the advance technologies that larger firms have (i.e., advanced sorting and processing technology) (Howard 1990; Cohen and Keppler 1996; Hrabovsky and Armstrong 2005). They also are less likely to have advanced quality management systems in place. This makes it more difficult and costly for them to implement COC certification. As a result, they are less likely to pursue certification (Montague 2011).
3.5 Conclusions

Increasingly, in a market of ecologically conscious consumers, a company needs to be capable of demonstrating sustainable business management acumen. This research suggests that in the BC value added wood products sector this has come to include concern for the environment. Chain of custody certification provides a powerful tool that has the potential to promote the environmental responsibilities of companies. Being a voluntary scheme, participation in chain of custody certification, depends on the decisions of individual value-added companies. Such decisions are invariably based on the net benefits that companies expect from CoC certification adoption.

This study presents an opportunity to characterize the demographics of the BC’s value-added wood products sector and to understand the dynamics of the industry and the certification adoption. Overall, the respondents were composed mainly of small- and medium-sized companies and employing fewer than 50 employees and less than $5 million sales and there is a substantial orientation towards the domestic market. Value-added activities are strongly concentrated in Metro Vancouver and to some extent in the rapidly urbanizing region of Okanagan, as well as Vancouver Island.

The survey found that 40% of the respondents had adopted CoC certification and another 13% had expressed interest in becoming certified in the next five years. Forty-six percent of the respondents had no interest in pursuing certification. The highest adoption level was among the remanufacturing subsector as they tended to consist of relatively large companies and were export oriented. All other subsectors within the value-added wood products industry have shown moderate or low levels of CoC adoption levels.
4 The State of Innovation in the BC Value-Added Wood Products Sector

4.1 Introduction

Historically, the forest industry in British Columbia (BC), Canada has been production focused with mass production and export of primary forest product commodities, such as lumber, plywood and pulp and paper (Schultz et al. 2013). However, as the resource base has deteriorated in recent decades, the growth rates of these commodities have levelled off or declined and become highly volatile while job losses have been relentless (Edenhoffer and Hayter 2013). Overall, it is perceived by many industry observers that the BC forest products industry faces a significant challenge with respect to maintaining its competitiveness into the future (Schultz et al. 2013; Innes 2009). This is true of primary and secondary (value-added) firms.

Given the current situation, enhancing innovation is increasingly seen as a path to competitive advantage and improved financial performance. Due to the rise of manufacturing in developing countries and resulting loss of competitiveness in their own domestic industries, there has been an escalation of interest in the potential for innovation among policy makers in developed countries to counteract the loss of global competitiveness and increase profitability (Hansen 2010). Contrary to the common beliefs that innovation is the key to competitiveness, the forest products industry literature provides limited evidence of this relationship (Knowles et al. 2008). The forest sector is perceived as being traditionally conservative and reluctant to adopt changes, even when these can be beneficial (Innes 2009). Hansen et al. (2014) describe forest sector companies as typically isolated, with limited knowledge transfer, and they tend to inadequately utilize market opportunities and possess a weak focus on innovation.

Nevertheless, most innovation research focusing on the forest products industry suggests that there are three primary areas of innovation: product, process, and business systems (Hovgaard and Hansen 2004; Hansen et al. 2007). Product innovation is product development in new ways that satisfy customer needs, or create new, previously unrecognized needs. Process innovation refers to improved processes such as improved efficiency in raw material utilization, computer-aided manufacturing and customized machinery (Hovgaard and Hansen 2004). Business systems innovation represents a myriad of activities that a firm can use in business and marketing management (e.g., management and marketing) (Hovgaard and Hansen 2004). Innovativeness,
on the other hand, is defined as the propensity of firms to create and (or) adopt new products, manufacturing processes, and business systems (Knowles et al. 2008). In other words, an innovative individual or firm tends to be an early adopter of new concepts, products and technologies; tends to develop or create new ideas, concepts and products; or some mix of the two (Hansen 2014).

Across forest industry sectors, financial performance is influenced by product and process innovation. Compared to primary manufacturers, secondary manufacturers appear better able to turn innovativeness into improved financial performance (Valimaki et al. 2004; Crespell and Hansen 2008). Most existing research shows a forest products industry that is focused on process innovation (Hansen 2010). The wood products industry has had a long-term focus on process innovation, particularly as it relates to cutting the cost of production of a limited range of commodity products (Innes 2009). During the twentieth century, primary wood processing (lumber production) increased its wood utilization rate from 25-30 percent of the log to over 50 percent of the log (cubic recovery) (Wagner and Hansen 2005). Among the value-added wood sector, engineered wood products such as laminated beams are a relatively new category of wood products that provide an example of product innovation (Wagner and Hansen 2005). Companies developing these products were able to open new markets not previously available to the traditional forest products industry (e.g. made-to-order beams with very large spans) (Innes 2009). Other products such as dimension lumber have remained largely unchanged over the last decades, justifying the lack of reputation of the industry for product or business systems innovation within the primary sector. Of late, the unique ways of addressing environmental issues, e.g. third-party certification, are a recent example of business systems innovation conducted by the industry (Wagner and Hansen 2005).

A range of factors hindering innovation in the forest sector have been reported in previous research. For instance, institutional and other barriers to innovation may sometimes explain the relatively slow adoption of innovations in the forest sector (Rosenberg et al. 1990; Innes 2003). There is often little space in new policies for innovation, with many government forestry departments being risk-averse and unwilling to develop policies that can promote innovation (Vosick et al. 2007). Private firms may lack the expertise and/or funding, or there may be policies in place that hinder the rapid and effective uptake of innovation (Duduman and Bouriaud
Wagner and Hansen (2005) found that larger companies in the U.S. forest products industry are more likely to adopt process innovation, but smaller companies may neutralize this competitive advantage by being more adoptive of product innovation and business system innovation, suggesting that resources and higher levels of networking increase the ability to be innovative (Crespell et al. 2008). Lack of priority, lack of slack resources (time and money), low levels of knowledge, lean centralized organizations, a traditional culture, and commodity mentality are significant barriers to innovation within forest products companies that have been identified in the literature (Hansen et al. 2007; Stendahl and Roos 2008). In a case study of a small, secondary company in Oregon, fear of change, ineffective management and poor communication were found to be major challenges to being innovative (Crespell 2008).

Innovation related research has been largely focused on the primary wood products sector; therefore insight into the innovation portfolio of the secondary or value added wood products sector is needed. Hence, this research concentrates on the context of the BC value-added wood products sector. This sector has the potential to be a champion of environmentally-friendly, ‘green’ products and create thousands of new jobs, hundreds of millions of dollars in incremental manufacturing product sales, new profits for entrepreneurs, and higher government revenue streams to pay for public services (Schultz et al. 2013). However, it has consistently failed to adopt such a role (Parfitt 2011). One reason for this failure may be that value-added wood products companies are unable or unwilling to take the risks that are inevitably associated with innovation.

This chapter attempts to explore the current situation in the BC value-added products sector with respect to innovativeness. Using the diffusion of innovations theory (Roger 2003) as a theoretical framework and CoC certification as an example of business system innovations, this chapter seeks to accomplish the following objectives:

1. Determine attitudes of BC value-added wood products manufacturers with regard to current and potential participation in CoC certification
2. Examine the current state of innovation and innovation focus in the BC value-added wood products sector
3. Study key characteristics of companies according to their degree of innovativeness
4.2 Methodology

In order to assess attitudes of certified and NCI companies towards CoC certification, variables were obtained from the perceived attributes of innovations using Rogers (2003) theory of Diffusion of Innovations. These attributes are relative advantage, compatibility, complexity, trialability, and observability which provide a useful framework for studying the adoption process (Rogers 2003). A five-point Likert-type scale ranging from 1= strongly disagree to 5= strongly agree was applied to assess the perceived attributes of certification. The questions used in the survey were developed based on these attributes. The attributes are perceived as barriers if they inhibit diffusion of CoC certification. This chapter analyses responses of section III, question 10; section II, question 11; and section IV, question 1 of the survey that related to the general perception of certified companies towards chain of custody certification, the general perception of NCI companies towards chain of custody certification, and innovativeness of certified and NCI companies, respectively. The process of implementation of a structured questionnaire is detailed in Chapter 2.

To measure innovativeness in the BC value-added wood products sector, an indirect self-evaluation scale was designed to assess the propensity of value-added manufacturers to create and (or) adopt new product, process and business systems (Knowles et al. 2008). In this study, innovativeness is defined as the propensity of firms to create and (or) adopt new products, manufacturing processes, and business systems. These categories of innovativeness were based on previous forestry industry research findings (Hovgaard and Hansen 2004; Hansen et al. 2007). This scale was composed of 9 items (see appendix A, section IV, question 1). Each of the items was assessed using five-point Likert scales with 1 being “strongly disagree” and 5 being “strongly agree”. Survey items that were considered to be indicators of product innovation include readiness to develop new products, readiness to take on a leading role in R&D for new products, and having a diversified product line. Items for process innovation included readiness to install new processing equipment, efficiency in raw material use and taking advantage of innovative processes from other leading industries. Business systems innovation included factors such as readiness to look for new customers and bear marketing costs, and readiness to train new marketing managers.
4.2.1 Data analysis

Attitudinal data were analyzed by computing means, standard error of the means and 95% confidence levels to make statistical inferences. Mean values for each variable were also tested against a mean value of three (at alpha = 0.05), considered to be the neutral value in a five-point interval scale. This test was a significance test used to verify whether means were significantly different from a neutral attitude level.

Means were calculated for each variable, i.e., type of innovativeness. For instance, a mean value for all the items related to product innovativeness (readiness to develop new products, readiness to do product research, and a diversified product line) was obtained (Table 13). A one-sample t test was used to determine if the means for these scales were significantly different from the midpoint of the scale (3). The midpoint of this scale (3) indicates a neutral position regarding firm innovativeness; therefore, testing to determine if the values are significantly different from the scale midpoint gives an indication that respondents have strong opinions regarding the innovativeness of their firms.

Cluster analysis was conducted to identify similar characteristics of companies. Three variables were chosen to study the characteristics of three clusters; company size, proportion of sales in international markets and proportion of certified companies and companies interested in certification. See Chapter 2 (section 2.3.1) for rationale behind choosing these three variables and details on cluster analysis.

4.3 Results

4.3.1 Attitudes of certified and interested companies

Certified respondents’ attitudes towards improving corporate image, compatibility with the company’s values and help in meeting requirements of other policy instruments such as LEED were significantly higher than neutral. Attitudes towards the likelihood of enhanced effectiveness of the production process were significantly lower than neutral. Other variables showed no significant difference in respondents’ attitudes from neutral.
Figure 34: Attitude of certified (n = 34) and interested (n=11) companies towards CoC certification

* = Significantly different from neutral (alpha =0.05)
As can be seen by the means in Figure 34, perception of certified companies was positive for two of the five statements that measure relative advantage attribute. More than three-quarters of certified companies agreed or strongly agreed that CoC certification improves the corporate image of their company (mean = 3.94). More than half of certified companies also believed that certification helps access new markets (mean = 3.41). In contrast, more than half of certified companies disagreed or strongly disagreed to statements that using certification enhances effectiveness of the production process (mean = 2.29) and that certification leads to increased price premiums (mean = 2.68). As revealed in the previous chapter, the issue of price premium was also perceived as one of the major barriers by NCNI companies (see Chapter 3, Figure 33). Most certified companies did not perceive that certification leads to improved communication with their customers (mean = 2.79). This indicates that a majority of certified companies did not perceive a relative advantage of certification in terms of increased price premium, enhancement of effectiveness of production process and improved communication with customers.

A majority of certified companies (68%) perceived certification to be compatible with their companies’ value proposition (mean = 3.88), and more than half of certified companies agreed or strongly agreed to the statements that the requirements of certification standards fits well with their existing processes and procedures (mean = 3.32) and that certification helps in meeting requirements of other policy instruments such as LEED, the U.S. Lacey Act and FLEGT (mean = 3.56). Forty-one percent of certified companies disagreed that certification requires significant changes in their current procedures (mean = 3.00), highlighting another aspect of compatibility where they have a generally favourable opinion.

All but one of the statements measuring the complexity attribute indicated a negative perception of certified companies. Thirty eight percent of certified companies disagreed or strongly disagreed to the statement that certification standards are easy to understand (mean = 2.88). Approximately one quarter of certified companies indicated their disagreement to the statements that the contents of standards are clear (mean = 2.94) and that the choice of standards is easy to make (mean = 2.97). Conversely, one quarter of certified companies agreed that the requirements of standards are relevant to the industry (mean = 3.12), indicating a generally positive perception. A higher mean of 3.18 to the statement significant resources are needed to train the
staff on requirements of the certification standards also reflects the higher degree of perceived complexity.

Certified companies also tended to have a generally positive perception regarding the trialability and observability attributes of certification. More than half of certified companies agreed or strongly agreed to the statement that CoC certification can be adapted or modified to suit the production process within their organization (mean = 3.41). Approximately one-quarter of the certified companies disagreed or strongly disagreed with the statement that CoC certification can be adopted on a limited basis to test the market performance (mean = 3.06). One-quarter of certified companies also agreed or strongly agreed to the statement that the benefits of using the certification within their company are obvious/visible (mean = 3.12) and 23% of certified companies perceived that the evidence regarding the impacts of using certification were available (mean = 3.18).

Figure 34 also shows that most of the responding companies that were interested in becoming chain of custody certified (NCI) had positive views about most of the statements (with a score of 3 being the neutral). For seventeen out of eighteen statements the mean indicated strong agreement or agreement expressed by the respondents (a rating above 3). Respondents disagreed most strongly with the statement “Using CoC certification will enhance effectiveness of the production process” (a mean rating of 2.80).

NCI respondents have strong positive views (mean 4.0 or above) regarding at least 7 statements, with the statement “CoC certification can be adapted or modified to suit the production process within my organization” having the highest mean value at 4.40, showing a strong positive perception towards trialability attribute of CoC certification. Respondents also agreed strongly (mean 4.40) to the statement “CoC certification will help in meeting requirements of other policy instruments such as LEED, Lacey Act and FLEGT”. This is an indication of one of the main reasons for their interest in certification as they perceive CoC certification to be compatible with other market driven instruments.

The statement “CoC certification will lead to increased price premiums on certified products” achieved a mean score of 4.30 which indicates that many interested companies perceived the relative advantage of CoC certification positively. All statements except one that measure
complexity attribute had means higher than 3, but lower than 4. The overall mean for responses to the five statements measuring complexity was 3.72, which was lower than those of relative advantage (mean = 3.76), compatibility (mean =3.92), trialibility (mean =4.05) and observability (mean = 3.9).

4.3.2 Innovativeness in the BC value-added wood products sector

Table 14 shows results of the propensity to create and (or) adopt innovation, which indicates that the major focus of the value added industry was on business systems (market) innovation. Business systems innovation was rated the highest on the scale with the propensity to look for new customers having a highest mean value of 4.18. The overall mean for business systems innovation was 3.6 compared to the means of 3.5 for both product and process innovation. The respondents were less ready to take a leading role in R&D for new products, having the lowest mean (3.10) among all items that measure innovativeness. Among the items measuring product innovation, the propensity to develop new products (mean 3.80) and having diversified product lines (mean 3.85) were rated higher than the propensity to involve in R&D (mean 3.10) and were found to be significantly different than the midpoint (3). The propensity of efficient raw material use (mean 3.90) and the propensity to install new processing equipment (mean 3.38) were also found to be statistically significant among the items measuring process innovation.

Table 14: Results of propensity to create and (or) adopt measures of innovativeness in BC value-added wood products sector

<table>
<thead>
<tr>
<th>Measurement</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our company is always seeking ways to develop new products*</td>
<td>40</td>
<td>3.80</td>
<td>.120</td>
<td>.000</td>
</tr>
<tr>
<td>Our company takes leading role in R&amp;D for new products</td>
<td>40</td>
<td>3.10</td>
<td>.128</td>
<td>.440</td>
</tr>
<tr>
<td>Our company has a diversified product line*</td>
<td>40</td>
<td>3.85</td>
<td>.137</td>
<td>.000</td>
</tr>
<tr>
<td>Our company is always ready to install new processing equipment*</td>
<td>40</td>
<td>3.38</td>
<td>.133</td>
<td>.005</td>
</tr>
<tr>
<td>Our company is very efficient in raw material use*</td>
<td>40</td>
<td>3.90</td>
<td>.104</td>
<td>.000</td>
</tr>
<tr>
<td>Our company takes advantage of innovative processes from other leading</td>
<td>40</td>
<td>3.22</td>
<td>.128</td>
<td>.071</td>
</tr>
<tr>
<td>Our company is ready to look for new customers*</td>
<td>40</td>
<td>4.18</td>
<td>.101</td>
<td>.000</td>
</tr>
<tr>
<td>Our company is ready to bear the cost of marketing for products promotion*</td>
<td>40</td>
<td>3.57</td>
<td>.118</td>
<td>.000</td>
</tr>
<tr>
<td>Our company is ready to train new marketing managers</td>
<td>40</td>
<td>3.18</td>
<td>.118</td>
<td>.147</td>
</tr>
</tbody>
</table>

* Denotes significantly different from midpoint of scale (3) at alpha = 0.05
(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)
A cluster analysis was conducted to identify groups of value-added companies according to their degree of innovativeness. The data used for this analysis was collected from question 1, section IV of the survey, which comprised 9 variables that measure product, process and business systems innovations on a 5-point Likert scale. As indicated in Chapter 2 section 2.3.1, solutions for both three and two clusters were explored.

4.3.2.1 Three-cluster solution

As shown in Table 15, Cluster 1 had 17 companies, whereas Cluster 2 and Cluster 3 had 19 and 4 companies, respectively. Final cluster centres and the distances among them are presented in Tables 16 and Table 17, respectively. Means of the final clusters were computed for each cluster. The mean for Cluster 1 was 3.7 indicating that respondents grouped in this cluster tend to “agree” that they were innovative in terms of product, process and business systems innovations. With a mean of 3.2, respondents from Cluster 3 tend to have a “neutral” opinion about innovativeness of their firms. Respondents from Cluster 2 are between “agree” and “neutral” with a mean of 3.4.

Table 15: Number of cases in each cluster

<table>
<thead>
<tr>
<th>Cluster</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>17.00</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>19.00</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4.00</td>
</tr>
<tr>
<td>Valid</td>
<td></td>
<td>40.00</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)
Table 16: Final cluster centres

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our company is always seeking ways to develop new products</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Our company takes leading role in research &amp; development for new products</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Our company has a diversified product line</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Our company is always ready to install new processing equipment</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Our company is very efficient in raw material use</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Our company takes advantage of innovative processes from other leading</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Our company is ready to look for new customers</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Our company is ready to bear the cost of marketing for products promotion</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Our company is ready to train new marketing managers</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Cluster Centre Means

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.7</td>
<td>3.4</td>
<td>3.2</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Table 17: Distances between final cluster centres

<table>
<thead>
<tr>
<th>Cluster</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.00</td>
<td>1.991</td>
<td>3.411</td>
</tr>
<tr>
<td>2</td>
<td>1.991</td>
<td>0.00</td>
<td>2.395</td>
</tr>
<tr>
<td>3</td>
<td>3.411</td>
<td>2.395</td>
<td>0.00</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

In order to establish profiles of the clusters, the characteristics of each cluster were identified. Table 18 shows variables used to study distinct characteristics of the clusters, including average number of employees, average percentage of export volume (USA and Europe), and proportion of certified and non-certified but interested companies.

Table 18: Characteristics of the three clusters

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1 n= 17</th>
<th>Cluster 2 n= 19</th>
<th>Cluster 3 n= 4</th>
</tr>
</thead>
<tbody>
<tr>
<td># Employees</td>
<td>68.59</td>
<td>20.0</td>
<td>146.0</td>
</tr>
<tr>
<td>Sales Destination</td>
<td>USA 42.31%</td>
<td>Europe 9.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certification Status</td>
<td>Certified 76.47%</td>
<td>Not certified interested 23.53%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster Centres Means</td>
<td>3.7</td>
<td>3.4</td>
<td>3.2</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)
One-way ANOVA was used to verify if there were any significant differences (alpha = 0.05) between the means of number of employees and sales percentages in the USA and Europe for the three clusters. Results of the ANOVA tests showed that the means of number of employees, sales percentages in USA and European markets were not significantly different for the three clusters (Tables 19, 20 and 21).

Table 19: One-way ANOVA for average number of employees of the three clusters

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>87721.825</td>
<td>2</td>
<td>43860.913</td>
<td>2.272</td>
<td>.118</td>
</tr>
<tr>
<td>Within Groups</td>
<td>694925.765</td>
<td>36</td>
<td>19303.493</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>782647.590</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 20: One-way ANOVA for percentage of export volume in USA in the three clusters

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.375</td>
<td>2</td>
<td>.188</td>
<td>2.409</td>
<td>.108</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2.182</td>
<td>28</td>
<td>.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.557</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21: One-way ANOVA for percentage of export volume in Europe in the three clusters

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.065</td>
<td>2</td>
<td>.032</td>
<td>1.101</td>
<td>.364</td>
</tr>
<tr>
<td>Within Groups</td>
<td>.353</td>
<td>12</td>
<td>.029</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.418</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Z-test was used to compare the proportions of certified companies among the three clusters. The results are summarized in Table 22. The Z-tests indicated that the proportion of certified companies were not significantly different (alpha level of 0.017) in the three clusters.
Table 22: Z-test for proportion of certified companies in the three clusters

<table>
<thead>
<tr>
<th></th>
<th>Z-test</th>
<th>Z-critical</th>
<th>Alpha Level</th>
<th>Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1 x Cluster 2</td>
<td>0.193</td>
<td>± 2.39</td>
<td>0.017</td>
<td>No</td>
</tr>
<tr>
<td>Cluster 1 x Cluster 3</td>
<td>0.253</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Cluster 2 x Cluster 3</td>
<td>-0.054</td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Even though the mean number of employees, average sales in USA and Europe and proportion of certified companies are not significantly different for the three clusters, a distinct trend is noted showing the following:

Cluster 1 showed relatively positive views towards innovativeness and composed of medium sized companies with more than half (51.9%) of their sales volume being exported to USA and Europe. Companies in Cluster 1 had more than two-thirds (76.47%) of certified companies, which was the highest among the three clusters.

Cluster 3, which showed a neutral view towards innovation comprised large companies with slightly less percentage of export volumes to USA and Europe than Cluster 1 (51% vs 42%). The proportion of certified companies (75%) was also slightly lower in this Cluster than in Cluster 1.

Cluster 2 can be described as consisting of small companies with lowest export volumes to the USA and Europe among the three Clusters and less than one-third certified companies, lowest among three Clusters.

4.3.2.2 Two-cluster solution

The three-cluster solution produced above resulted in underrepresentation of Cluster 3 with a membership of only 4 companies, therefore a two-cluster solution was explored that allowed analyzing two clusters with equal sample sizes. Table 23 shows the two-cluster solution with 20 companies in each cluster. Final cluster centres and the distances between them are presented in Tables 24 and Table 25, respectively. Means of the final clusters were computed for each cluster. The mean for Cluster 1 was 3.8 indicating that respondents grouped in this cluster tend to “agree” that they were innovative in terms of product, process and business systems innovations. With a mean of 3.2, respondents from Cluster 2 tend to have a “neutral” opinion about innovativeness of their firms.
Table 23: Number of cases in each cluster

<table>
<thead>
<tr>
<th>Cluster</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Valid</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td>.000</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Table 24: Final cluster centers

<table>
<thead>
<tr>
<th></th>
<th>Cluster</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Our company is always seeking ways to develop new products</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company takes leading role in research &amp; development for new products</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company has a diversified product line</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company is always ready to install new processing equipment</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company is very efficient in raw material use</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Our company takes advantage of innovative processes from other leading</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company is ready to look for new customers</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Our company is ready to bear the cost of marketing for products promot</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Our company is ready to train new marketing managers</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cluster Centre Means</td>
<td>3.8</td>
<td>3.2</td>
<td></td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Table 25: Distances between final cluster centers

<table>
<thead>
<tr>
<th>Cluster</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2.182</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.182</td>
<td></td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

In order to establish profiles of the clusters, the characteristics of each cluster were identified. Table 26 shows variables used to study distinct characteristics of the clusters, including average number of employees, average percentage of export volume (USA and Europe), and proportion of certified and non-certified but interested companies.
Table 26: Characteristics of the two clusters

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1 (n=20)</th>
<th>Cluster 2 (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td># Employees</td>
<td>42.1</td>
<td>91.75</td>
</tr>
<tr>
<td>Sales Destination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>24.47%</td>
<td>37.33%</td>
</tr>
<tr>
<td>Europe</td>
<td>18.27%</td>
<td>12.50%</td>
</tr>
<tr>
<td>Certification Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certified</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>Not certified interested</td>
<td>20%</td>
<td>30%</td>
</tr>
<tr>
<td>Cluster Centres Means</td>
<td>3.8</td>
<td>3.2</td>
</tr>
</tbody>
</table>

(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Cluster 1 was associated with a full time employee mean of 42.1 (SE = 17.705). By comparison Cluster 2 was associated with numerically larger numbers of full time employees with M = 91.75 (SE = 41.404) (Table 27). To test the hypothesis that the two clusters were associated with statistically significantly different mean numbers of full time employees, an independent samples t-test was performed. As can be seen in Table 28, the assumption of homogeneity of variances was tested and was found statistically different via Levene’s F test, F(37) = .032. However, Welch’s t-test (with equal variances not assumed) showed no significant difference between the numbers of full time employee means in the two clusters.

Table 27: Descriptive statistics associated with number of full-time employees in two clusters

<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time employees</td>
<td>1</td>
<td>20</td>
<td>42.11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20</td>
<td>91.75</td>
</tr>
</tbody>
</table>

Table 28: Independent samples t-test for average number of employees in two clusters

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Full-time employees</td>
<td>4.984</td>
<td>.032</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-1.102</td>
<td>25.677</td>
</tr>
</tbody>
</table>

Independent sample t-tests were used to verify if there were any significant differences (alpha = 0.05) between the means of sales percentage in the USA and Europe for the two clusters. Results of the t-tests showed that the means of sales percentages in USA and European markets were not significantly different for the two clusters (Tables 29, Table 30).
Table 29: Descriptive statistics associated with percentage of export volume in USA & Europe in two clusters

<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Destination USA</td>
<td>1</td>
<td>16</td>
<td>.4922</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
<td>.6227</td>
</tr>
<tr>
<td>Sales Destination Europe</td>
<td>1</td>
<td>11</td>
<td>.4233</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4</td>
<td>.3177</td>
</tr>
</tbody>
</table>

Table 30: Independent samples t-test for percentage of export volume in USA & Europe in two clusters

<table>
<thead>
<tr>
<th>Sales Designation USA</th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>F 8.570, Sig. .007</td>
<td>t -1.256, df 29, Sig. 2-tailed .219</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>F -1.235, df 22.013, Sig. .230</td>
<td></td>
</tr>
<tr>
<td>Sales Destination Europe</td>
<td>Equal variances assumed</td>
<td>F .412, Sig. .532</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>F .870, df 4.067, Sig. .432</td>
<td></td>
</tr>
</tbody>
</table>

Table 31: Z-test for proportion of certified companies in the two clusters

<table>
<thead>
<tr>
<th>Cluster 1 x Cluster 2</th>
<th>Z-test</th>
<th>Z-critical</th>
<th>Alpha Level</th>
<th>Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.73</td>
<td>± 1.96</td>
<td>0.05</td>
<td>No</td>
</tr>
</tbody>
</table>

A Z-test was used to compare the proportions of certified companies between the two clusters. The results are summarized in Table 30. The Z-tests indicated that the proportion of certified companies was not significantly different (alpha level of 0.05) between the two clusters.
4.4 Discussion

4.4.1 Attitudes towards chain of custody certification

The survey indicated a difference in attitude towards CoC certification between the two groups of respondents. This may be because non-certified but interested (NCI) companies had not yet adopted the CoC certification, so their responses reflect more their expectations, whereas respondents from the certified companies (CC) were more indicative of their actual experiences. From the survey results, it can be generalized that non-certified but interested companies (NCI) were relatively optimistic about economic benefits of CoC certification, whereas the actual experience of certified companies demonstrates that certification provides less tangible benefits.

According to this study, the certified manufacturers considered a company’s corporate image and meeting regulatory requirements of LEED certification as the two most important determining factors for adopting CoC certification, a result that is consistent with the findings of previous studies (Perera et al. 2008; Chen et al. 2011; Ganguly et al. 2013). CoC certification appears to imply that a company is managing its business well and is showing ethical and environmental responsibility. The fact that a company has been awarded the CoC certification by an independent third-party enhances perceived reliability. Brand protection is a key issue for many leading companies (Marx 2011). The proliferation and internationalization of environmental non-governmental organizations establishing themselves as effective influencers through the use of media strategies, have forced organizations to take civil society concerns into account (Bartley 2003). Joining a voluntary sustainability initiative can be a strategy to protect a firm’s reputation, especially when independent external parties certify products and production processes and hence provide assurance on the efforts made by companies to manage for example social issues (Marx 2008).

The non-certified but interested (NCI) companies in this study were generally optimistic about certified wood markets and believed that certification had the potential to command price premiums and would help meet regulatory requirements for LEED certification. The current Canadian procurement requirements involve a commitment from the Public Works and Government Service Canada to achieve LEED (Leadership in Energy and Environmental Design) Gold standard certification for all new public buildings (Government of Canada 2010).
Such policies create a momentum and spawn additional certification among manufacturers that are interested in bidding for such projects because wood products certified by an FSC standard contribute, in a very minor way, to certification under the LEED standard (Tikina et al. 2012).

Seeking market benefits in addition to compatibility with companies’ values, such as access to new markets, also appears to be a major motivation for both groups to adopt CoC certification. Both groups were also of the view that CoC certification does not enhance the efficiency of the production process. The most likely explanation for the inability to enhance efficiency is that maintaining certification requires an enormous amount of paperwork and tracking or the allocation of physical space for separating the CoC-certified products from other products (Chen et al. 2011).

Non-certified companies did not perceive CoC certification to be a complex process, which is not surprising given that they have not actually adopted certification and they have not therefore been exposed to the particularities of the overall CoC process and standards. On the other hand, even though certified companies had a general belief that the CoC standards are relevant to the value-added wood products industry, they perceived CoC certification to be a relatively complex process. Certified companies indicated difficulty in factors such as understanding CoC standards, choosing the right certification scheme, and unclear contents of CoC standards. Furthermore, CoC certification requires significant resources to train staff, which adds extra burden on these manufacturers. According to Fischer et al. (2005), the diversity of ecolabels, reflecting the multitude of certification schemes, can be confusing to customers and weaken the credibility of all labels. Coordination and competition in the field of certification has been cited as a major challenge to the legitimacy of certification schemes (Marx 2011). Different organizations that essentially have the same social and environmental goals are currently operating alongside one another. Competition between certification systems can lead to a race to the bottom in terms of enforcement mechanisms in order to increase market share (Marx 2014). However, initiatives have been developed to achieve greater cooperation among certification schemes (Fischer 2005). For example, PEFC has developed and adopted mutual recognition for various national forest certification programs in an effort to establish a common certification framework.
4.4.2 Innovativeness

The results of the innovativeness assessed using the propensity to create and (or) adopt scales showed mean values closer to the scale midpoint (3) than to the upper end of the scale (5) for all types of innovativeness, with the exception of propensity to look for new customers. This indicates that overall the value-added wood manufacturers do not have strong, positive views on the innovativeness of their firms. This result shows that the value-added wood products sector also follows the trend of primary manufacturers in terms of innovativeness. A study conducted by Knowles et al. (2008) assessed the innovativeness of softwood sawmills in the US and Canada found that respondents did not have strong positive views about the innovativeness of their mills.

In this study, the respondents had positive views regarding only one item concerning business systems innovativeness which showed favorable opinion to their propensity to look for new customers. This is encouraging given the fact that the industry focus appears to be primarily on existing customers versus new customers; as a result, innovations tend to be incremental as opposed to radical (Hansen 2006). Customer focus includes not merely reacting to existing customer demands but proactively seeking to meet the needs of new customers and changing needs of existing customers (Leavengood and Anderson 2010). According to Hansen (2006) firms rely heavily on customers for innovative ideas. Customers can be significant drivers of innovation and successful new product development (NPD) by maintaining close connections with customers during development. Experts suggest that the industry needs to shift to a market oriented culture in order to improve innovation performance and a major component of such a shift includes how firms interact with their customers and competitors (Leavengood and Bull 2014). Many value-added wood product manufacturers in BC lack in-house capacity and resources to design and develop new products (Schultz et al. 2013). Unfortunately, there is insufficient recent empirical data in BC to suggest which new products have the greatest growth potential, which markets should be pursued and which products best match with its current resource base, and this gap in knowledge must be filled with future research in this area.

The survey found that the major focus of the value-added industry was on business systems (market) innovation. Wagner and Hansen (2005) found that smaller companies are more likely to adopt business system innovations whereas larger companies outrun smaller companies in
process innovation since the capital enjoyed by large companies allows them to excel in process innovation. Hence, this study follows the trend explained by Wagner and Hansen (2005) considering the fact that value-added wood products industry is mostly composed of small and medium sized enterprises (see Chapter 3, Figure 13) and are more oriented towards business systems innovations. In another study of 587 U.S. firms, Cohen and Klepper (1996) found that large firms have a greater incentive to pursue both process and product innovations. However, these firms face a relatively larger incentive to undertake process and more incremental innovations as compared to small firms. The survey found that the respondents were least innovative with respect to taking a leading role in R&D for new products. R&D and innovation are inextricably connected (Leavengood and Lyndall Bull 2014). Capacity to innovate is a central factor for any value added wood industry, and government plays a major role in all cases through direct investment in research and education (Schultz et al. 2013). Despite the presence of world class universities in BC focusing on wood products related research as well as industry-focused research institutions such as FPInnovations, the research capacity is significantly challenged to address the research and technology interests and needs of the value added wood sector (Schultz et al. 2013). As the sector is composed primarily of small and medium sized enterprises, and management capacity is routinely focused on their normal business operations, with a lack of organizational slack to focus on short and long term research interests. Hence, individual engagement between them and the research infrastructure is particularly challenging.

In this study both the three-cluster solution and the two-cluster solution did not reveal any significant difference among the clusters for the company size (measured by number of full-time employees) and the proportions of export sales volume to the USA and Europe. According to Wagner and Hansen (2006), environmental certification and a corporate focus on exports are two successful initiatives in business systems innovation. Previous studies on the determinants of innovations have found that, among other things, exporting firms are more inclined toward innovating. Becker and Egger (2009) performed empirical analysis of the effects of new product versus process innovations on export propensity at the firm level using survey data from German firms. They found that firms that perform both process and product innovation have a higher probability to export than firms that do not innovate; however, when performed alone, product innovation is more determinant in the exporting behavior of a firm than was process innovation. In another study involving a sample of firms in the German state of Lower Saxony, Wagner
(1996) reported a positive impact of new products introduced on exports. Wakelin (1998), working with British data, found a positive impact of innovating on the intensive and extensive margins of exports at the firm level.

Both the three-cluster solution and the two-cluster solution did not find any significant difference among the clusters with respect to the proportion of certified companies though the general trend in two-cluster solution indicated that companies in the cluster with the greater proportion of certified companies had more positive views about innovativeness. Due to changing market requirements and globalization, companies in the forest sector are shifting to forest sustainability, environmental concerns, and certification processes to demonstrate their sustainability credentials (Leavengood and Bull 2014). Measures introduced to control illegal wood in United States and Europe such as the Lacey Act amendments and the EU Timber Regulation, respectively, may help boost interest in certification, since certification is generally regarded as a pathway for addressing legality requirements (UNECE 2012). This explains the trend shown in two-cluster solution that certified companies tend to be more innovative in business systems innovations.

4.5 Conclusions

Identification of the main driving forces revealed some dissimilarities in the motivation and attitudes between the currently certified (CC) and non-certified but interested (NCI) respondents. Among the NCI companies, initiation of the forest certification process is motivated by external factors, mainly linked to the price premiums and participation in LEED projects. Certified companies, on the other hand, appear to be affected by both internal and external factors, in particular, internal corporate policies that view certification as being compatible with their company’s values and corporate image, as well as meeting external market demand such as meeting LEED requirements. Certified companies did not consider the price premium an added benefit in the adoption of certification. They identified certification to be a complex process with high costs and also saw the lack of certified raw material as another important impediment to CoC certification. Nevertheless, both groups of respondents were of the view that CoC certification is compatible with their company’s values. Finally, the study revealed that insufficient customer demand for certified products, high costs, and the lack of price premiums
were the three most important reasons specified by non-certified not interested (NCNI) respondents for not adopting CoC certification.

The aim in this chapter was to provide novel insights in the state of innovation in the BC value-added wood products sector. Innovation has been overall very slow in this sector, and largely restricted to the business systems innovation as the results point to the importance of business systems innovation relative to product and process innovation. Very few of the items measuring innovativeness were rated significantly higher than the midpoint of the scale. Those that were rated higher than the midpoint are propensity to look for new customers (business systems innovation), efficiency in raw material use (process innovation), and diversified product line (product innovation). Cluster analysis revealed that companies with the greatest proportions of certification adoption tend to be more innovative mainly in order to satisfy the market requirements. However, the study could not find any statistically significant relationship between the certification adoption and innovativeness of the firms.

The findings of this research suggest that companies should refocus their innovation efforts on product and process innovation as they may benefit from a more well-balanced portfolio approach to innovation and a more structured approach to business systems innovation. The increasing importance of environmental issues, the rising competition with low-cost manufacturers in developing countries, the evolution of entirely new products, and many other changes will result in a very different sector to what is present today. To cope with these changes and to remain globally competitive, the value-added wood products sector will need a massive change with the adoption of genuine innovation as a prerequisite for the continued success of the sector.
5 A Change Management Model for the Adoption of Chain of Custody Certification in the BC Value-Added Wood Products Sector

5.1 Introduction

Change is defined as the continuous process of an organization’s attempt to align itself with shifts in its marketplace and with the realities of its external financial, physical, social, political and technological environment (Evans and Schaefer 2001). Change management has been defined as ‘the process of continually renewing an organization’s direction, structure, and capabilities to serve the ever-changing needs of external and internal customers’ (Moran and Brightman 2001).

Organizations are continually facing with the need to change their structures, objectives, processes, and technologies (Al-Shamlan et al. 2011). Thus, in order to remain competitive and relevant it is necessary for organizations to undergo constant change, yet two-thirds of all organizational change initiatives fail (Balogun and Hailey 2004). This may indicate a basic lack of a valid framework of how to successfully implement and manage organizational change since what is currently available is a wide range of contradictory and confusing theories and approaches, which are mostly lacking empirical evidence and often based on unchallenged hypotheses regarding the nature of contemporary organizational change management (Todnem 2005).

For manufacturing enterprises, change management has become an unavoidable necessity since change in business processes carries significant impact on the performance of manufacturing companies; hence a change management model is definitely required to remain competitive (Ayhan 2013). For instance, in order to remain competitive, organizations in the wood products industry implement broad range of changes in many operational aspects including labour, land, manufacturing, marketing, supply chain, business strategies, staffing requirements or technology (Hansen et al. 2002; Baldwin 1984 and Brinberg et al. 2008).

Manufacturing systems have evolved in response to changes in the ecological systems such as global warming and a decline of natural resources (Ayhan et al. 2013). In recent years, transnational and domestic nongovernmental organizations have created non–state market–driven (NSMD) governance systems whose purpose is to develop and implement
environmentally and socially responsible management practices (Bernstein and Cashore 2007). The emergence of ecologically sustainable organizations has been argued to be dependent upon the institutionalization of environmental beliefs and processes into the very fabric of modern organizations (Purser 1994; Harris and Crane 2000). This calls for an extreme change in management philosophy, whereby organizational actions will need to go beyond technical fixes and embrace new environmentally responsible values, beliefs and behaviors (Harris and Crane 2000). In the wood products sector, many wood products companies are changing their corporate strategy by addressing environmental issues through initiatives like third-party environmental certification, an example of business systems innovation (Wagner and Hansen 2005). There are a growing number of studies that have measured the adoption level of chain of custody certification within the wood products industry in various jurisdictions and evidence in almost all studies suggest low levels of adoption (Espinoza et al. 2012; Chen et al. 2011; Montague 2011). However, to date, no study has extended their work into the intricacies of certification adoption in the light of organizational change management. This chapter has two main aims. First, it seeks to establish a change management framework using the ADKAR (awareness, desire, knowledge, ability, reinforcement) model for the value-added wood products sector to facilitate adoption of chain of custody certification. Second, the chapter identifies, explores and discusses those factors which organizations viewed as acting as barriers or facilitators to change.

5.1.1 Change management models

A multitude of change models exist for explaining and fostering organizational change. For example, the McKinsey 7S Model developed by Peters and Waterman (1990) breaks down an organization into seven elements which make up the organization, namely shared values, strategy, structure, systems, style, staff, and skills. By gaining better alignment between the 7S’s, organizations can effectively diagnose issues and plan organisational change processes (Kliewe et al. 2013). Another change management model was developed by Kurt Lewin (1947) which has been ‘profoundly influential’ (Lawler and Sillitoe 2010) in informing the development of debate in this area. This model consists of three distinct steps or phases, namely; unfreeze, change, and re-freeze. Basically, this means that inertia/resistance has to be overcome first (unfreeze) before change can occur (change) and the new situation can be stabilized (refreeze).
Yet another model was presented in Kotter’s (1996) book ‘Leading Change’. Kotter suggests an eight-step process for creating organizational change, including (1) establishing a sense of urgency, followed by (2) creating a guiding coalition, (3) developing a vision and strategy, (4) communicating the change vision, (5) empowering broad-based action, (6) generating short term wins, (7) consolidating gains and producing more change, and finally (8) anchoring new approaches in the culture. Kotter (1996) argues that if implemented systematically, one step after the other, it will lead to successful change. The Kotter model has had wide use in organizational change and development programs and represents a systematic approach that includes various levels of the organization from executive management to line employees (Lawler and Sillitoe 2010).

While all three models provide valuable insights into change management, none was considered optimal to investigate the change of an organisation towards adopting market innovation such as CoC certification. McKinsey’s 7s Model focuses on building blocks, but it provides insufficient guidance on the change process itself as well as at the individual’s level change. Lewin’s unfreeze-change-refreeze model, on the other hand, provides a too simplified look at the innovation change process not being able to handle its complex nature. Finally, Kotter’s eight-step model provides a detailed reflection of the change process, but does not put enough emphasis on the individual’s perception which is recognized as being a key component in change management in respect to innovation (Kliewe et al. 2013).

Since people rather than processes are the main priority of any successful and sustainable change management approach (Tierney 1998; McAlpine and Jackson 2000; Dawson and Jones 2003), the ADKAR (awareness, desire, knowledge, ability, reinforcement) model developed by Hiatt (2006) has been highly valued for its separate consideration of the change process at the individual’s level (Kliewe et al. 2013). Each ADKAR element builds off one another to provide strong plan development, to evaluate and decrease resistance, and to promote knowledge, implementation, and reinforcement for change sustainability (Hiatt 2006). The ADKAR model for change management is a simplified way to implement complex changes at an individual level within organizations and seems most appropriate for this study. The model was developed based on analysis of research data from over 900 organizations over a 10-year period (Hiatt 2008). Aside from being a relatively newer model that captures the complexities and the realities of
today’s business world, the tenets of the ADKAR model may help diffuse the CoC adoption and steepen the S-shaped curve (see Figure 6) of adoption in the early stages of diffusion.

While all the models that have been considered are simplifications of the real world. None are guaranteed to accommodate all circumstances, or provide a reliable basis for understanding why things are the way they are. Depending on the circumstances and purpose, some models might have greater utility than others. Nevertheless, Hayes (2010) identified three characteristics of a “good” change management model:

1. Is relevant to the particular issues under consideration
2. Helps change agents to recognize cause-and-effect relationships
3. Focus of elements that they can influence

The ADKAR model appears to meet the above three criteria in the scope of this study since it is relevant to the CoC certification and covers the most important issues that are influence the adoption process such as awareness and knowledge. The model also identifies the barrier points which helps change agents in recognizing where the change process is failing and finally it focuses on elements where the change agents can intervene to facilitate the change process.
5.2 Methodology

A questionnaire designed to measure change management constructs was developed and administered to the BC value-added wood products manufacturers (see Appendix A, Section IV, question 2). This section was based on the ADKAR model of change management, namely Awareness, Desire, Knowledge, Ability and Reinforcement. The process of administration of the structured questionnaire as well as the data collection methods are detailed in Chapter 2.

A five-point Likert-type scale ranging from 1= strongly disagree to 5= strongly agree was applied to assess the organization’s perception on each of the change management constructs. Means and standard error of the means (SE) were computed in order to position the relative importance of each item. A one-sample $t$ test was used to determine if the means for these scales were significantly different from the midpoint of the scale (3). The midpoint of this scale (3) indicates a neutral position regarding firm’s perception about change management constructs; therefore, testing to determine if the values are significantly different from the scale midpoint gives an indication that respondents have strong opinions regarding the change management constructs.

Based on ADKAR model, a change management framework was developed that aims to facilitate adoption of chain of custody certification by the value-added wood products sector.

5.3 Results

Table 32 shows results of the change management constructs in relation to CoC certification adoption. The mean values for all items were closer to the scale midpoint (3) than to the upper end of the scale (5) for all change management constructs. This indicates that overall the value-added wood manufacturers do not have strong, positive views on any of the ADKAR items. Results indicated that that the major barriers in adopting CoC certification relate to the “ability” to implement change. For example, availability of certified raw materials was rated the lowest on the scale with a mean of 2.97. The statement “our company is environmentally conscious” was rated with the highest mean (mean 4.20). The second highest mean was achieved by the statement that “our company understands the business reasons for introduction of CoC program” (mean 3.92), followed by the statement “our company understands the goals/objectives of CoC program”.
Table 32: Results of ADKAR

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Std. Error Mean</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand business reasons for introduction of CoC*</td>
<td>3.92</td>
<td>.075</td>
<td>.000</td>
</tr>
<tr>
<td>Understands the issues being addressed by the CoC*</td>
<td>3.73</td>
<td>.107</td>
<td>.000</td>
</tr>
<tr>
<td>Understands the impact of the CoC *</td>
<td>3.65</td>
<td>.092</td>
<td>.000</td>
</tr>
<tr>
<td>Understands the goals/objectives of the CoC *</td>
<td>3.80</td>
<td>.096</td>
<td>.000</td>
</tr>
<tr>
<td>Our company is environmentally conscious*</td>
<td>4.20</td>
<td>.073</td>
<td>.000</td>
</tr>
<tr>
<td>Certification has environmental benefits*</td>
<td>3.72</td>
<td>.124</td>
<td>.000</td>
</tr>
<tr>
<td>Feel pressured by customers to supply certified wood*</td>
<td>3.38</td>
<td>.155</td>
<td>.020</td>
</tr>
<tr>
<td>Feels pressured by outside groups</td>
<td>3.18</td>
<td>.138</td>
<td>.213</td>
</tr>
<tr>
<td>Access to information about benefits of certification*</td>
<td>3.63</td>
<td>.085</td>
<td>.000</td>
</tr>
<tr>
<td>Participated in other certification/quality management</td>
<td>3.13</td>
<td>.172</td>
<td>.473</td>
</tr>
<tr>
<td>Adequate certified raw material supply</td>
<td>2.97</td>
<td>.170</td>
<td>.884</td>
</tr>
<tr>
<td>Sufficient resources to implement CoC systems*</td>
<td>3.52</td>
<td>.129</td>
<td>.000</td>
</tr>
<tr>
<td>Chain of Custody leads to public recognition</td>
<td>3.25</td>
<td>.128</td>
<td>.058</td>
</tr>
<tr>
<td>Increased sales or new customers*</td>
<td>3.38</td>
<td>.132</td>
<td>.007</td>
</tr>
</tbody>
</table>

* Denotes significantly different from midpoint of scale (3) at alpha = 0.05
(1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

The overall mean for “Ability” was 3.24, which was lowest among all ADKAR constructs, followed by “Reinforcement” and “Knowledge” with means of 3.31 and 3.38, respectively. On the other hand, the overall mean for “Awareness” (mean = 3.77) was highest among all constructs, followed by “Desire” (mean 3.68). This indicates that the sector appears to have awareness and desire for adoption of CoC certification but knowledge, ability and reinforcement appear to be barriers. Means for each of the items in ADKAR were computed with confidence intervals (Figure 35).
Figure 35 shows that 86% of the respondents either agreed or strongly agreed to the statement that “our company understands the business reasons for introducing CoC certification program”. More than two-thirds (71%) of the responding companies either agreed or strongly agreed to the statement that “our company understands the issues being addressed by CoC” while two-thirds (66%) agreed or strongly agreed to the statement that “understand the impact of CoC”. Results also showed that 98% of the responding companies agreed or strongly agreed to the statement that “our company is environmentally conscious”. The statement that “certification has environmental benefits” was favored by 73% of the responding companies. Half (50%) of the responding companies felt they “were pressured by their customers to supply certified wood” whereas more than one-third (35%) agreed or strongly agreed to the statement that “our company has pressure from outside groups to adopt certification”.
A majority (65%) of the responding companies agreed or strongly agreed to the statement that “our company has access to information regarding CoC certification”. Nearly half (48%) of the responding companies agreed or strongly agreed to the statement that “our company has previously participated in other certification/quality management programs”.

The biggest barrier appears to be the “adequate supply of certified raw materials” which was cited as a problem by 43% of the responding companies. Even though the majority (63%) of responding companies agreed or strongly agreed that they have sufficient resources to implement CoC program, most companies did not believe CoC certification would lead to increased sales or new customers or public recognition for that matter.
5.4 Discussion

The data collected to assess the organizations’ perceptions of CoC certification concepts, perceived barriers and willingness to implement CoC systems identified gaps that guided the planning of various implementation strategies and tactics. Table 32 outlines the implementation plan, key tactics, and interventions that would allow organizations to move from one step to the next, thereby building the capacity for change. Table 33 provides a framework that summarizes the points of interventions that would help in implementing the change (CoC adoption) successfully in BC value-added wood products sector. The most important points of interventions are included in the ADKAR framework. Table 34 is a “Roles and Responsibilities
Matrix” which identify and clarify the roles and responsibilities of different stakeholders in each aspect of the adoption process.

Table 33: A framework for CoC certification adoption using ADKAR model

<table>
<thead>
<tr>
<th>ADKAR model for change management</th>
<th>Strategies</th>
<th>Key tactics and interventions</th>
</tr>
</thead>
</table>
| **Awareness of the need for change** | Awareness about the change in adoption of CoC, what the change entails and how change should be made i.e. awareness knowledge | - Change agents to create awareness through workshops, seminars, trade fairs and direct visits to organizations  
- Build awareness of why CoC adoption is needed  
- Distribute CoC related literature in the organization |
| | Develop and communicate vision for the change and future state, business reasons, scope, timeline and seek input from stakeholders | - Develop a vision, objective, and scope of CoC adoption for the organization (value proposition)  
- Discuss the details of CoC concepts  
- Understand the value of adopting CoC certification in the organization  
- Gain acceptance and sponsorship from top-management  
- Communicate the vision for the buy-in and support from key staff |
| | Identify and address companies’ poor perception and uncertainties about the cost benefits of CoC certification | - Change agents to provide information about cost benefits of adopting certification  
- Provide research data on trends and markets for certified wood products |
| **Desire to participate & support the change** | Highlight benefits of adoption of CoC certification | - Raise urgency of why CoC adoption is important to the organization  
- Organizations to develop capabilities, core competencies, leverage intangible resources; be first-moves.  
- Institutions to adopt procurement policies to support use of certified wood products |
| | Focus on “what’s in it for companies and employees?” | - Change agents to provide information on benefits of CoC certification e.g. information on process change, raw material supply, personal effects e.g. health and safety and administrative requirements  
- Determine impact on the role of the staff  
- Encourage employees, award supportive workers and state benefits |
| **Knowledge on how to change** | Identify CoC competencies for staff | - Set the plan to roll-out CoC implementation  
- Form a working group responsible for activities related to CoC implementation  
- Customize the generic CoC requirements to fit with the organizational setting |
<table>
<thead>
<tr>
<th>ADKAR model for change management</th>
<th>Strategies</th>
<th>Key tactics and interventions</th>
</tr>
</thead>
</table>
|                                  | Educate on CoC standards and concepts | - Provide the fundamental concepts of CoC certification to all participants  
- Prepare all participants to be ready to implement the CoC process.  
- Conduct training sessions and outline marketing strategies for certified products  
- Use integrated marketing communications for promotion of certified products |
|                                  | Provide access to information | - Prepare a “how to” CoC manual and distribute to staff involved in the process  
- Develop a shared intranet site for easy access to information for staff |
| Ability to implement required skills and behaviors | Provide resources and support for the change | - Plan and organize a series of workshop sessions to develop a roadmap  
- Allocate responsibilities to individuals in the organization  
- Conduct debriefing and review sessions  
- Identify suppliers for certified products and seek new suppliers if needed.  
- Conduct round table quarterly discussions with key people involved in the process |
| Reinforcement to sustain the change | Sustain change | - Perform internal audits to evaluate the conformance to the standards  
- Integrate CoC process into organization’s existing processes  
- Evaluate CoC outcomes routinely through staff surveys, and periodic assessment of costs and benefits of certification  
- Conduct performance evaluation of staff and recognition e.g. rewards, incentives and allowances. |
Table 34: Roles and responsibilities for adoption of CoC certification

<table>
<thead>
<tr>
<th>Activities</th>
<th>Individual companies</th>
<th>Trade associations</th>
<th>Government</th>
<th>Universities/R&amp;D Institutions</th>
<th>Certification Bodies</th>
<th>Certification Schemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create awareness through workshops, seminars and direct visits to companies</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Distribute CoC related literature to companies</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Showcase certified companies in the media</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Provide up-to-date information about recent trends in certification and its benefits</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Strengthen organizational capabilities and core competencies</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage employees to participate in the adoption process</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide technical guidance and training</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Employ technical and skilled workers with a background in quality management</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide easy access to information regarding CoC certification</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Develop a roadmap for implementation of CoC systems</td>
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<td>Create synergies between the primary and secondary manufacturers</td>
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<td>Provide fiscal incentives to certified companies</td>
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<td>Reinforce the change through reminders and continuous interaction with staff</td>
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<td>Recognize and reward supportive employees</td>
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5.4.1 Awareness

While the results showed that most respondents had sufficient awareness regarding the need for adoption of CoC certification, there were many respondents who not only lacked the awareness regarding the need for adopting CoC certification but they were also unaware of the issues being addressed by CoC certification and its impact. In a study of 411 companies undergoing major change projects, the number one reason for resistance to change was lack of awareness of why the change was being made (Hiatt 2006). This is because employees and managers alike wanted to know the business reasons for the change so that they could better understand the change and align themselves with the direction of the organization. As a point of intervention, external change agents especially trade associations like BC Wood, certification schemes (FSC, PEFC etc.), and certification bodies should help create awareness through workshops, seminars, direct visits to companies, and the mass media. Distributing literature on CoC certification would be helpful in informing potential adopters about the change. Certified companies should be showcased in the media by the government, trade associations, and certification bodies to help create awareness about CoC certification.

The credibility of the sender of awareness messages directly impacts how an individual will internalize that information (Hiatt, 2006). Depending on the level of trust and respect for the sender, recipients of the message will view the sender either as a credible source or someone not to be believed. Using credible change agents e.g. government and non-governmental organization, trade associations (BC Wood), research institutions (e.g. FP Innovations) would be the first step to facilitate effective flow of the necessary information about CoC certification. Within firms, credible change agents include CEOs, board of directors, and managers. According to Kliewe (2013) “innovation starts at the top,” as the top management creates/supports the environment that allows innovation to “flourish on the floor”. Hence it is important that the leaders in the business are committed and understand how critical innovation is to increasing the bottom line and competitiveness in the marketplace. With targets in mind this ‘vision’ needs to be consistently communicated across the whole business with everyone’s role clearly outlined.

Research on CoC certification becomes outdated very quickly as it is a rapidly evolving field (Chen et al. 2010). It is imperative that researchers collaborate in research with other partners such as industry and trade associations and provide them with up-to-date information about
recent trends in certification and its economic, environmental and social benefits. Use of certified wood products by institutions e.g. government buildings, universities, schools, and hospitals could go a long way in creating awareness about certified wood products. In Canada, progress in this direction is already being made through initiatives at both provincial and federal level, for instance, Public Works and Government Services Canada requires all wood products in its building projects to be certified to SFI, FSC or CSA (Government of Canada 2010).

5.4.2 Desire

Desire represents the motivation and ultimate choice to support and participate in a change (Hiatt 2006). Creating desire poses a challenge, in part because of the limited control over another person’s choices. Unlike awareness-building, where definitive steps to generate awareness of the need for change can be taken, creating the desire to change remains elusive and, by definition, not under the direct control of change agents (Hiatt 2006). The results of the survey showed that almost all of the responding companies (98%) believed that their companies were environmentally conscious, which may reflect a desire to change. Knowing the nature of the change and the benefits therein are important catalysts that provoke desire in potential adopters (Bonsi 2009). Although most respondents believed certification has environmental benefits, there is little information quantifying the benefits of adopting certification. The point of intervention is that change agents should raise urgency of why adoption of CoC certification is important to the organization. The organizational or environmental context of the change is imperative in facilitating desire in adopting change (Bonsi 2009). The adoption of certification is an initiative which the entire value chain needs to accept on a large scale in order to support the supply chain because if any actor in the value chain does not have a CoC then the products flowing out of their production facility may not carry any certification claim even though they were produced using certified raw materials. It is common that companies adopt once leaders in the industry succeed with adoption. Nevertheless, the degree to which innovations have succeeded in the industry and in a particular company can affect one’s decision to adopt (Bonsi 2009).

The point of intervention is the strengthening of the organizational capabilities and core competencies. If these organizations can realize their internal strengths and identify resources that are rare, valuable and difficult to imitate and substitute, and leverage them, they can achieve sustained competitive advantage as posited by the resource-based view of the forest products
firm (Bonsi et al. 2008). These traits will help companies to be innovative and become first-movers.

The source of motivation for companies to adopt certification may be the benefits from gaining market share while other companies adopt because of corporate image (see Chapter 4 section 4.3.1). Non-adopters (NCNI) have concerns such as lack of customer demand and high costs of certification (see Chapter 3 section 3.3.5). Specific information about CoC certification with respect to costs and markets is limited. Hence the point of intervention is explaining how a wise deployment of internal resources can enhance the desire to adopt. Employees should not only be encouraged to participate in the adoption process but also trained about the process. Companies should recognize and reward supportive employees.

5.4.3 Knowledge

Knowledge is prerequisite to the implementation of innovation (Hiatt 2006). The survey found that a majority of companies that were interested in adopting CoC certification lack the specific knowledge on the specific concepts of certification (see Chapter 3 Figure 25). The points of intervention include provision of technical guidance and training on CoC certification concepts and providing knowledge on how CoC requirements fit into the overall organizational setting. Training sessions, conducted either by universities, research organizations such as FP Innovations or by the trade associations such as BC Wood, should include how to acquire certification and the ongoing process of maintaining it.

The current knowledge base of the adopters is very important in adopting an innovation as the knowledge gap between an individual’s current knowledge level and the knowledge requirements associated with the change will directly impact the probability of success for those individuals (Hiatt, 2006). The current knowledge base of an individual could be in the form of education or work experience. According to Kozak and Maness (2001), third-party quality assurance programs can serve as powerful marketing tools by promoting high quality products, building global demand and increasing the likelihood of customer acceptance. Yet the results of this survey show that even though most companies had access to information regarding CoC certification process, a majority (53%) did not have any previous experience with certification and/or other quality management programs. One approach would be that companies employ
technical and skilled workers with a background in quality management and tacit knowledge that can be useful to set the basis for advancement.

The quality and quantity of resources that are available for education or training are important in determining the quality of knowledge created (Bonsi 2009). Once appropriate knowledge is acquired, organizations should set up a roll-out plan for implementation of the CoC process. Staff should have easy access to information which can be done through providing the CoC manual and related documentation on intranet. Further training may be required for managers to market their certified products in an effective way using integrated marketing communications. Integrated marketing communication is the concept under which a company carefully integrates and co-ordinates its many communications channels to deliver a clear, consistent, and compelling message about the organization and its products (Kotler, 2008).

5.4.4 Ability

Ability is the demonstrated capability to implement the change at the desired performance level (Hiatt 2006). The results of the survey indicated that ability was the biggest barrier in implementing change (CoC adoption). Respondents cited the lack of certified raw materials supply and lack of resources to implement CoC requirements as two major barriers. Previous studies have revealed that only a small percentage of the potential annual supply of certified logs (logs from forest management (FM) certified forest) are used as inputs to CoC-certified wood products (Werndle et al. 2006; Auld et al. 2008). Most certified logs are consumed by non-CoC-certified value-added wood products manufacturers and therefore the wood products do not carry any certification claims (Huang 2013). This is largely due to the relatively small number of CoC-certified value-added manufacturers and a general lack of recognition and differentiation of certified wood products by private end-users (Durst et al. 2006). Given that most of the forests (52 million ha) in BC is certified against one of the three major certification schemes (Certification Canada 2014), the assertion that there is a lack of certified raw materials may be somewhat misguided; there is indeed abundance of certified raw materials. Three reasons may explain the result that manufacturers perceive supply constraints of certified logs to be a barrier:

1. manufacturers do not understand CoC certification well enough;
(2) there is information asymmetry between the primary and the secondary manufactures. In other words, primary sawmill are not necessarily segregating supply based on certification since their focus is on forest management certification and not CoC or the primary manufacturers are not interested in CoC due to lack of economic benefits (i.e. price differential) and the market pull (international, or otherwise) along the supply chain.

(3) The majority of the big lumber companies are certified, and these make up the bulk of the certified lands. They do not sell directly to value-added companies, which are forced to seek out other sources – which mainly comprise the uncertified smaller sources such as private woodlots.

Kozak et al. (2003) reported that one-third of secondary manufacturing companies in BC were experiencing lumber-procurement problems, the main reason being with the grade of lumber that they received. The solution for some of these companies may lie in establishing new relationships with sawmills in the form of buyers groups (Kozak et al. 2003). Under the current circumstances, secondary manufacturers are not prepared to pay the market price whereas the primary manufacturers will expect a higher price from secondary manufacturers for the extra effort of getting CoC. The trade associations and government could play an important role in creating synergies between the primary and secondary manufacturers. Within firms, the organizations should develop a roadmap for implementation of CoC systems tailored to the specific needs of individual companies.

Lack of resources was cited as another barrier in adoption of certification; this may refer to a lack of either technical or financial resources. The lack of financial resources results in a weak business environment (Bonsi 2009). The survey found that the high cost of certification was the biggest barriers for both adopters and non-adopters (see Chapter 3, Figure 24 and Figure 33). The best point of action would be for government or trade association to provide incentives (e.g. subsidies) to potential adopters. In Ontario, for instance, interested companies received a subsidy from the Ministry of Natural Resources to help offset their CoC costs by 50% (EOMF 2014).

**5.4.5 Reinforcement**

Reinforcing is achieved when the necessary mechanisms are in place to sustain the change (Hiatt 2006). In order to sustain the change organizations should conduct periodic internal audits to evaluate the organization’s performance against the standards. Organizations should also
integrate the CoC process into the organization’s existing processes and evaluate CoC outcomes regularly through staff feedback and assessment of costs and benefits of CoC certification. Once the change is underway, it is imperative to keep reminding employees about its importance and why its sustenance would benefit them and the organization as a whole. Top management should reinforce the importance of this change through reminders and interaction with their employees.

Reinforcement can take the form of recognition of exceptional workers participating in the change process (Bonsi 2009). Such awards should be meaningful and valuable to recipients. Accountability systems such as performance evaluation of employees can provide a basis for participation in the change. Hardworking staff that support the implementation of CoC within organizations should be motivated through promotions, praise and salary increases. A good job description for employees together with clear goals and objectives and credible appraisal system can also instill motivation and make them more productive at implementing CoC.

5.5 Conclusions

This chapter has developed a change management framework to explain and recommend interventions that the BC value-added wood products industry and related stakeholders could embrace in the process of adoption of CoC certification. The framework was developed based on the most important needs and barriers perceived by the industry and presented in a way that would facilitate awareness creating, thereby creating a desire to adopt CoC certification, improving knowledge about CoC certification concepts and processes, and developing the ability to implement the CoC certification. If these interventions are achieved, adoption of CoC certification would likely increase. After the successful adoption, change agents need to ensure that the change is reinforced. Once reinforcement is successful, the change will be considered successful.

Governments, trade associations, research centres, and top management of firms have key roles in effectively promoting the change process by conducting workshops, seminars, and trade fairs for potential adopters. It will inform the potential adopters about what the change entails and its enormity. Creating desire in potential adopters means that adopters would have to know what the benefits of the change would be. The benefits of changing and the risks for not changing need to be explained to the potential adopters by the change agents. Knowledge about the CoC
requirements and the overall process must be provided to the organizations. As shown in Chapter 3, both adopters and non-adopters were faced with knowledge barriers. This means that change agents need to play an active role in providing adequate knowledge to the value-added firms. Organizations should provide appropriate training to staff for implementation of the CoC process and marketing managers to market their certified products effectively. Organizations should develop supply chain linkages to identify certified sources. Smaller firms that lack the ability to adopt CoC certification due to financial reasons should be supported by the government through subsidies. Once CoC certification has been widely adopted in the BC value-added wood products sector, the change process needs to be reinforced. Adopters and workers who have pioneered and promoted the process need to be recognized and rewarded with allowances, salary increases, and promotions. Adopters need to be reminded about the change and its benefits in order to sustain it. When all the elements of the ADKAR model are well implemented, the rate of adoption of CoC certification of the BC value-added wood products sector is expected to rise.
6 Conclusions

In the forest products marketing literature, increasingly research has been focused on the study of adoption of chain of certification by various actors in different jurisdictions. However, thus far, limited research has explored the value-added wood products sector of British Columbia in the contexts of chain of custody certification adoption, innovation and change management. It is particularly important to study these aspects not only to gauge the sectors acceptance to innovations such as chain of custody certification but also to assess its overall state of innovation since these factors impact its competitiveness in today’s increasingly fickle markets faced with intense competition from low-cost producers in the developing countries.

Past research on the BC value-added wood products sector has covered different aspects of the sector such as certification adoption, solid wood supply impediments, the competitive factors for success, and the sector’s contribution towards an economically and environmentally sustainable forest economy (Jayasinghe et al. 2007; Kozak et al. 2003; DeLong et al. 2007; McIlhenney and Hayter 2013). However, most research becomes outdated quickly due to rapid changes in the markets. Even studies undertaken in the 2012 may be out of date for some aspects such as certification. This research attempts to provide up-to-date and comprehensive information on the BC value-added wood products sector as a whole with a focus on chain of custody certification adoption, innovation and change management.

The first objective of the research, which aimed at creating a profile of BC value-added wood products manufacturers (size, scope, markets, products) and determining the current status of CoC certification adoption among value-added wood products manufacturers, revealed that the value-added wood products sector in BC is fragmented, diverse, domestic oriented and primarily constitutes small and medium sized establishments. The study found that the majority of respondents companies were located predominantly in three regions; Metro Vancouver, Vancouver Island and Fraser Valley regions. The sector consisted of many small and medium sized establishments that produced a wide range of value-added wood products. The majority of companies surveyed had up to 20 employees with less than $5 million annual sales. There was also a presence of some large sized companies, mostly in the remanufactured wood products category. Geographically, marketing of value added wood products by the sector was primarily limited to the domestic market with a minority of companies with sales in the USA and fewer yet
selling internationally to countries in Europe and Asia. Over 65% of the respondents indicated their affiliation with at least one or more industry association, with 40% being a member of BC Wood. About two-thirds of the companies purchased solid wood as raw material primarily of coastal species such as Western Red Cedar, Douglas-fir and SPF.

Looking into the CoC certification adoption, three main categories of firms were identified; currently certified companies (CC), non-certified companies but interested in becoming certified within 5 years (NCI); and non-certified companies that were not interested in certification (NCNI). The results showed that 46% of the respondents belonged to NCNI companies while 41% were certified companies (CC), compared to 56.4% NCNI companies and 18.2% certified companies in western Canada region (British Columbia and Alberta) nearly a decade ago (Jayasinghe et al. 2007). This suggests that market interest and acceptance in BC has grown over time and that certification has gradually being integrated into standard business practice and is seen as a part of the cost of doing business sustainably. When the data were disaggregated according to the certification status of companies to uncover the adoption level among sub-sectors, a moderate to low adoption levels were found among all value-added wood products sub-sectors with the exception of remanufacturers that had over 55% certified companies. The survey also found that the larger the company, the greater the likelihood of CoC certification adoption, and vice versa. For example, 95% of small sized companies with fewer than 50 employees belonged to NCNI group. On the contrary, a majority (57%) of “large” and “very large” companies as determined by their annual sales revenue were certified. Larger firms usually have more resources and management capacity, facilitating the implementation of CoC certification (Huang 2013). This indicates that SMEs may need more support in adopting CoC certification as they usually lack managerial, entrepreneurial and marketing expertise, lack capital, investments and assets, have limited access to financing, and have difficulties sourcing raw materials (Mead and Liedholm 1998).

The second objective of this study sought to assess the attitudes of value-added wood products manufacturers toward CoC certification and towards the benefits and challenges of adopting CoC certification. Past research has revealed a general lack of awareness and understanding about forest certification amongst various actors (e.g., Jayasinghe et al. 2007; Ratnasingam et al. 2008; Vlosky et al. 2003). This study found considerable variations among the responding companies
in terms of their experience and or expectation with CoC certification. Only one-third of the NCI companies had knowledge about CoC certification and overall they showed low levels of knowledge regarding specific requirements for implementing CoC certification. In addition to this common challenge of a lack of awareness of chain of custody certification certification, there were other impediments specific to value-added wood products manufacturers in British Columbia.

Past studies have identified an array of CoC adoption barriers in various jurisdictions such as cost of certification, lack of knowledge, and lack of price premiums (e.g. Halalisan et al. 2013; Huang 2013; Owari 2007), however, these barriers may not apply to the manufacturers in BC due to being in a different economic and social environment. The theory that certification is a market-driven approach suggests that market players could make use of their power to pressure value-added companies to adopt chain of custody certification. As a result, market acceptance and adequate customer requests for certified wood products would greatly impact the future of chain of custody certification. In this study the most important challenge identified by NCNI companies was lack of customer demand for certified wood products. Even though the demand for certified wood products is being fueled by the government policies towards LEED green building projects that encourage and reward the use of certified wood products, end-consumers who play a significant role in market pull appeared to be unaware or indifferent regarding the distinction between certified and non-certified wood products. High costs associated with setting up and implementing the CoC certification systems was reported to be another major challenge by NCNI companies and the top challenge for certified companies. While most certified companies claimed that CoC certification helped them access new markets, their experience was that certified products did not command price premiums, a perceived benefit and one of the major reasons for interested companies (NCI) to consider adopting CoC certification. NCNI companies also cited lack of price premiums as one of the impediments to adopting CoC certification. These challenges are closely linked to each other and are rooted in one common factor, this being a lack of financial capacity and market-support systems that link the entire supply chain together.

The study revealed a difference in attitude between the certified and interested companies. The perceived benefits of CoC certification was significant factor in their decision to adopt or
consider adopting certification. Business owners’ commitment to the environment has been cited as one of the most important reasons for forest companies to engage in forest certification in the United States (Vlosky et al. 2003). The results of this study also suggest that primary motivations for obtaining certification for certified companies relate to the improved corporate reputation which is an indirect benefit of certification. These indirect benefits may result in an improved competitive advantage and, therefore, increased economic benefits (Miles and Coven 2000; Vidal et al. 2005). That is to say, long-term and indirect benefits can play important roles in influencing a firm's decision to adopt CoC certification. Direct benefits, such as access to LEED projects and access to new markets were also perceived as being likely to occur by the respondents, although to a lesser extent. Non-certified but interested companies (NCI), on the other hand, were found to be more optimistic about the direct market benefits of CoC such as increased price premiums, access to LEED building projects, and access to new markets. These results provide an indication to the BC value-added wood products manufacturers as to how the market for certified wood products may evolve and what market benefits may be attained.

The third objective of the research sought to examine the current state of innovation in the BC value-added wood products sector and to assess the current innovation focus of the sector. A review of literature revealed that innovation-related research in wood products sector is critically lacking, particularly in the value-added wood products sector. There have been some studies in the US that focused innovation in the primary wood products sector (Crespell and Hansen 2008; Hansen 2006), however, until now no study has focused the BC value-added wood products sector in the context of innovation. Therefore, this research provides new information on the state of innovation in the BC value-added wood products sector. In this study, innovativeness was measured using firms’ propensity to create and (or) adopt new products, processes and business systems. Results of the survey indicated that BC value-added wood products manufacturers did not have strong positive views about innovativeness of their firms. The industry was primarily focused on business systems innovations with the customer focus as a top priority. Most value-added producers had neutral responses towards product and process innovations indicating a lack of well-balanced innovation approach within the sector. The value-added wood products manufacturers were found to be least innovative in taking a leading role in R&D for new products. To be competitive, it is important that the sector should adopt a well-
balanced innovation portfolio where product, process, and business systems innovations are all given equal importance.

The fourth objective aimed to study key characteristics of value-added wood products companies according to their degree of innovativeness. Cluster analysis was performed to classify the value-added manufacturers according to their degree of innovativeness using both three-cluster solution and two-cluster solution. Three variables were tested in the cluster analysis namely; firm size, proportion of export sales volume to the USA and Europe and proportion of certified companies. In both two-cluster solution and the three-cluster solution, no significant difference was revealed among the clusters for firm size and proportion of export sales volume to the USA and Europe. In both the three-cluster solution and the two cluster solution, there was also no significant difference among the three clusters for the proportion of certified companies. However, the general trends in the two-cluster solution indicated that that companies in the cluster with the greater proportion of certified companies had more positive views about innovativeness. Given that certification has become a new way of addressing environmental concerns, this finding supports the view proposed by Wagner and Hansen (2005) that certification is an example of business systems innovation and is therefore being practiced by many value-added wood products manufacturers.

The fifth objective of this research was to develop a change management framework using the ADKAR (awareness, desire, knowledge, ability, reinforcement) model to assist the government, industry, certification policymakers, and industry associations to facilitate adoption of chain of custody certification in the value-added wood products sector. A number of past studies have measured the adoption level of chain of custody certification within the wood products industry in various jurisdictions (Espinoza et al. 2012; Chen et al. 2011; Montague 2011, Jayasinghe et al. 2007). However, to date, no study has extended their work into the intricacies of certification adoption in the light of organizational change management. This study established a change management framework using the ADKAR model for the value-added wood products manufacturers in order to facilitate adoption of CoC certification and identified factors that the organizations viewed as barriers or facilitators to change. The results showed that while there was sufficient awareness and desire among the value-added wood products sector to implement the change (CoC adoption), knowledge, ability and reinforcement appeared to be barriers. The
change management framework illustrated that adoption would be successful if companies are informed (awareness creation) about the change and the risk of not changing. External change agents, e.g., government, non-governmental organizations, trade associations, research institutions, and internal agents such as CEOs, board of directors, and managers may help diffuse adoption of CoC certification through workshops, presentations, seminars, and face-to-face discussions. Adoption could also be successful if desire is incited in companies and its employees by informing them about the benefits of changing. The poor perception about CoC certification can be reduced when reputable institutions such as government offices, hospitals, and schools adopt procurement policies to use only certified wood products to support sustainable forest management. Change agents, such as universities, research organizations, and trade associations, should expand their roles as providers of information and training to help disseminate knowledge on CoC concepts and requirements, implementation knowledge, and marketing strategies for certified wood through training, short courses, and workshops.

The sixth objective, aimed to identify, explore and discuss the factors which organizations viewed as acting as barriers or facilitators to change, revealed that the lack of certified raw material on the local market and lack of resources were identified as two important impediments to CoC certification. Past studies have shown that BC value-added wood products manufacturers face impediments in procurement of solid wood raw materials (Kozak et al. 2003). This is also true in the case of certified raw materials as most companies complained about lack of certified raw material in the market. These challenges of certification could dilute the attractiveness of CoC certification and therefore discourage companies from staying committed to CoC certification for the long term. The ability of value-added wood products manufacturers to adopt CoC certification would require physical, financial and technical resources. Change agents would have to ensure that all these needs are provided to the industry, particularly establishing effective supply chain networks.

Previous studies in China indicated that all levels of government could play an important role in the promotion of certification. From the perspectives of Chinese wood products manufacturers, government support and industry-led requirements would be the only viable ways to encourage the early adoption certification, given the potentially limited and unclear financial benefits associated with certification (Chen et al. 2011b). This study revealed the need for similar
governmental support to stimulate the development of CoC certification in BC, including some fiscal incentives for SMEs. When all stakeholders, i.e., the industry, research institutions, industry associations, and government collaborate well and share useful information, the CoC adoption in BC could be successful. Currently, the immediate barriers will have to be removed or mitigated before companies will invest in adopting CoC certification.

This study has provided valuable insights into the attitudes of BC value-added wood products manufacturers towards the adoption of COC certification as well as their perceived challenges. It has also contributed to a better understanding of the state of innovation in the sector and provides a valuable framework for implementing change at organizational levels. Given that BC is endowed with some of the most valuable and high quality wood fibre in the world, it is critical to shift the efforts towards developing value-added wood products sector in order to remain competitive in the global market. The study has contributed to the identification of the key barriers and potential solutions to the adoption of certification in BC, providing recommendations for policy makers, government, trade associations, wood products manufacturers and other interested groups upon which informed decisions can be made.

6.1 Limitations

As with most studies of this nature, this study has its limitations. Due to limited resources, the survey was conducted on-line and only participants with valid email addresses were invited to participate in the study. Previous studies on e-business adoption of forest products firms have revealed that firms in this sector have been slower in investing and implementing IT in their business processes compared to other industry sectors (Sowlati, 2013). In addition, IT investments in e-business have been lower for smaller firms compared to larger firms (Kozak, 2002). Given that most value-added producers are small and medium sized companies, there is likelihood that some companies without a website and/or email address were inadvertently excluded from the survey, hence establishing a risk of “undercoverage”.

The disaggregation of data resulted in a small sample size for each of the respondents’ categories, which limited my ability to conduct inferential statistical tests. Therefore, while the results of the study provide preliminary information about BC value-added wood products
manufacturers and their adoption and attitude towards certification, these may not be generalized to any population in BC or Canada.

By its nature, non-response bias is very difficult to assess accurately and no simple, certain method exists (Smith 1983). Non-response bias is the bias that results when respondents differ in meaningful ways from non-respondents (Dillman 2000). Even though the non-response bias was tested in this research using three variables for early vs late respondents and comparison with existing data, it is still possible that a higher proportion of certified respondents may have resulted as they may be more interested in the topic than non-adopters, thereby giving the impression that there are more CoC certificate holders. Notwithstanding the non-response bias tests conducted in this study, the results need to be viewed with some caution.

There are also limitations regarding the propensity to create and (or) adopt the scale that was used to measure innovativeness (Knowles et al. 2008). This scale used indirect self-evaluations of innovativeness with 9 items, and therefore it had a potential to introduce response bias.

Another source of response bias may have been due to the socially desirable responding (SDR) trait of respondents, which is a tendency to give positive self-description (Paulhus 2002). Given that someone from the UBC faculty of forestry was conducting a survey who obviously cares about the environment, the SDR factor may have played a role in responses to the question “our company is environmentally conscious” where 98% of the responding companies agreed or strongly agreed to the statement. This may also be the case with commitment of some NCIs saying that they had desire but exhibited little knowledge of the process.

Another study caveat is that answers most likely came from only one person from each company’s management team, and the responses might therefore not reflect the views of other members of the organization or organizational policy (Alderman and Salem, 2010).

6.2 Future research

Future research should examine the situation of value-added wood products sector in other provinces, particularly in Ontario and Quebec, to reveal similarities and differences among them. Longitudinal studies within Canada are therefore needed in order to understand the dynamic process of CoC certification in wood products marketing.
Consumer awareness for certified wood products has not been assessed in western Canada for over a decade. The last study done to assess consumer awareness for certified value-added wood products was in 2002 (Kozak et al. 2004). Research is needed to assess the change in consumers’ attitudes towards certified value-added wood products since 2002.

New market instruments such as environmental product declaration (EPD) have been introduced to promote transparency and full disclosure of potential environmental impacts of a product. An EPD is a standardized tool used to communicate the environmental performance of a product. It is important for researchers to assess the attitudes of the BC value-added wood products sector towards innovations such as EPD.

To understand what the future may hold for innovation in the value-added wood products sector, future research should focus on the drivers for innovation. That is, what forces will the value-added wood products industry be responding to and/or what opportunities will the industry be seeking to capitalize upon? While there are numerous forces/opportunities, a good starting point could be reexamining the current industry and societal trends in light of how they will and, in fact, currently are driving product, process, and business systems innovations. Moreover, an important development would be an understanding of how innovation, productivity, and competitiveness are linked to the financial performance of the manufacturers in the value-added wood products sector.

The recent increase in the manufacturing and export capacity of developing countries, particularly China, may impact BC’s ability to increase exports and penetrate new markets. Further research should be aimed at growing export opportunities for BC’s value-added wood products sectors in overseas markets of Europe, China and the oil-rich countries of the Middle East.

The data collected through this research provides useful insight about the value-added wood products sector in British Columbia. Further analysis of this data set is needed to better understand the strength of discriminating variables that determine a company’s willingness to adopt chain of custody certification. A good starting point would be to conduct logistic regression analysis to provide information about the strength of each individual variable and to
identify which of the predictor variables (such as firm size, export orientation, product type and location) determine company’s willingness to adopt certification.
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Appendices

Appendix I
Survey on Chain of Custody Certification (CoC) for Value-added Wood Products Manufacturers in British Columbia

Section I – Company Profile

1. Where is your company located?
   - [ ] Metro Vancouver  [ ] Fraser Valley
   - [ ] Cariboo  [ ] Thompson/Okanagan
   - [ ] Northern British Columbia  [ ] Vancouver Island
   - [ ] British Columbia Rockies

2. Please select the products that your company manufactures: (Check all that apply.)
   - [ ] Millwork  [ ] Engineered Wood Products
   - [ ] Cabinets  [ ] Log Homes and Timber Frames
   - [ ] Furniture  [ ] Remanufactured Wood Products
   - [ ] Pre-built housing  [ ] Other, please specify ______________________

3. Please indicate if your company is a member of one or more of the following associations? (Check all that apply.)
   - [ ] BC Wood
   - [ ] Architectural Woodwork Manufacturers Association of Canada (AWMAC)
   - [ ] Independent Wood Processors Association BC (IWPA-BC)
   - [ ] Canadian Kitchen Cabinet Association (CKCA)
   - [ ] Other, please specify_____________________________________________________________________
   - [ ] None

4. How many full-time, part-time and temporary employees work in your company?
   - Full-time _____________
   - Part-time _____________
   - Temporary _____________
5. Which of the following materials do you use as inputs to your finished products?

- Panel products only (Particle board, MDF etc.) ➔ Skip to Q 7
- Solid wood
- Both panel products & solid wood

6. If you use solid wood as inputs to your finished products, please indicate the most common species: (list up to three species.)

____________________________________________________________________

7. Please indicate your annual sales revenue:

<table>
<thead>
<tr>
<th>Check Per Total Revenue</th>
<th>Annual Revenue (CAD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;$200,000</td>
</tr>
<tr>
<td>□</td>
<td>$200,001 – 500,000</td>
</tr>
<tr>
<td>□</td>
<td>$500,001 – 1,000,000</td>
</tr>
<tr>
<td>□</td>
<td>$1,000,001 – 2,000,000</td>
</tr>
<tr>
<td>□</td>
<td>$2,000,001 – 5,000,000</td>
</tr>
<tr>
<td>□</td>
<td>$5,000,001 – 10,000,001</td>
</tr>
<tr>
<td>□</td>
<td>$10,000,001 – 20,000,000</td>
</tr>
<tr>
<td>□</td>
<td>&gt; $20,000,001</td>
</tr>
</tbody>
</table>

8. Please specify your company’s total volume of production in 2012: (Include measuring units.)

________________________________________

9. Please estimate the geographic sales destinations of your production volumes for 2012 (total must equal 100%):

__________% BC  __________% China

__________% Rest of Canada  __________% Japan

__________% United States  __________% Other Asia

__________% Europe  __________% Other, please specify
Section II - Awareness and Adoption level of Chain of Custody (CoC) Certification

1. Is your company Chain of Custody certified?
   - [ ] Yes
   - [ ] No
   If your company is Chain of Custody certified, skip to Section III on page 7

2. Does your company plan on becoming Chain of Custody certified within the next 5 years?
   - [ ] Yes
   - [ ] No
   Skip to question 12 on page 6

3. Do you know about Chain of Custody certification as it applies to the value-added wood products sector?
   - [ ] Yes
   - [ ] No
   Skip to question 6 on page 4

4. If yes, where did you learn this from?
   - [ ] Internet
   - [ ] Industry Association
   - [ ] Certification Bodies
   - [ ] Value-added companies already certified
   - [ ] Tradeshows
   - [ ] Certification Programs (e.g FSC, CSA)
   - [ ] Other, please specify ______________________________

5. Please indicate your level of understanding for each of the following components of Chain of Custody (CoC) certification? *(Please indicate your level of understanding by circling the single most appropriate number after each statement)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very knowledgeable</th>
<th>Somewhat knowledgeable</th>
<th>Not very knowledgeable</th>
<th>Not at all knowledgeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical segregation of certified raw materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Implementation of tracking systems of certified inputs and outputs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Percentage-based system for CoC</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Credit-based system for CoC</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Controlled Wood requirements</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
6. Please indicate the certification scheme that would be your first choice?

- [ ] Forest Stewardship Council (FSC)
- [ ] Programme for Endorsement of Forest Certification (PEFC)
- [ ] Sustainable Forestry Initiative (SFI)
- [ ] Canadian Standards Organization (CSA)
- [ ] Other, please specify ___________________________________________________
- [ ] Don’t know

7. Which of the following entities most influenced your organization to consider adopting CoC certification? (Check all that apply.)

- [ ] Certification organizations (e.g. FSC, PEFC)
- [ ] Certification Bodies (e.g. Rainforest Alliance, SGS, SCS etc.)
- [ ] Suppliers
- [ ] Customers
- [ ] Participation in LEED building projects
- [ ] Corporate image/public relations
- [ ] Other, please specify ___________________________________________________

8. a) What do you expect the total cost (in CAD) of setting up a Chain of Custody system for a typical product line in your company to be?

- [ ] < $2,000
- [ ] $2,000 - $5,000
- [ ] $5,000 - $10,000
- [ ] $10,000 - $15,000
- [ ] >$15,000

b) What do you expect the total annual cost (in CAD) of auditing Chain of Custody for a typical product line in your company to be?

- [ ] < $2,000
- [ ] $2,000 - $5,000
- [ ] $5,000 - $10,000
- [ ] $10,000 - $15,000
- [ ] >$15,000

9. Assuming your company becomes Chain of Custody certified, please estimate the proportion of raw materials you think would be from non-certified sources. ____________%

10. Please indicate the type(s) of potential customers for your company’s certified products? (Check all that apply.)

- [ ] Broker/distributors
- [ ] Manufacturers
- [ ] Retailers
- [ ] Builders
- [ ] End-users
- [ ] Architects & engineers
- [ ] Other: ______________

_____________
11. Please indicate your level of agreement with the following statements? *(Indicate your level of agreement or disagreement by putting an “X” in the appropriate box ☐ for each statement.)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using CoC certification will enhance effectiveness of the production process</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification will lead to increased price premiums on certified products</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification will help access new markets for our company</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification will improve the corporate image of our company</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification will provide my company with improved communication with customers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The idea of CoC certification is compatible with my company’s value proposition</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The requirements of CoC certification standards will fit well with our existing processes and procedures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC Certification will help in meeting requirements of other policy instruments such as LEED, Lacey Act and FLEG.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification will require significant changes in our current procedures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The CoC certification standards are easy to understand</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The contents of the CoC standards are clear</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The choice of the CoC certification schemes is easy to make</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The requirements of the CoC standards are relevant to the industry</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Significant resources will be needed to train the staff on the requirements of the CoC certification standards</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Statement</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
<td>Strongly Agree</td>
<td>Don’t Know</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
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<td>------------</td>
</tr>
<tr>
<td>CoC certification can be adapted or modified to suit the production process within my organization</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>CoC certification can be adopted on a limited basis to test the market performance</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The benefits of using the CoC certification within my company are obvious/visible</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The evidence regarding the impact of using the CoC certification is available</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**PLEASE SKIP TO SECTION IV ON PAGE 11**

12. If your company does not have plans to become CoC certified within the next 5 years, please indicate which of the following reasons influenced your decision? (Check all that apply.)

☐ Cost of certification is too high to implement
☐ Lack of knowledge on CoC certification
☐ Customers don’t demand for certified
☐ No price premiums on certified products
☐ CoC standards are difficult to implement
☐ Shortage of certified raw material inputs
☐ Other, please specify _________________________________________________________

___________________________________________________________________________

**ATTENTION!!** If your company does NOT have plans to become certified in the next 5 years, please answer Q3 on page 12 and return the survey. The remainder of this survey concerns with companies who are certified or are interested in obtaining Chain of Custody certification.
Section III – Companies Involved in Chain of Custody Certification

1. Which of the following certification schemes(s) do you currently use? (Check all that apply.)
   - Forest Stewardship Council (FSC)
   - Programme for Endorsement of Forest Certification (PEFC)
   - Sustainable Forestry Initiative (SFI)
   - Canadian Standards Organization (CSA)
   - Other, please specify ________________________________

2. Which of the following accredited certification bodies have certified your company? (Check all that apply.)
   - SmartWood/Rainforest Alliance
   - SGS- Qualifor
   - Scientific Certification System (SCS) Global Services
   - QMI-SAI Global
   - KPMG
   - Other, please specify ________________________________

3. Where did you initially learn about Chain of Custody certification?
   - Internet
   - Industry Association
   - Certification Bodies
   - Value-added companies already certified
   - Tradeshows
   - Certification Programs (e.g FSC, CSA)
   - Other, please specify ________________________________

4. Please indicate when your company initially obtained Chain of Custody certification?
   ____________ Year
5. a) Does your company work with materials from both certified and non-certified sources?

- [ ] Yes
- [ ] No

b) If yes, please specify the proportion of each type used by volume:

<table>
<thead>
<tr>
<th>Certified wood materials</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-certified wood materials</td>
<td>%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

6. Please indicate the type(s) of customers for your company’s certified products? (Check all that apply.)

- [ ] Broker/distributors
- [ ] Manufacturers
- [ ] Retailers
- [ ] Builders
- [ ] End-users
- [ ] Architects & engineers
- [ ] Other: ____________

7. Which of the following technologies does your company use to track certified materials? (Check all that apply)

- [ ] Conventional paint and chisel labels
- [ ] Conventional labels made of paper or plastic with barcode information
- [ ] Radio Frequency Identification (RFID) labels
- [ ] Branding Hammers
- [ ] Other, please specify ______________________________________

8. a) What was the total cost (in CAD) of setting up a Chain of Custody system for a typical product line in your company?

- [ ] < $2,000
- [ ] $2,000 - $5,000
- [ ] $5,000 - $10,000
- [ ] $10,000 - $15,000
- [ ] >$15,000

b) What is the total annual cost (in CAD) of auditing chain of custody for a typical product line in your company?

- [ ] < $2,000
- [ ] $2,000 - $5,000
- [ ] $5,000 - $10,000
- [ ] $10,000 - $15,000
- [ ] >$15,000
9. What difficulties your company faced when implementing Chain of Custody certification? (Check all that apply.)

- [ ] High costs
- [ ] Lack of supply of certified materials
- [ ] Lack of information about the process
- [ ] Material segregation
- [ ] Employees’ training
- [ ] Other, please specify ______________________________

13. Please indicate your level of agreement with the following statements? *(Indicate your level of agreement or disagreement by putting an “X” in the appropriate box for each statement.)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using CoC certification enhances effectiveness of the production process</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
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<td>[ ]</td>
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<td>[ ]</td>
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<td>[ ]</td>
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<tr>
<td>CoC certification improves the corporate image of our company</td>
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<td>The requirements of CoC certification standards fits well with our existing processes and procedures</td>
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<td>CoC Certification helps in meeting requirements of other policy instruments such as LEED, Lacey Act and FLEG.</td>
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<tr>
<td>CoC certification requires significant changes in our current procedures</td>
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</tr>
<tr>
<td>Statement</td>
<td>Strongly disagree</td>
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</tr>
<tr>
<td>The CoC certification standards are easy to understand</td>
<td>☐</td>
<td>☐</td>
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</tr>
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<td>☐</td>
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<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The choice of the CoC certification schemes is easy to make</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>The requirements of the CoC standards are relevant to the industry</td>
<td>☐</td>
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<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Significant resources are needed to train the staff on the requirements of the CoC certification standards</td>
<td>☐</td>
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</tr>
<tr>
<td>CoC certification can be adapted or modified to suit the production process within my organization</td>
<td>☐</td>
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</tr>
<tr>
<td>CoC certification can be adopted on a limited basis to test the market performance</td>
<td>☐</td>
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<td>☐</td>
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</tr>
<tr>
<td>The benefits of using the CoC certification within my company are obvious/visible</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The evidence regarding the impact of using the CoC certification is available</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Section IV – Innovation and Change Management

1. Please indicate your level of agreement with the following statements? (Indicate your level of agreement or disagreement by putting an “X” in the appropriate box for each statement.)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our company is always seeking ways to develop new products</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company takes leading role in research &amp; development for new products</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company has a diversified product line</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company is always ready to install new processing equipment</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company is very efficient in raw material use</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company takes advantage of innovative processes from other leading industries</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company is ready to look for new customers</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company is ready to bear the cost of marketing for products promotion</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company is ready to train new marketing managers</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

2. Please indicate your level of agreement with the following statements? (Indicate your level of agreement or disagreement by putting an “X” in the appropriate box for each statement.)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our company understands the business reasons for introduction of CoC program</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company understands the issues that are being addressed by the CoC certification</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company understands the impact of the CoC certification</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Our company understands the goals and objectives of the CoC certification</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Statement</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>Our company is environmentally conscious</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company believes certification has environmental benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company feels pressured by our customers to supply certified wood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company feels pressured by outside groups (other than customers) to</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>produce environmentally certified products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company has access to information about benefits of certification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company has adequate certified raw material supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company has participated in other certification/quality management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>programs before</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company has sufficient resources to implement CoC systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company believes Chain of Custody leads to public recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our company believes increased sales or new customers can be results of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>adopting CoC certification</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. Do you have any other comments about Chain of Custody certification to help us understand how CoC certification can better meet your needs as a value-added wood products manufacturer? You are invited to make any additional comments in the section below.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you for your time and cooperation in answering this survey!
Appendix II

October 9, 2013

Letter of Invitation

You are invited to participate in a web-based questionnaire on the adoption of Chain of Custody certification by value-added wood products manufacturers in British Columbia. The survey is part of a research project being conducted at the University of British Columbia, in Canada.

There are no known risks to responding to this study. Participation in this research is strictly voluntary. If you choose to complete the survey, please answer the questions truthfully and to the best of your ability. This survey will remain open for 2 weeks, until 11:59 pm (PST) (GMT) on 2013-October 23, 2013.

By completing this survey, you are giving consent for the researchers involved to use the information you provide for the purposes of this study. Please take the time to read the consent form on the homepage of the survey. If you have any questions about this survey or the research process, please contact me via email or at 1-604-XXX-XXXX or Dr. John Innes at 604-XXX-XXXX.

Thank you for taking the time to participate in this survey. Please click on the link below to complete the survey.

http://fluidsurveys.com/s/subcforestrychainofcustody/?code=hc9kkwkxks

Yours sincerely,

Dr. John Innes (Principal Investigator)
H. Gilani (Co-investigator)
Department of Forest Resources Management, University of British Columbia.
604-XXX-XXXX
Appendix III

Chronbach’s Alpha test on internal consistency for the scale item questions

**Scale: NCI Relative Advantage**

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.801</td>
<td>.814</td>
<td>5</td>
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</tbody>
</table>

**Scale: NCI Compatibility**

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.237</td>
<td>.345</td>
<td>4</td>
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</tbody>
</table>

**Scale: NCI Complexity**

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.877</td>
<td>.866</td>
<td>5</td>
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**Scale: NCI Trialability**

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.720</td>
<td>.722</td>
<td>2</td>
</tr>
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</table>
### Scale: NCI Observability

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>.103</td>
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<td>2</td>
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### Scale: CC Relative Advantage

<table>
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<th>N of Items</th>
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</thead>
<tbody>
<tr>
<td>.692</td>
<td>.717</td>
<td>5</td>
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### Scale: CC Compatibility

<table>
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<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
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</thead>
<tbody>
<tr>
<td>.347</td>
<td>.365</td>
<td>3</td>
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### Scale: CC Complexity

<table>
<thead>
<tr>
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<th>N of Items</th>
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</thead>
<tbody>
<tr>
<td>.731</td>
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## Scale: CC Trialability

**Reliability Statistics**

<table>
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<th>N of Items</th>
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</thead>
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<td>.536</td>
<td>.537</td>
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## Scale: CC Observability

**Reliability Statistics**

<table>
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<th>N of Items</th>
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<td>.278</td>
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## Scale: Product Innovation

**Reliability Statistics**

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<tr>
<td>.716</td>
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## Scale: Process Innovation

**Reliability Statistics**

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<tr>
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<td>3</td>
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</table>
### Scale: Business Systems Innovation

**Reliability Statistics**

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### Scale: ADKAR - Awareness

**Reliability Statistics**

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<tbody>
<tr>
<td>.843</td>
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### Scale: ADKAR Desire

**Reliability Statistics**

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<tr>
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### Scale: ADKAR Knowledge

**Reliability Statistics**

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<th>N of Items</th>
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<td>.655</td>
<td>.683</td>
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</table>
Scale: ADKAR - Ability

<table>
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</thead>
<tbody>
<tr>
<td></td>
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Scale: ADKAR - Reinforcement

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<tbody>
<tr>
<td></td>
<td>.700</td>
<td>.701</td>
<td>2</td>
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</table>