Abstract. Recent challenges to forest sector firm competitiveness have driven interest in innovation to create a competitive advantage. Suppliers are a major source of innovation for forest sector firms, yet little study has been done on their role in the innovation process. Using a qualitative case study approach, we explore how chemical companies perceive innovation in the wood treating industry and how they feel they impact innovation among wood-treating firms. Our findings indicate that chemical company managers view the wood-treating industry as conservative and not particularly innovative. Additionally, retailers play a hampering and directing role regarding innovation in the industry. Chemical company managers feel that they have an important impact on innovation within their customer firms, partially because they see limited possibilities for differentiating wood products without value-added additions, such as chemical treatments. Currently, various mechanisms for coloring wood products, along with standard chemical treatments, are the focus of innovation efforts. Chemical company managers also view their role with customers as a problem-solver, providing a package of benefits following the total product concept. Finally, strong relationships between chemical suppliers and key innovative customers play an important role in creating and implementing innovations in the industry.

Keywords: Wood industry, sawmills, chemical companies, NPD, process innovation, buyer–supplier relationships.

INTRODUCTION

The forest products industry has experienced difficulty during the last several years because of increasing global competition and the recent financial crisis. For example, thousands of jobs were lost in the US prior to the financial crisis because of increased competition (Hansen et al 2013a). The situation has worsened because of new regulations (Husso and Nybakk 2010) and the financial crisis, leading to decreased demand and even stronger competition (Hodges et al 2011), including from other industries. To
increase industry competitiveness and financial performance, governments around the world have introduced strategies to boost innovation (Tykkä et al 2010). They have done this because of a commonly held belief and a growing body of forest sector literature documenting the positive impact of innovation on firms’ financial performance (Crespell et al 2006; Hansen et al 2011; Nybakk 2012). Multiple experts advocate for increased innovativeness and attention to innovation in the sector (Bullard and West 2002; Stendahl and Roos 2008; Leavengood and Bull 2013).

Despite the attention given to the issue, the sector continues to be perceived as a mature and traditional industry (Peltoniemi 2013; Toppinen et al 2013) and a low-technology community (Laestadius 2000) with a low priority for research and development (R&D) (Diaz-Balteiro et al 2006). The sector is also viewed as tending to fail to adapt to rapid technological advances and new product development (NPD) in both the wood industry (Leavengood and Bull 2013) and the pulp and paper industry (Lundmark 2005; Järvinen et al 2009). Recent evidence suggests movement in the right direction with a large proportion of US forest sector companies becoming increasingly innovative in response to the great recession (Hansen 2014). Furthermore, empirical studies have shown that innovation, growth, and economic performance within the wood industry are affected by such internal factors as firm size, educational level (Stendahl and Roos 2008), an innovative working climate (Nybakk and Jenssen 2012), innovation strategy (Nybakk et al 2011), and organizational learning (Nybakk 2012).

A large proportion of innovative ideas coming into the forest sector originated outside the individual companies (Pavitt 1984). In the mid-2000s, nearly half of the innovative ideas used by sawmills and panel manufacturers were from external sources, primarily customers and machinery manufacturers (Hansen 2006). A more diverse set of forest industry sectors in 2013 claimed that external sources provided just greater than one-third of the innovative ideas (Hansen 2013). Other findings indicate that forest sector firms relied heavily on suppliers for innovations or even information for innovation (Anderson 2006). In fact, Anderson (2006) suggests that this reliance on equipment and instrument suppliers in particular may explain some of the lack of innovation in the sector. Nakamura et al (2003) also report that equipment suppliers are important sources of innovation for the sector and suggest that this reliance is problematic because innovations from suppliers are easily available to competitors.

During the last decade, extensive research has been conducted regarding innovation in forest industry firms (Välimäki et al 2004; Bull and Ferguson 2006; Hansen et al 2007; Stendahl and Roos 2008; Nybakk 2012; Alfranca et al 2014). Given the important role that suppliers play in forest sector innovation, there is little research characterizing the relationship between forest sector firms and their suppliers and how that relationship influences innovation. With this gap in mind, we chose to study the wood-treating industry, for which we expected suppliers of wood protection chemicals to be important contributors to innovation in wood-treating companies. Our primary objectives were to determine how chemical suppliers view the state of innovation in the wood-treating industry and how they see themselves impacting innovation in the wood-treating industry.

The remainder of this study begins with an overview characterizing the industry supplying chemicals to the wood-treating industry. This overview is followed by a brief theoretical background covering the concepts of innovation and innovativeness. We next provide a detailed explanation of the qualitative methods used in the study. Finally, we discuss the results and implications of our work.

**CHEMICAL INDUSTRY BACKGROUND**

We refer to the chemical industry as companies that provide chemical solutions to wood-treating companies that own impregnation plants, often in combination with sawmills. There are a
handful of these large chemical companies that supply the US and European marketplaces. The suppliers that participated in this study sell registered end-use products. Producers of active ingredients who supply the producers of wood preservatives are not considered here. Some of the main suppliers of wood protection agents serve both the European and US markets. According to the European industry trade association (WEI 2014) and its members, 21 companies are registered as suppliers of wood preservative chemicals and 80 as treaters (customers) in Europe. The Treated Wood Council has registered 10 preservative chemical manufacturers and 235 wood-treating companies in the US (TWC 2014). However, the major chemical suppliers registering end-use protection products to the US and European wood protection industries are limited to approximately three companies in Europe, six in the US, and two that are located in both the US and Europe.

Use of wood products in outside applications often requires chemical protection. Producers of wood preservative chemicals provide their customers with formulations that are used to protect wood in a variety of applications. The market increasingly demands wood products with a long service life. Chemical suppliers offer wood preservatives that are mainly waterborne solutions with multiple active ingredients.

The registered end-use products of the wood preservative suppliers include solutions against decay by fungal attack, surface fungi, insects (eg termites), bacteria, and marine borers. In addition, products including fire protection are provided. During the last decade, many pesticides have been removed from the market, and some industrialized countries have banned well-known families of products, such as creosote and pentachlorophenol. There has also been much debate on aqueous-phase, heavy metal-based products of chrome or copper combined with arsenic or boron, which are used to improve durability. Chromated copper arsenate (CCA)-based products once dominated the US and European markets (Wade and Mason 2002); however, the use of CCA has been decreased and restricted extensively in certain countries.

The current application of wood preservatives is linked to several restrictions and directives concerning biocides (eg arsenic, chromium, and creosotes). Alternatives to conventional preservatives have become more important in the European and North American markets, leading to the development of organic and inorganic chromium-free wood preservatives (Murphy 1998; Read 2003). Environmental concerns, safety, product performance, cost, and manufacturing processes drive changes and innovation in the industry. However, these concerns have also considerably hampered the development of new chemical approaches. The European Biocide Products Directive and the US Environmental Protection Agency (EPA) limit both the number of active substances used in preservation and their fields of application (Aston 2001). However, environmental concerns are less of a driver in the US compared with Europe. US legislation has not banned CCA. The pesticide registration for CCA was modified as a result of a voluntary agreement reached in February 2002 between the registrants and the EPA for most nonindustrial applications (Sanders 2008). In Europe, however, the European Biocide Products Directive, which came into force in 1998, led to the recording of all active agents already in existence and in use and permitted the continued use of only those products for which interest in and extensive documentation on the biological effectiveness and toxicological and ecotoxicological profiles have been provided. As a result, the function of chromium as an active agent has been discussed, and chromium acid is considered a “substance of concern” under the Biocidal Products Directive (Aston 2001; Jüngel and Hellkamp 2008). During the last 20 yr, new wood protection systems, such as wood modification systems, that do not use toxicity as their mode of action have been commercialized. However, these products do not have a large market share in Europe and are not widely known in the US (Hill 2011).
THEORETICAL BACKGROUND

Use of the term innovation has proliferated in recent decades. Scholars use multiple definitions in the literature (Garcia and Calantone 2002). In this study, we define innovation as something new, such as a product, service, or business system, that is put into use or commercialized in the marketplace. Innovativeness is another important term in the literature, and we follow Garcia and Calantone (2002) in tying innovativeness to the degree of novelty an innovation brings to the market or existing technology.

Product innovation is development of a new product, improvement of an existing product, or adoption of a product (Nybakk 2012) and can be viewed as a technical innovation (Hovgaard and Hansen 2004). According to Hansen et al (2011), new products can range from radical or new-to-the-world products to simple modifications of existing products. A process innovation is a new or improved way of producing a product or service and includes the process itself and the technologies and improvements aiding in production (Tatikonda and Montoya-Weiss 2001). If a firm has created a process innovation, it has found a new way to manufacture a product by, for example, introducing a new element to the process. It often involves a technological change (Damanpour et al 1989). According to Hansen et al (2011) who studied the wood industry, process innovation can manifest in new ways to use raw materials, in new ways to manufacture products, or in new machinery. In other words, it refers to improvement in manufacturing processes. Although several scholars focused on product and process innovation, others have focused more on firm structure and administrative business systems (Johe 1999; Boer and During 2001). Studying the wood industry, Nybakk (2012) defined business systems as those mechanisms put in place to manage, structure, operate, and administer the business and its internal and external environments. According to Hansen et al (2011), a new development in the way a company manages its business includes everything from organizational structure to marketing routines.

The innovation management literature often distinguishes among four levels of factors affecting innovation: 1) individual level, 2) organizational level, 3) interorganizational level, and 4) innovation system level (Nybakk 2009). An example of the individual level is a single person within an organization acting as an innovation champion (Jenssen and Jørgensen 2004). Organizational factors include such aspects as organizational structure, organizational culture, organizational climate, strategy, team development, communication, and organizational slack (Jenssen and Nybakk 2013). However, innovation typically does not occur exclusively within an organization but tends to occur in cooperation with others. The interorganizational level emphasizes the importance of relationships among organizations. Relationships among individuals in different companies and networks of individuals in different organizations are assumed to stimulate innovation (Granovetter 1973; Burt 1992; Jenssen and Nybakk 2009).

The importance of supplier involvement in the innovation process is addressed in several studies (Pittaway et al 2004). Suppliers often hold knowledge that could lead to all types of innovations. As mentioned earlier, suppliers are an important source of innovative ideas for forest sector firms (Hansen 2006, 2013). Additionally, reliance on suppliers may negatively impact innovation in forest sector firms (Nakamura et al 2003; Anderson 2006).

Supplier involvement can have both positive and negative effects on manufacturer performance. According to Wynstra et al (2001), negative outcomes can be divided into three main issues: 1) the supplier lacks capabilities; 2) the manufacturer fails to steer the supplier in the correct direction; and 3) relationship issues. Wynstra et al (2001) argue that these problems can be solved through proactive activities by the manufacturer (customer). They argue that it is important for manufacturers to integrate suppliers into product development and to have a clear plan for the development process. Manufacturers must develop a shared understanding.
with their suppliers on how product development is conducted (Wynstra et al 2001).

Innovation itself will not necessarily lead to increased profits for both parties in a relationship, but it can lead to increased profits and improved business performance if market demand increases because of innovation (Kim 2000). An involved buyer–supplier relationship can contribute more to knowledge transfer, which can be valuable for both parties, than can a distant relationship (Hartley et al 1997). Hartley et al (1997) argue that manufacturers experience fewer delays in product development when they have a highly skilled supplier. They also report that suppliers’ actions affect the duration of buyers’ development projects. Buyer–supplier relationships can improve the financial performance of the parties involved if relationships with vital suppliers are strategically managed (Carr and Pearson 1999). Furthermore, Carr and Pearson (1999) note that suppliers can hold knowledge that can decrease costs for manufacturers, such as alternative lower-cost materials, and this knowledge can be beneficial for both manufacturer and supplier performance.

Buyers can also contribute to improved performance through the buyer–supplier relationship by developing suppliers through investments in different assets and infrastructure (Humphreys et al 2004). A supplier–customer relationship in which the participants are well suited to each other has a positive effect on the success of innovation projects initiated within the relationship (Wagner 2010). Given the dearth of structured NPD in forest sector firms (Hansen 2006), it is unclear if these firms actively manage supplier relationships with respect to an innovation strategy.

At the innovation systems level, suppliers are only one of many actors affecting innovations. Innovation systems theory argues that institutions both shape and are shaped by the actions of organizations and the relationships among them (Edquist 1997). Then, the main factors in the system are the actors, the institutions, and their interactions. Examples of actors in the context of this study include wood treaters, their competitors, chemical suppliers, regulatory agencies, retailers, and research institutions. Of course, there are other actors as well. Changes in regulations often drive innovation in the chemical industry (Davies 1983). New regulations open new markets by removing existing products from the market. The removal of CCA from some markets had clear impacts on innovation in the sector as chemical companies and their customers adapted to a new marketplace context. Other regulations in the sector have forced significant process innovations.

MATERIALS AND METHODS

We used qualitative methodology for this work because the main questions under investigation were “how” in nature (Yin 1994). Qualitative methods are suitable if one wants to obtain an overview of a phenomenon (Miles and Huberman 1994). Although often referred to as a “case study” approach, we emphasize that in this situation, the “case” is the phenomenon “supplier views of and impacts on innovation in the wood-treating industry” rather than the sampled companies. The study attempts to identify how relationships between buyers and suppliers in the wood-treating industry affect innovation. The research was not designed for generalization, and readers should carefully consider this fact as they explore the results and the discussion.

Sample

We followed a theoretical sampling approach and interviewed multiple individuals in each target company as suggested by Patton (1990) and Miles and Huberman (1994). Target companies for this research included chemical suppliers and their key wood-treating industry customers. Four industry experts helped identify chemical companies that could participate, and representatives of the chemical companies suggested their key customers following a snowball
sampling method suggested by Goodman (1961) and Patton (1990). Generally, this key customer was identified as one of their most innovative. In total, interviews were conducted within three chemical suppliers and three customer companies. Two chemical suppliers were based in Europe, and one was based in the US. The three customer companies were from Norway, Germany, and the US. A total of 14 managers were interviewed. For each supplier, a manager responsible for R&D or marketing and a field sales–technical representative were interviewed. In customer companies, three Chief Executive Officers, one Chief Operating Officer, and one mill manager (all from different companies) were interviewed.

Interviews

Interview protocols were designed specifically for each position in the chemical companies, and a separate protocol was developed for managers from customer companies. Feedback was sought from other researchers regarding the questions included in the protocol, resulting in minor alterations. The semistructured interviews lasted 40 to 100 min. On the chemical supplier side, all nine interviews were conducted face to face. Representatives from two of the customer companies were interviewed face to face, whereas the other was conducted via telephone.

All interviews were recorded and later transcribed. Recording the interviews allowed the researchers to more accurately document the interview data and be more engaged in the conversation (Yin 1994). It also provided extensive textual data that were used in the analysis. One interview was performed in Norwegian, and the remaining interviews were conducted in English. The transcribed interviews consisted of approximately 144 pages of double-spaced text. To enhance reliability, transcripts were provided to interviewees allowing them to clarify, alter, or add important aspects to their answers. Approximately one-third of the respondents made some revisions to the transcriptions of their interviews.

Analysis

Analyzing qualitative data is a challenging process (Yin 1994). However, qualitative methods have been applied extensively in forest business research settings in recent years (Hovgaard and Hansen 2004; Korhonen and Niemelä 2004; Bull and Ferguson 2006; Hansen et al 2007; Huss and Nybakk 2010; Villaviciencia et al 2012), providing extensive examples of proper procedures. Two of the authors analyzed the data, and the analysis process included two basic steps.

1) Each analyst carefully read the transcripts, underlined key phrases, and wrote notes regarding content. After this process was complete, the analysts compared notes and discussed initial findings from the data. After extensive discussion, two primary categories of information were created to identify all instances of those categories in the data. The two categories were 1) chemical supplier views of innovation in the wood industry and 2) impacts of chemical suppliers on innovation in the wood industry.

2) The analysts then reread the transcripts, identifying any occurrence of the categories. Each occurrence was incorporated into a separate Word file (one for each analyst), and they compared their interpretations of the data. Any differences between interpretations were discussed until agreement was reached.

RESULTS AND DISCUSSION

In the text that follows, we highlight the key findings from our research and discuss those results within the context of the larger body of innovation literature, especially literature focused on the forest sector.

Innovation in the Treated-Wood Sector

Views from suppliers. Chemical company managers hold a picture of the wood-treating industry that is consistent with past literature describing the nature of innovation in the forest sector (Hansen et al 2007; Nybakk and Jenssen
2012; Leavengood and Bull 2013). They view the industry as conservative, not particularly innovative, and reactive rather than proactive.

“...the industry is quite conservative, so it is not so easy to bring in new technologies into this market.” —European Manager, chemicals

“...this industry is quite conservative, so customers like to do business as they have done it for the past twenty years.” —US Manager, chemicals

“...the majority of treaters are not going out there and trying to find new and different, and asking us if we can do it. They sit back and answer the telephone and take orders.” —US Manager, chemicals

Chemical company managers observe the limits of innovation with respect to wood products in a similar manner as some wood products managers. For example, a manager quoted by Hovgaard and Hansen (2004) simply stated, when thinking of the possibility for innovation, “We’re working in wood, so what is there?” Similarly, a chemical company manager stated, “...the product itself is quite limited. It is wood. ...solid wood, for me is difficult to think about too many innovations, except for something that you apply to wood.” —European Manager, chemicals

**Power of customers.** Another critical factor impacting the ability of wood treaters to innovate is the power of retailers, especially big box retailers, in the marketplace. Low cost (price) is supremely important for big box retailers, and the pressure that they place on wood treaters to provide low-cost products limits the ability of treaters to explore new options. The low-cost approach is opposed to costly innovations such as introducing new chemical products to the market. As suggested by Porter (1980), the power of suppliers can have a significant impact on the profitability of a company, and low profitability does not translate to the slack resources often needed for active innovation.

“I don’t think it [treated wood sector] is very innovative. If I had to be honest, I think the pressure treated side is driven by the retailers.” —US Manager, chemicals

“If you are supplying into them [big box retailers], it is going to be hard to get the cost covered for the innovation.” —US Manager, chemicals

“I will tell you that big boxes always want something for nothing. They want everything, but they don’t necessarily want to pay for it.” —US Manager, chemicals

This sort of pressure from customers reinforces the well-documented tendency (Rich 1986; Husso and Nybakk 2010; Toppinen et al 2013) among forest sector companies to pursue low-cost strategies rather than, for example, differentiation strategies. The literature indicates some evolution by forest sector companies (Toppinen et al 2013), but many still rely on low-cost strategies and probably suffer from a commodity mentality (Crespell et al 2006; Hansen and Juslin 2011). Regardless of the reasons why, a low-cost production orientation has arguably prevented the industry from sufficiently investing in the development of new or value-added products (Hansen et al 2013b). Our findings reinforce earlier evaluations of the industry and suggest that although significant evolution may have already occurred, there remains significant room for improvement.

**Impact of suppliers.** Each of the chemical companies participating in this study has a strong R&D department, and each uses a structured approach to NPD. All three companies use a form of the stage–gate NPD process, in which projects are carefully evaluated at various stages of development and either pushed to the next stage of development or killed where they stand (Cooper 2008). Each of the companies is actively involved with research institutes and universities in developing new products and/or intellectual property. Given this aspect and the history of new chemical formulations entering the market, chemical companies are the major drivers of innovation in the treated-wood sector. This result is consistent
with past work documenting the forest sector as being “supplier dominated,” in which a majority of new innovations come from suppliers rather than within the industry itself (Pavitt 1984; Globerman et al 1998; Ukrainski and Varblane 2005). However, as pointed out by an anonymous reviewer, innovation is hampered by the risk and expenses that accompany introducing new wood protection chemicals in the market, and the inertia of the tried-and-true means new alternatives are often ill-received in the marketplace.

The interviewees mentioned a number of product innovations, but the most current and prevalent topic concerned additives that provide new colors to the final wood products. Although some radical innovations were mentioned, most discussion centered on incremental innovations, or small changes, to the existing formulations. On the wood-treating side of the industry, companies are focused on improved treatment processes as well as what the chemical suppliers could provide for product enhancements, such as improved penetration, durability of a color, improved appearance, and product stability.

“The question is how the saw mills and treaters can differentiate themselves: it can be via nice design or colours or very good durability or less maintenance. The chemicals can play a huge role in the possibility to differentiate but is not of course the only one.” —European Manager, chemicals

“Colour is the product innovation. The new generation will maybe have something else than green. We are screening the market, so we try to adapt by adding colours. But the technology today is not good enough.” —Scandinavian Manager, wood treater

“Sometimes they come and say that they have a customer who would like to have a new greenish colour. So we are working on this and another one is coming saying that I would like to have a greyish colour, then we are working on a greyish colour, or colourless wood preservative.” —European Manager, wood treater

“With wood preservative products, it is quite rare to have new products for the market, but once in a while, we achieve that with our colour paste product range.” —European Manager, chemicals

“. . .we are the only customer getting this new product, with this colourless impregnation, with the grey colour for example. Because they developed it for us, we have this advantage to be the only one.” —European Manager, wood treater

Fire retardant-treated wood is mentioned as a current product for one of the customer companies and as a potential upcoming innovation for the other two customer companies. The chemical treatments can be applied to the surface only or impregnated within the wood.

Although the fire protection segment is a small percentage of the market in both Europe and the US, respondents discuss a bright future for fire protection treatments. Managers are optimistic regarding the fire protection segment because of increased commercial building with wood and regulations that require the use of fire retardant in those applications.

“It is a very important segment. We are already in this business, and we are expecting future growth.” —European Manager, chemicals

“Definitely is something that is important and growing. . . . also sell fire protection products, and we also expect that this is growing. There is no doubt about this.” —European Manager, chemicals

“. . .we have some innovation ongoing, especially for the protection of timber frames, which is a big topic in the UK.” —European Manager, chemicals

“You look at the chemical companies, all three of them have a fire retardant . . . .” —US Manager, wood treater

One of the managers in Europe notes that legislation regarding fire protection is still unclear from some governments, and this unclear legislation is one element of uncertainty in how the market will progress in the future.

“From my point of view, the problem is that legislation is indecisive here, so you still have national
regulations on this and the market; the national markets are typically very small at this stage, and some markets have the feel of authority and don’t know what to do with it.” —European Manager, chemicals

Combining the environmental advantages of wood with the properties resulting from fire-retardant treatments may allow wood products to be more commonly used in commercial and private buildings in the future. The US supplier and customer managers state that although several different fire protection technologies are available on the market, at this point, treaters tend to use the lower-cost chemicals because they are sufficient to meet market demand.

Beyond pure R&D-based innovation, chemical suppliers see themselves as problem-solvers for their customers and believe that they are well connected to the marketplace. Managers consistently speak of their ability to bring both ideas and problems back from the marketplace into their companies and to develop solutions for their customers. They refer to this ability in the spirit of providing a total product (Bumgardner and Bowe 2002) to their customer, meaning something far beyond a chemical formulation, including a variety of supporting services.

“So we help them solve this problem by chemical means, giving technical support, maybe also marketing and regulatory support.” —European Manager, chemicals

“...our sales people in the area are usually not simple sales people, but they are technical experts. So, they can transport what they see or hear from the customer back to R&D, translate that into a technical requirement.” —European Manager, chemicals

“So we are definitely not just a chemical company that sells chemicals. We definitely have a full package. There are some chemicals we offer, plus a service package.” —European Manager, chemicals

“Our business model, technical selling, is based on having a good product, but also scientific advice that we are providing to customer in every field, marketing, environment, health and safety, and especially in technical service.” —European Manager, chemicals

As previously outlined, chemical company managers view the wood-treating sector as traditional, conservative, and lacking innovation. However, each chemical company that participated in this study directed us to a customer they knew to be quite innovative. Managers tend to discuss customers in two groups: innovative and noninnovative.

“. . .you will find that some are prone to innovation, and there are of course some that are just price buyers.” —European Manager, chemicals

“So I would say when you are talking about a customer innovation standpoint, you got 85% of them, they are just waiting on us to bring them something. Then about 15% of them, there is good communication, and they are trying to think ahead of the game.” —US Manager, chemicals

“A needs-based segmentation helps us pick out those customers with whom we want to work together in developing new products. . . . We are defining services and service packages that we offer to different kinds of customers in the way that the innovation buyer gets something else than the price buyer.” —European Manager, chemicals

It is with these more innovative customers that the chemical companies develop particularly close relationships. These relationships were described and explained throughout our interviews. The building of trust with time with these “key customers” translates to a situation in which the customers are essentially facilitators of innovation development and implementation in the industry.

“You build trust obviously when you are developing these relationships, and they are more willing to be our guinea pig when we have a new product.” —US Manager, chemicals

“So we help them solve this problem by chemical means, giving technical support, maybe also marketing and regulatory support. They may also get a reduced price to act as a test customer.” — European Manager, chemicals
“If we have a new product, we will first ask him [the innovative customer] if he is interested and can do the test because sometimes, it is very sensitive to make a test, and if the test fails, there are some rumours on the market. So, to prevent those rumours, we will mainly contact customers that we have a good feeling and are trustful.” —European Manager, chemicals

As described earlier, big box retailers are considered to limit innovation in the industry because of their strong focus on low prices. In the US example, however, a situation was described in which the retailers drove innovation by demanding a more stable product. Ironically, the big box retailer, instead of going to its supplier of treated wood, went directly to the chemical company to ask for an improved product. This sort of action may tend to exacerbate the lack of innovation in the sector because market signals are one key impetus for innovation. If a major buyer chooses not to send signals directly to the customer, it is difficult for the customer to know when to innovate.

**CONCLUSIONS**

As indicated in earlier research, our findings indicate that suppliers to forest product manufacturers play an important role in the innovation that takes place in their customer companies. In the context of our study, the suppliers are important both for product innovations, namely, providing the chemical formulations and color pigments used by wood treaters, and for process innovations. On the process side, chemical companies often provide important technical support to their customers.

Suppliers of wood protection chemicals are limited in their ability to innovate because of restrictions imposed by governmental regulations and public perception (Preston 2000; Freeman et al 2003). Inventions, such as new biocide chemicals for wood protection, must be accepted and registered by the authorities, forcing the suppliers to go through a time-consuming and costly process of documenting the efficacy and environmental impact of their product. Restrictions on and even bans of some wood protection products as well as the decrease of concentration of active ingredients or the use of lower retentions could lead to product performance setbacks for treated wood. Such setbacks impact both chemical suppliers and the entire wood industry. Still, positive perceptions of environmental impact often favor the use of wood (Panwar et al 2013). Bad product performance decreases the positive opinion of wood, and therefore, the industry faces both the possibility of increasing the amount of wood used but also the risk of losing market share via high-profile product failures.

With the exception of a very few customers, such as those we interviewed, the chemical company managers see the wood-treating industry as rather noninnovative. The descriptor “conservative” is used many times throughout the interviews. Managers described much of the industry as “order takers” that want to do things in the same manner as they have in previous decades. This viewpoint does not suggest a strong innovation-focused future scenario for the wood-treating industry. However, the customers interviewed during this study were outliers, clearly pushing the envelope with respect to developing innovation. In fact, one of the customer companies had recently hired an innovation manager, something nearly unheard of in the forest sector.

Big box retailers, because of their intense focus on low-cost products, are described as villains in the marketplace, discouraging innovation by their customers. Chemical company managers are clear in their description that it is exceedingly difficult for treating companies to reap any rewards from big box retailers through innovation. However, an example is cited in which the retailer went directly to the chemical company seeking specific product improvements. Accordingly, retailers can also be a strong force for innovation in the sector. We argue that skipping the customer and dealing directly with the chemical supplier may not be the ideal situation for the development of innovation within the wood-treating sector. Strong signals directly
from customers can be a powerful motivation to innovate, and those signals are lost by skipping the customer in the value chain.

LIMITATIONS

The findings of this study should be interpreted with care. The qualitative approach used provides rich insights into the dynamics of innovation in the sector and the role played by chemical suppliers. However, our data represent only a minor number of companies across a large sector of the industry, and our results should not be treated as generalizable to the industry as a whole. Additional interviews with customer companies judged by the chemical company managers as being average would provide a more complete picture of the context of innovation within the sector.

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