SWST – International Society of Wood Science and Technology

Adapting to the Digital Age: Strategic Change in the Pulp and Paper Sector

BIOPRODUCTS BUSINESS

Alice M. J. Palmer[1]* and David H. Cohen[1]

Abstract

With the rise of the internet and electronic media, the first two decades of the 21st century have seen a rapid decline in demand for graphic paper. This study examines the strategic actions pulp and paper companies have been taking to adapt to such changes in their business environment, with the aim of providing a comprehensive description of both the leading firms and the smaller players in the industry. Public documents of 40 public and privately owned pulp and paper manufacturers in North America and Nordic Europe were examined for a range of change-related activities, such as repositioning efforts and changes to leadership, financing, and/or firm structure. Companies have been gradually reducing their production of graphic paper and increasing production of other products, thereby illustrating the twin turnaround concepts of retrenchment and recovery. Due to the capital outlay required to switch from one product to another, larger, integrated companies have generally been more successful at adapting than smaller companies that make mostly graphic paper. An unexpected observation was that declining demand was just one of many pressures on the pulp and paper industry; company documents also frequently mentioned fiber supply shortages and government regulations as drivers of change.

Keywords: turnaround, forest industry, transformational change, abductive content analysis, forest-based bioeconomy

1. Introduction

Since the year 2000, pulp and paper companies have experienced an unprecedented shift in market demand for their products (Bogdanski 2014, Jonsson 2011, Hetemäki & Hurmekoski 2016, Zhang et al. 2014). For North American producers, the rise of e-mail, electronic media, and mobile computing has cut demand for graphic paper grades (defined as newsprint plus higher-value printing and writing grades) by roughly 60% (FAO 2019) (Figure 1). The second largest traditional producing region, northern Europe, has also seen sharp declines, decreasing nearly 40% since its peak production year in 2006 (FAO 2019). The consequences of this decline have rippled through the supply chain, forcing producers of market pulp to find new markets for their product. For example, whereas in 2003 about 60% of northern bleached softwood kraft (NBSK) pulp went into printing and writing paper, by 2013 this figure had shrunk to 30% (Quinn & Patel 2014). Paper manufacturers have been forced to systematically reduce their production of graphic paper products and investigate new processes, products, and markets to maintain sales and profitability.

In addition to declining demand for graphic paper, pulp and paper companies in North America and Nordic Europe have also been adjusting to increasing global competition, particularly in pulp (FAO 2019). Rising global demand for pulp and paper products in the 1980s and 1990s attracted investment in forest plantations in warmer regions such as South America, Southeast Asia, and Oceania, where fast-growing species such as euca-

1 Department of Wood Science, Faculty of Forestry, University of British Columbia, 2424 Main Mall, Vancouver, BC V6T 1Z4

* *Corresponding author.* Email: alice.palmer@alumni.ubc.ca; Tel: 604-833-3596

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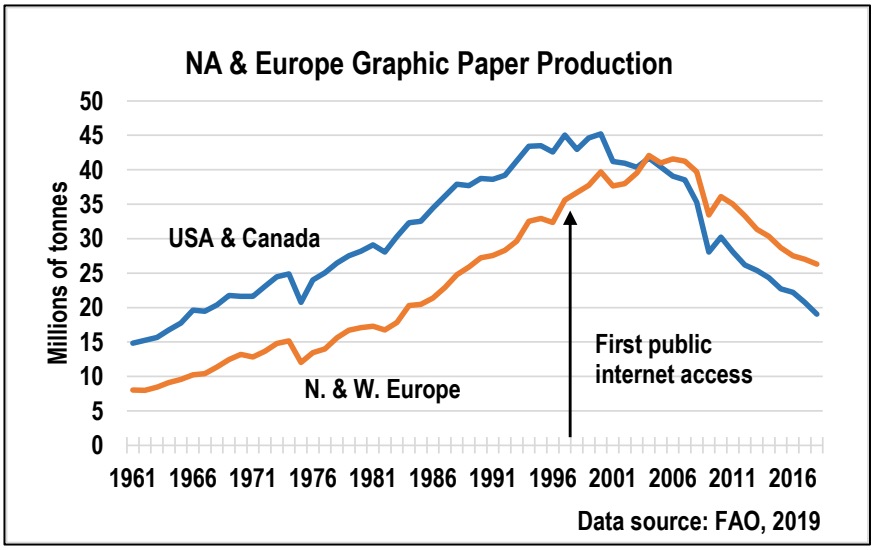

Figure 1. Decline of graphic paper production in North America and Europe.

lyptus and radiata pine can reach maturity much more quickly than in the Northern Hemisphere (Bogdanski 2014). Large, state-of-the-art pulp mills were built to use this rapid-grown fiber, and production has risen quickly from the 1990s. With lower costs than those of the older mills in the Northern Hemisphere, mills in these emerging regions have contributed to the pressure on pulp and paper companies in North America and Europe.

With the pulp and paper sector in the throes of change, manufacturers, industry associations, government agencies, and scholarly researchers alike have begun to discuss a need to transform the pulp and paper industry and broader forestry sector in general (Madero et al. 2019). The recent interest from industry and government has prompted an increase in research into how forestry companies (including those that make pulp and paper) can adapt to ongoing market shifts.

An expedient way to think about the burgeoning body of literature on the topic of transformational change within the pulp and paper industry is to categorize it according to subject emphasis and methodology (Figure 2). Regarding subject emphasis, the most common approach to the topic has been to investigate the opportunity to produce a greater variety of products from the pulping process, or in other words, to shift to a "biorefinery" operating model. Methodologically, authors have done so either through discussing the topic with expert respondents (e.g., Brunnhofer et al. 2020; Hämäläinen et al. 2011; Hurmekoski et al. 2018; Karltorp & Sandén 2012; Näyhä 2019, 2020; Näyhä & Pesonen 2012, 2014; Patari et al. 2016; Toppinen et al. 2017) or by examining company actions and financial records (Novotny & Laestadius 2014; Pätäri et al. 2011). Alternatively, a smaller group of studies examine the subject more broadly. For example, Cohen and Nikolakis (2013) and Madero et al. (2019) asked industry to define transformation in their own words, resulting in a much broader range of activities that could be transformational, including not only product diversification and biorefinery technology but also operational improvements. On a similar thematic note, but by examining financial records and case studies, Ghosal (2015) highlighted the importance of making continuous improvements to manufacturing and supply chain facilities in order to remain competitive. Lamberg and Peltoniemi (2019) examine the topic on an even broader scale, examining entries, exits, and investments of Finnish pulp and paper companies over a 200-year period.

While the literature portrays a relatively consistent picture of what the ideal pulp and paper industry would look like, it also hints that some solutions may not be appropriate for all companies. For example, although all but two of the cited papers highlighted the opportunity to expand into emerging biomaterials such as nanocellulose or biofuels, Novotny and Laestadius (2014) point out that only chemical pulp mills are well suited to producing such products and that not all pulp and paper companies have this type of mill. Moreover, the four studies that use companies as a unit of analysis either consider a broad range of actions for a small group of

Subject Emphasis	Pulp and Paper Industry Change: Themes and Methods* at a Glance		
	Emphasis on bio-products	10 studies Common themes: - New product opportunities - Factors driving interest in bioproducts - Role of wood-based bioproducts within the bioeconomy	2 studies - P&P companies with specific *dynamic capabilities* perform better; bio-refineries could become the next dynamic capability - Chemical pulp mills can make many different products; mechanical mills are more limited Gaps: - Financial info available for large, public companies only - Detailed actions only available for 3 Nordic companies
	Other changes examined	2 studies - Many activities can be transformational, i.e. not just product diversification and bioeconomy (as above) but also operational improvement - Leadership, access to capital, & employee engagement are important enablers	2 studies - The careful selection of technology investments is vital to financial health & longevity - P&P companies need to continuously improve manufacturing and logistics processes to stay competitive Gaps: - Studies either examined a narrow range of actions for a large group of companies, or examined a wide range of actions for a small group of companies
		Participant responses	**Observations of company actions and financial records**
Source of Study Data			

** Excluding literature reviews and conceptual papers. For authors and titles, please refer to Appendix 1.*

Figure 2. Topical and methodological approaches to examining pulp and paper industry change.

companies (i.e., case studies) (Novotny & Laestadius 2014, Ghosal 2015) or consider a relatively narrow range of activities or statistics for a larger group of companies (Pätäri et al. 2011, Lamberg & Peltoniemi 2019). In sum, it is possible that the literature has overemphasized the opportunities available to some categories of pulp and paper companies (e.g., those that are publicly traded or that have chemical pulp mills) while underemphasizing solutions that might be well suited to others.

This study seeks to fill in such potential blind spots in our understanding, through an examination of the types of actions pulp and paper companies have been taking to adapt to their business environment, including both large, publicly traded firms and small, privately owned firms in North America and northern Europe. Through a content analysis of corporate publications as a methodology and using business turnaround as a theoretical lens, we consider a wide range of different change-related actions, including not only product focus and investments/divestments, but also such topics as leadership, financing, and company structure.

The study begins with a brief overview of business turnaround concepts, followed by a detailed explanation of its two-part methodology. Next, the results section details the themes and trends emerging from the content analysis. Finally, the discussion and conclusion sections examine the results within their theoretical context and highlight emerging questions for future study.

1.1 Theoretical Lens: Business Turnaround

Madero et al. (2019) propose business turnaround as a theoretical lens for discussing transformative change in the forest industry. Business turnaround has been defined variously as "a decline and recovery in performance" (Schendel et al. 1976, p. 3), "appropriate business responses to financial decline" (Pearce & Robbins 1993, p. 613), and "how firms reverse firm-threatening performance declines" (Barker & Duhaime 1997, p. 13). The recent struggles of the pulp and paper industry, as indicated by bankruptcies and mill closures, and the industry's efforts to reinvent itself suggest the term "turnaround" would indeed be appropriate. While this study does not specifically assume that *all* pulp and paper companies have experienced a period of poor performance (as per the above definitions of "turnaround"), it draws heavily on the ideas present in the turnaround literature.

A simplified turnaround model based on that of Pearce and Robbins (1993) provides a foundational overview of the concept (Figure 3). According to the model, a company undertaking a turnaround generally does so in two steps: a cost-reducing retrenchment[1] phase followed by a recovery phase. The retrenchment, defined as a period of cost reduction, frees up the resources a company needs to get started on the road to recovery. Deep cost cutting may also involve "asset reduction" – the sale or closure of operations. The rapid decline in graphic paper demand does indeed appear to be triggering asset reduction activities, including widespread mill closures. Madero et al. (2019) suggest the rising popularity of the term "transformation" among forest industry practitioners could reflect a phenomenon observed by Pearce & Robbins (2008): the term "turnaround" has become used in a pejorative sense, in that it is often associated with the retrenchment phase of a turnaround. "Transformation" is a more palatable way to describe the second, recovery phase of a turnaround.

What constitutes the best response to a given company's turnaround situation depends largely on the nature of the decline. While turnaround situations caused mostly by internal factors can generally be solved with operational remedies, declining performance caused by changes in a firm's business environment may require strategic actions such as a change in business model. In accordance with the model, the recent global reduction in demand for graphic paper could be considered an external turnaround cause, necessitating strategic changes. The following section describes a variety of different strategic and operational actions firms may take to effect an improvement in their business.

1.2 Business Turnaround Activities

The business turnaround literature offers insight into the types of steps companies may use as part of a turnaround initiative. For example, Barker and Duhaime (1997) observed 28 different management actions among firms that experienced performance recoveries between 1974 and 1988. Corporate-level activities (defined as "domain-changing activities" or changes to a firm's business model) included acquisitions and divestments, joint ventures, start-ups, geographic expansion or contraction, and changing priorities among the firms' existing businesses. At the business (or "product-market") level,

1 Scholars are not unanimous in their viewpoints about retrenchment. This concept will be discussed further in section 4.2.

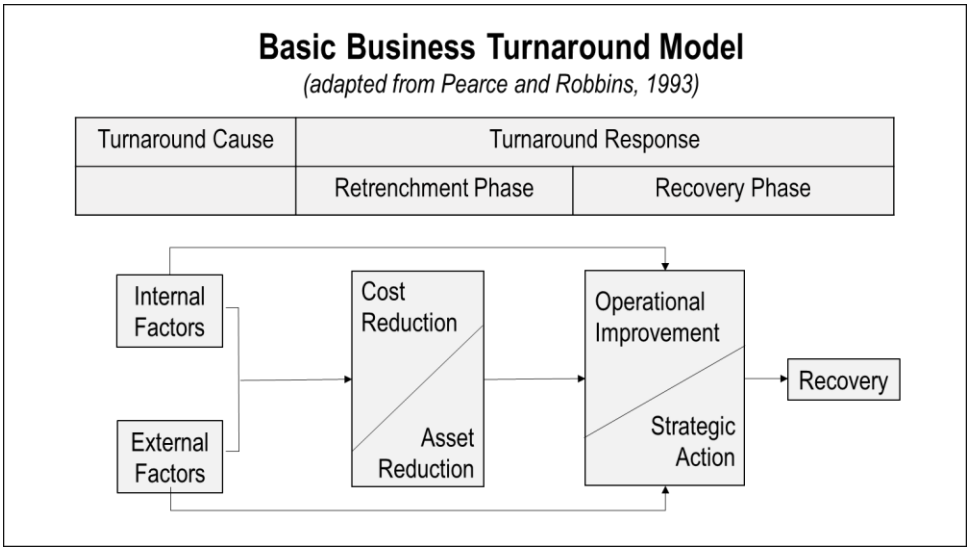

Figure 3. Basic business turnaround model.

Table 1. Actions used to effect business turnaround.

Category of change action	Adaptive actions	Trends to watch for
Business unit	Whole-firm or business unit acquisitions or divestments	Do the changes show a pattern over time? Eg., • growing importance or one business/product line over another • shifts along the supply chain (i.e., more raw materials, or more finished products) • growing importance of on geographic area over another
Mill facilities	Mill acquisitions or divestments, mill closures, new mill construction, major (i.e., publicly-announced) upgrades, conversions to different products	
Geography	Announced plans to enter or exit production or sales in a geographic region	
Products	Enter or exit a product or business line (announcement would likely be in conjunction with a venture- or facility-related decision)	
Leadership	Changes to CEO, senior management team, or board	• What precipitated the change? • Where was the background of the new leaders?
Financing	Major steps to reduce debt or shore up financing, such as debt recapitalization or bankruptcy restructuring	
Company structure	Sale of the company, merger, change between public or private ownership, change between business structure (i.e., corporation vs. REIT*), joint ventures	

* Real estate investment trust.
Source: adapted from Barker and Duhaime (1997), Harrigan (1980), and Schoenberg et al. (2013).

changes could be applied to product lines, marketing, prices, manufacturing (including facility modernizations or closures) research and development expenditures, and/or financial policy changes (e.g., asset liquidations or bankruptcy protection).

Other turnaround literature cites similar types of actions. For example, Harrigan (1980) stresses acquisitions, divestments, facility closures, and mergers (activities which would fit into Barker and Duhaime's 1997 corporate-level change category). Pretorius (2008) mentions activities that fit into several of Barker and Duhaime's (1997) categories, but groups them according to motivation. For example, "last resort" activities include financial policy changes such as bankruptcy protection and emergency financing as well as corporate-level activities such as a sale of the company.

A literature review by Schoenberg et al. (2013) groups company activities into six turnaround themes, four of

which are content-oriented, that is, they suggest which actions to take; and two that are process-oriented, meaning they suggest ways to achieve them. Content-oriented themes include cost efficiencies, asset retrenchment, a focus on the firm's core activities, and building for the future; among the process-oriented themes are reinvigoration of firm leadership and culture change. Table 1 summarizes the actions and thematic trends discussed above.

2. Methods

2.1 Overview of Methodological Approach

This study asks, "What actions have pulp and paper firms in North America and northern (Nordic) Europe been taking to adapt to their changing business environment?" To answer this question, the authors conducted a careful examination of publicly available information sources to inventory the adaptive actions these companies have taken. This content analysis approach takes advantage of the abundance of publicly available information about company activities, including websites, annual reports, news releases, and (to a lesser extent) analyst commentary, to paint a picture of the initiatives pulp and paper producers have explored for adaptation to this new market reality. Furthermore, examining the companies' actions over a 14-year period enabled the authors to observe how company strategies played out over time.

This study primarily uses a problem-oriented or abductive approach (Krippendorff 2013)[2] to the above-described content analysis. Abductive reasoning seeks to identify the best explanation for a given set of observations, but recognizes that there may be other possibilities. For example, a physician may contemplate a patient's symptoms and then make a diagnosis, or a detective may gather clues and solve a murder. In a similar fashion, the "clues" this study sought from the chosen texts were mentions of business activities such as divestments or leadership changes. In doing so, the authors aimed to piece together an overall image of company strategies. While many companies may be reticent about their strategies, even the most secretive firms take publicly observable actions, such as advertising new products or informing their employees of mill closures.

For additional insight, following the abductive information-gathering step, the study incorporates an inductive examination of the accumulated text to identify the prominent accompanying themes. For example, if annual reports state why companies are making specific strategic changes, commonly cited reasons are identified in this second, inductive step.

The use of content analysis provides a contrasting approach to much of the recent literature in the field of forest products business management, in which the majority of studies have used respondent-dependent methods such as surveys, interviews or Delphi procedures. One potential shortcoming of respondent-dependent research is the potential for respondent bias (Krippendorff 2013). For instance, participants may alter their response to meet what they perceive as the expectations of the researcher, attempt to manipulate the researcher, or (conversely) be influenced by the researcher. While content analysis itself is not necessarily bias-free, its potential "blind spots" are different from those of other research methods, therefore providing an opportunity for triangulation.

2.2 Sampling Method and Units of Analysis

This study used purposive sampling, with the goal of having as large and robust a sample as possible. The criteria for choosing companies were as follows:

- Companies had manufactured pulp and/or paper products at some time within the initial 2004-2016 study window.[3]
- Companies had operations in Canada, US, and/or northern Europe (Finland, Sweden, Norway).
- Companies had at least one primary pulping facility (groundwood or chemical).

The third criterion (primary production) excluded many consumer products or specialty firms such as Kimberley Clark, Neenah Paper, etc., that operate further along the supply chain and have not been subject to the same market decline as the primary producers. Also excluded were peripherally relevant firms which may have a pulping facility, but which earn most of their revenue from specialty or value-added products such as chemicals or packaging such as Borregard and Graphic Packaging.

2 This contrasts with a content-driven (inductive) approach, in which combining specific observations leads to the development of a general theory; and a deductive approach, in which a general theory is used to develop specific, testable hypotheses.

3 The study period was later updated to include the years 2017 and 2018. Data collection began with the year 2004 because this was the earliest year in which consistent financial information was available.

Sample companies were drawn from the following sources:

- PricewaterhouseCoopers, *Global Forest, Paper & Packaging Industry Survey* Top 100 Companies List (2016 and previous editions)
- RBC Capital Markets, *North America Paper, Packaging & Forest Products Coverage List* (Quinn & and Patel 2014) and *Global Paper Comparables List* (Quinn & Swanson 2016)
- RISI, *Pulp and Paper International* PPI Top 100 List (2016).

In addition, the study included companies that, over the 14-year study period, merged into, sold mills to, bought mills from, or were spun off the companies on the above lists. Finally, the researcher added two additional small companies suggested by industry experts.

In most instances, the unit of analysis was the company, as this is the level at which strategic decisions are made. In a few exceptions, the authors grouped a pair or small group of companies if one company makes strategic decisions for its subsidiary (i.e., Canfor and Canfor Pulp) or if a new company resulted from a spinoff (i.e., Rayonier with Rayonier Advanced Materials).

2.3 Data Collection Process

2.3.1 Quantitative Overview

Data was collected in two steps. Step one was to create an annual overview of each company, including information about its location, ownership, products and total revenue (as an indicator of company size) (Table 2). Wherever possible, total revenue was compiled using the *Morningstar* investment website as a single source to ensure uniformity of data among companies (Morningstar Research Inc. 2019). Remaining information was gathered from company websites and annual reports. Firm production was also tracked over time, with the goal of identifying when each entered or exited product lines.

An important dimension of the variables is how they change over time. While some amount of change is to be expected (such as the retirement of a senior leader in the firm, or a new brand launch), an unusual or unexpected change (such as the replacement of a majority of the board of directors with executives from outside the firm, or the acquisition of another firm's entire productive capacity of a new product) is indicative of a change in strategy.

Table 2. Quantitative variables: company characteristics and financial information

Variable	Indicator(s)
Ownership	Public, private, or public with a significant shareholder
Geographic location	North America (Canada + US) or Europe
Products manufactured	Forest land management, lumber, panels, engineered wood products, market pulp, specialty pulp, newsprint & magazine paper, fine & specialty paper, containerboard, packaging, tissue products, chemicals, bioenergy, and other
Firm size	Firm revenue

2.3.2 Examining the Text(s) for Change Indications

Step two involved a careful reading of available business documents from the initial 2004-2016 study period,[4] searching for mentions of adaptive actions such as those noted in Table 1. In other words, for each company under study, the text was examined in light of these questions:

- What corporate-level acquisitions or divestments did the company make, (if any)?
- What mill-level changes did the company make, such as acquisitions, divestments, upgrades, conversions etc.?
- Did the company announce plans to enter or exit specific geographic regions (e.g., Asia)?
- Did the company officially announce that it was entering or exiting a product line?
    - Alternatively, did the firm sell off its last production unit of a category of product, thereby exiting the business line?
- What changes were made to the company's senior leadership team and board (if any)?
- Did the company announce major changes to its financing, and if so, what?
- Did the company make any major structural changes, and if so, what?

Each change indicator or "answer" was recorded in a Microsoft Word (Microsoft Office 2016) document (referred to hereafter as the "compendium"). Shorter sections were copied and pasted in their entirety; longer sections were paraphrased.

4 The research period was later extended to include the years 2017 and 2018, to be discussed in Section 2.5.

The literature sources were examined in the order below, with the search continuing until either all of the above questions were addressed, or all sources were exhausted.

1. Company websites, including historic and current press releases.
2. Company annual reports (sampling the earliest available report, the most recent report, and reports at 3-4 year intervals in between, depending on how many years of detail each report provided).

For the majority of companies, steps 1 and 2 were adequate for finding the answers to the questions above. However, for some small, privately owned firms (all of which were North American), additional searching was needed:

3. If unanswered questions remained after the websites and annual reports were examined, the authors then searched (via Google) the company name with a keyword phrase, such as "Canfor closure" or "Canfor acquires" (or its French-language equivalent[5]). Such searches often uncovered articles in the online editions of local newspapers or broadcast media.

If the literature offered specific motivations for the adaptive activities (such as closing a mill to save costs) this information was also noted.

2.4 Analysis of Text Extracts

The compendium of company change activities was manually coded sentence by sentence using the logic of open coding (Coffey & Atkinson 1996) and with the aid of NVivo Professional 11 (QSR International Pty Ltd. 2015) software. Because the compendium included text references to both measurable actions (i.e., a change in CEO) and surrounding context (i.e., the new CEO's background, alluding to intentional succession planning), codes were classified as to whether they represented actions or contextual themes such as motives for change, external drivers, or influential actors. The NVivo results were then exported to Microsoft Excel (Microsoft Office 2016) for further analysis. The number of companies mentioning each action as coded was tallied to gain insight into the relative rate of incidence of each action.

2.5 Company Activities Updated to 2018

The original coding was done in 2017. Prior to the publication of this paper, the authors re-examined each of the 40 companies' activities to identify any additional strategic changes in direction. The compendium was not re-coded or re-tabulated after the addition of this new information; therefore, percentage tallies in the results section represent information from the initial 2004–2016 study period. However, the narrative considers the full range of data and not just that which was used for coding.

3. Results

As discussed in section 2.2, purposive sampling was used to create as large and robust a sample as possible. Forty companies (or company groupings, in the case of spinoffs or subsidiaries) were examined in detail (Table 3). Thirty-one companies were headquartered in North America, eight were headquartered in Europe, and one (SAPPI) was headquartered in South Africa, but had approximately 50% of its operations in Europe and an additional 25% in North America.

The coding exercise highlighted adaptive actions (as per Table 1) as well as company motivations for change, external drivers of change, and people involved in change.

3.1 Major Trends

3.1.1 Gradual withdrawal from graphic paper products

By far the most prevalent trend was reduced production, particularly in graphic paper[6] grades. Sixty-five percent of the companies indicated that they had closed at least one pulp and/or paper mill or machine.[7] Thirty percent of firms specifically mentioned declining demand as a driver. For example:

> Our white papers compete with electronic data transmission, e-readers, electronic document storage alternatives, and paper grades we do not produce. Increasing shifts to these alternatives have had, and are likely to continue to have, an adverse effect on traditional print media and paper usage. (Packaging Corporation of America)

In addition to mill closures, mill divestments (and corresponding purchases) have also been common, and were mentioned by over half of the companies. Most common among the wide range of motives for divesting, mentioned

5 Canada has two official languages: English and French.

6 "Graphic paper" is defined as *newsprint* plus *printing and writing* grades of paper.

7 Paper mills often have more than one "machine" or production line.

Table 3. List of companies / decision units.

Companies headquartered in North America			
Alberta Pacific*	Fortress Paper*	Mercer*	Tolko**
Boise Cascade and Boise Inc.**	Georgia-Pacific***	NewPage*	Twin Rivers* (formerly Fraser Papers)
Canfor and Canfor Pulp**	P H Glatfelter**	Paper Excellence**	Verso*
Cascades**	International Paper***	PCA**	Wausau Paper*
Catalyst*	J D Irving**	Rayonier and Rayonier Advanced Materials**	West Fraser**
Clearwater Paper**	Kapstone Paper and Packaging**	Resolute**	Weyerhaeuser**
Domtar**	Kruger**	Stern Partners' companies*	White Birch Paper*
Expera Specialty Solutions*	Meadwestvaco** (*** after 2015)	Tembec**	
Companies headquartered in Europe			
BillerudKorsnäs**	Metsä Group**	SCA***	Stora Enso***
Holmen**	Norske Skog**	Södra**	UPM Kymmene***
Company headquartered in South Africa but operating in Europe and North America			
SAPPI**			

Stars (*) indicate the approximate size of the company.
* = Annual sales of < US$ 1 billion or fewer than five pulp mills
** = Annual sales between US$ 1 billion and $ US 10 billion
*** = Annual sales over $US 10 billion; integrated company with global reach

by 40% of companies, was a desire to concentrate on a smaller number of core businesses. Several North American firms sold off not just individual paper mills, but their entire line(s) of different paper products. This could be done either by a sale or by "spinning off" the product line into a newly formed company. Examples include Meadwestvaco spinning off its graphic paper mills to form NewPage in 2005, International Paper spinning off its supercalendared paper mills to form Verso in 2006, Weyerhaeuser's sale of its fine papers division to Domtar in 2007, Domtar spinning off its lumber mills to form Eacom in 2010, and Cascades spinning off its fine papers facilities as Rolland Enterprises in 2014. Among European companies, the sale of one or two mills at a time has been more common.

Manufacturers of products other than graphic papers have also needed to close or divest poorly performing mills. For example, Cascades, Domtar, Södra, and WestRock have closed NBSK[8] pulp mills; Tolko was planning to shut its kraft paper mill, but instead found a buyer; Paper Excellence closed its BCTMP[9] mill; and Holmen and PCA have both closed paperboard mills. Mill closures accelerated during and immediately after the 2009 recession. While non-graphic pulp and paper products such as NBSK, BCTMP, and paperboard do not appear to be in permanent decline, they have nonetheless still been subject to market pressure and global competition.

The companies that (as of the end of 2018) were still heavily weighted to printing and writing paper, including those companies that were formed as spinoffs of other companies' printing and writing paper businesses, have been more likely to mention financial challenges than those that have exited or reduced their exposure. Catalyst Paper, Verso, and Norske Skog are examples.

3.1.2 Costs, prices, and margins are a prime concern

Declining demand (either structural or cyclical) and high operating costs combined to create tight or even negative margins for pulp and paper companies. A desire to cut costs and/or improve efficiencies was the most commonly highlighted motivator for change, mentioned by 45% of the companies. Costs were also mentioned by 28% of companies as an important driver of change. In the words of one company:

8 Northern bleached softwood kraft pulp, a chemical pulp with strong fibers.
9 Bleached thermo-mechanical pulp.

> Paper supply has exceeded demand despite the consolidation and capacity rationalization which has occurred across the industry. These factors have led to highly competitive market conditions and eroding industry margins with pricing leverage insufficient to offset the impact of increased manufacturing costs — most notably fiber and energy. (Wausau Paper, owned by SCA since January 2016)

3.1.3 Many firms have lacked sufficient financial resources

Several companies, especially those that are heavily invested in printing and writing paper, have had to restructure financially. Nine firms, including Catalyst Paper, Expera Specialty Solutions, NewPage, Norske Skog, Resolute, Stern Partners, Twin Rivers, Verso, and White Birch Paper have been through either debt recapitalization, Chapter 11 bankruptcy (in the US), or an equivalent procedure. The most common trigger was excess debt; indeed, a third (33%) of companies studied explicitly mentioned this as a motive for making changes. Liquidity improvement was an additional financial motive.

3.1.4 Private equity firms have played an active role in restructuring

Companies in financial difficulty have also merged with or been purchased by other firms, sometimes in leveraged buyouts. An unexpected trend was the frequency in which struggling firms or individual operations were purchased by private equity firms. Over a quarter of the companies in the study[10] were owned by various private equity firms at some point in the past 20 years. All but one of these were North American.

3.1.5 Firms that can afford it have grown in other business lines

Pulp and paper companies have needed to replace their dwindling graphic paper operations with other business lines. Popular areas of growth have included forest land management; packaging materials such as boxboard, linerboard, and corrugating medium; tissue and hygiene products; pulp products; and pulp by-products such as lignin and energy. These areas were selected because many of the skills needed for success were similar to those previously applied to successful graphic paper firms. For example, Weyerhaeuser gradually sold off its paper divisions over the past decade, investing instead in forestlands. In 2016, it merged with Plum Creek Timber, becoming one of the world's largest private timberland owners. International Paper restructured in 2005, and over the next two years, sold many of its operations in forestlands, wood products, beverage packaging, kraft paper, coated paper, and chemical businesses. It used the revenue to invest in its core businesses: packaging, printing papers, and distribution. Domtar hired a new CEO from personal care product manufacturer SCA in 2009. In 2012, it purchased adult incontinence product manufacturer Attends, establishing a personal care products division. It has since purchased additional manufacturers and distributers of adult incontinence products, which supplied 19% of its annual revenue by 2015 and 24% by 2017. UPM Kymmene has rebranded itself "The Biofore Company," commercializing various products from the chemical pulping process and further refining others to create new products, such as biodiesel and biochemicals. West Fraser Timber has done this on a smaller scale, by isolating lignin during the pulping process and working to commercialize it as a chemical in various markets.

Strategies for entering other business lines varied. The **most common way to expand into new product lines was by acquisition**, with acquisitions ranging from single-mill purchases (38% of companies examined) to mergers with an equal-sized firm (33%). Alternatively, some firms (33%) converted existing mills into other, similar products, and others built new mills (38%). Purchasing existing mills, either singly or as a group, can be less expensive than building new facilities. For example, in the summer of 2018, China-based Nine Dragons purchased Catalyst Paper's graphic paper mills in Rumford, Maine and Byron, Wisconsin for just US$175 million (ND Paper 2018). In contrast, BillerudKorsnäs is investing SEK 5.7 billion (approx. US$ 640 million) to build a new paperboard machine at its Gruvön mill site and rebuild the existing Kraft pulp mill (BillerudKorsnäs 2016). Moreover, the construction of Metsa's new sulphate (kraft) pulp mill in Äänekoski, Finland was budgeted to cost €1.2 billion (US$1.4 billion) (Metsa Group 2015). Mill conversions can also be technically complicated. For example, Fortress Paper's conversion of its Thurso, QC mill, originally scheduled for September, 2011, did not occur until December of that year, and production delays continued well into 2013 (Kuitenbrouwer 2015).

10 Boise Cascade, Boise Inc., Canadian Kraft Paper Industries (former Tolko mill), Catalyst Paper, Expera Specialty Solutions, Mercer International, NewPage, Norske Skog, PCA, Rolland Paper, Stern Partners, Twin Rivers, Verso, and White Birch Paper have been either fully or partially owned by private equity firms. In addition, Stora Enso had its own private equity investment arm.

Mill conversions are also a way to avoid closing efficient mills that have dwindling markets. Mills making newsprint, one of the earliest products to suffer continuous market decline, have been converted to a range of alternative products. For example, JD Irving, SAPPI, Norske Skog, and Holmen have converted newsprint mills to higher-value paper products including supercalendared and lightweight coated paper used for magazines and newspaper inserts. Converting newsprint (or other graphic papers) to containerboard or linerboard is another option, undertaken by PCA, Stora Enso, UPM Kymmene, and International Paper. Norske Skog partnered with Italian company Rotocard to convert a paper mill to tissue. Pulp mills have also been converted. For example, Fortress Paper converted a kraft pulp (NBSK) mill to dissolving pulp, and Stora Enso converted a paper pulp mill to make fluff pulp for tissue applications.

3.1.6 Leadership transitions ranged from stable to chaotic depending on the company

The majority of changes to corporate leadership (including CEOs, senior managers such as executive vice presidents, and board members) have been due to retirements, with the majority of replacements being internal. However, there have been a number of exceptions: 48% of companies brought in at least one external CEO or C-suite executive. Changes of ownership, changes of company direction, and activist boards were the most common drivers of such changes. Firms that have had financial difficulties have been more likely to have changes in leadership. For example, as of spring 2020, Norske Skog has undergone five CEO transitions since 2005, including three transitions since 2017.

3.1.7 Energy production for cost reduction and revenue generation

Energy production (including cogeneration, hydroelectric and wind production, and wood pellets) began as a means of cost reduction and is now becoming a source of supplemental income. The pulp production process (particularly the drying phase) is energy-intensive and subject to fluctuating fossil fuel and electricity costs. Government incentives have also encouraged energy conversions, such as the one announced here:

> In 2010, [our company] introduced the first phase of its energy strategy, a multi-year initiative that will allow the company to reduce fossil fuel use, increase renewable biomass use and further leverage the high-efficiency combined heat and power (CHP) technology at its paper mills. (Verso, a US-based paper manufacturer, upon announcing a US $100 million, 4-phase energy initiative using both federal and state-level grant money)

Over the past decade, new opportunities to sell bio- and wind-based power to regional electrical grids, and the development of the wood pellet export industry, have provided opportunities for companies to improve revenues and reduce greenhouse gases while improving their environmental credentials:

> [Our company's] three pulp mills are largely fossil-fuel free, and generate surplus energy. This energy is sold as bio-based products, such as green electricity and district heating. (Södra, a European integrated pulp and solid wood manufacturer)

Twenty-three percent of the firms in the study indicated they were increasing their production of bio-derived energy, 10% indicated they were selling electricity derived from cogeneration, and 8% indicated they were generating electricity by other means, such as wind or hydropower.

3.1.8 Emerging fiber and biofuel technologies

Firms have also increasingly been exploring high-tech **fiber** and **biofuel technologies** such as cellulose nanofibers, lignin, hemicellulose, and biodiesel. Such products are limited to firms that are already producing pulp through chemical (as opposed to mechanical) means. The majority of pulp and paper companies' investments in these new technologies have been joint ventures or involved partnership agreements. Examples of technology partnerships include Resolute and Mercer's joint venture, Performance Biofillaments; Domtar and FPInnovations's joint venture, Celluforce (with investors Shlumberger and Fibria); Canfor's joint venture with Licella Fibre Fuels Pty Ltd.; Alberta Pacific's cooperation with InnoTech Alberta and Alberta Innovates to develop a cellulose nanocrystals pilot plant; and Stora Enso's joint venture with chemical company Rennovia. UPM Kymmene has also created short-term (i.e., 2-year) partnerships with several land- and ocean-based transportation companies to pilot its biodiesel products.

European companies have been more likely to rebrand themselves as manufacturers of "biomaterials"; however, the adoption of new fiber and biofuel technologies appears relatively similar on both continents. European annual reports now typically refer to kraft and dissolving pulp mills as "biorefineries"; North Americans

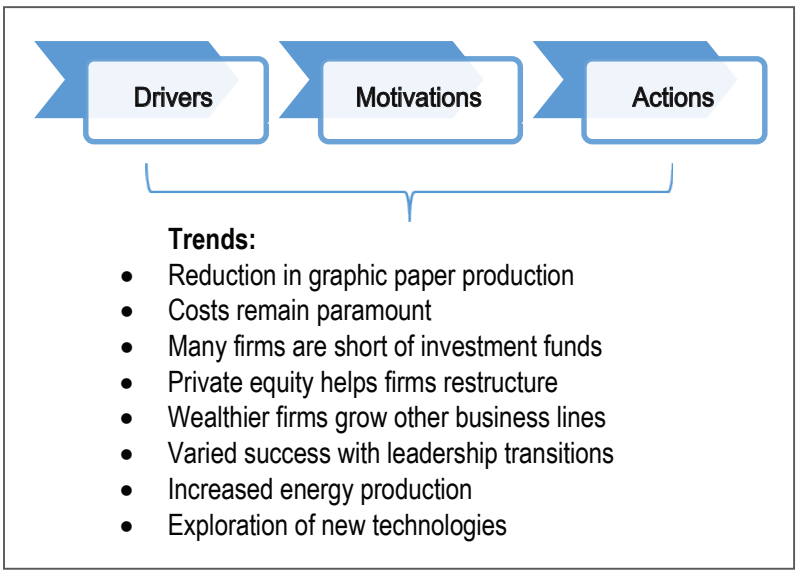

Figure 4. Summary of themes and trends.

firms tend to refer to the mills by their technical product names (NBSK mill, sulfate pulp mill, etc.).

In summary, pulp and paper firms are gradually reducing their production of graphic paper grades and growing in other product areas, including packaging materials, tissue products, new cellulose or by-product-based technologies, and energy. Financial issues, including costs and margins, finding adequate investment capital, and financial restructuring, were of paramount importance. Finally, the relative stability of the top leadership teams and boards varied by company, with financially and structurally stable companies less likely to make major changes. Figure 4 briefly summarizes these results; the following discussion will examine these results in the context of the extant literature and suggest topics for future study.

4. Discussion

From this study's examination of corporate documents, it is evident that the pulp and paper industry recognizes that its situation is not just "business as usual" and that firms need to alter the way they do business in order to survive and thrive. Each firm in this study made significant changes to its business. Furthermore, most (93%) of the firms appear to have expanded their actions beyond such "everyday" changes as operational improvements or changes to production volumes. The following discussion will highlight how the study's results advance our understanding of what pulp and paper companies are doing and can do to adapt to their changing market environment.

4.1 Unexpected Observations

Since a major premise of this research was that pulp and paper companies are transforming their businesses to adapt to the severe decline in demand for graphic paper, one might have anticipated "declining demand" to be by far the most prevalent change driver mentioned in the company documents. In fact, this was not the case. In addition to the driver "declining demand" (mentioned by 30% of the companies), the drivers "chip and raw material supply" (38%) and "subsidy or tax credit" (33%) were also mentioned frequently. This result suggests that the relative importance of declining demand as a change driver is worthy of further study. While it is possible that company literature (which has potential investors among its target audience) intentionally de-emphasized the issue of declining demand, it is also possible that other topics are emerging as more important to the industry.

The role of government incentives is worth noting. As one-third (33%) of the companies mentioned investments that were stimulated by a government subsidy or tax credit, it would appear that government policymakers have been actively, and successfully, seeking to influence company actions within the pulp and paper industry. Given that this study focused specifically on firms in regions in which the forest industry played a

historically important economic role, such government interest is perhaps not surprising.

The prevalence (33%) of companies owned or influenced by private equity firms, hedge firms, and special purpose acquisition corporations was also a surprise. Neither the business management nor the forest products literatures stress private equity's role in business transformation. Indeed, within the forest products literature there is little mention of the issue *driving* the need for private equity involvement: firms' difficulty obtaining the funds they need to carry out recovery activities such as mill upgrades or product conversions. This gap is worthy of deeper examination.

The companies that were most likely to need financial restructuring tended to have a number of characteristics in common: they produced mostly (or in several cases, exclusively) graphic paper grades, they tended to be smaller on average and several were privately owned for at least part of the study period. These characteristics have tended to make them more difficult to include in research samples. As mentioned in the introduction section, three of the four studies that examined companies as the unit of analysis either looked at financial information from publicly traded firms (Ghosal 2015, Pätäri et al. 2011), or examined a small number of large, integrated companies in detail (Ghosal 2015, Novotny and Laestadius 2014). One more characteristic of this study's cohort of struggling companies was that all but one were headquartered in North America. They were therefore not included in Lamberg and Peltoniemi (2019), which studied only Finnish companies.

Another way in which this research differs from that of the extant literature regards the role of emerging biomaterials within the forest industry. As discussed in the introduction, much of the forest products literature discusses the role of biorefineries in transforming the industry. Whereas 25% of the pulp and paper companies in this study have invested in emerging wood-derived biomaterials such as nanocellulose or lignin, only a handful (i.e., UPM Kymmene, Metsä) currently appear to be actively relying on these materials playing a major transformative role in their businesses.

The Novotny and Laestadius (2014) case study of three Swedish pulp and paper companies pointed out that the company that mostly used thermomechanical (TMP) pulping processes faced greater "lock-in" (p. 885) to traditional products and processes than did the companies that had more chemical process (kraft or sulphite) mills. As thermomechanical mills do not separate lignin from cellulose, they have fewer options for producing wood-derived chemicals. The fact that building new mills is extremely expensive may explain why only a few companies have made bioproducts an active part of their adaptation strategies: only companies that have existing chemical mills and/or companies that are very large (as indicated on Table 3) have the ability to expand in this direction. For the others, purchasing existing tissue or packaging facilities, or converting existing mills to make these products, made better financial sense.

4.2 Turnaround = Business Exit + Transformational Repositioning?

Overall, the concept of business turnaround was a helpful tool for investigating and conceptualizing change within the pulp and paper industry. First, it provided a framework of activities to look for when examining the company documents for evidence of change. Second, the majority of the concepts highlighted in the simplified turnaround model were observed among the industry's actions. For example, the industry undertook both retrenchment activities, such as mill closures, and a wide variety of recovery activities. Furthermore, it highlighted the utility of both operational and strategic changes (both of which were observed in our study) and the situations in which each would be most useful.

Although the dual concept of retrenchment and recovery was useful for discussing change in the pulp and paper industry, there are some ways in which retrenchment was more nuanced in reality than in the model. For example, the model's simple retrench-then-recover pattern was rarely observed in the industry; rather, most pulp and paper companies have used both capacity reduction (retrenchment) activities and strategic changes simultaneously over the past decade. The reasons for retrenching also varied. For example, several companies retrenched not by choice but because they lacked the resources to continue operating. This observation supports a study by Barker and Mone (1994) which suggested that retrenchment, rather than being a prerequisite to turnaround, was instead a consequence of business decline. Other companies divested or closed mills not to free up resources for change, but as a vital part of their strategic reorientations away from graphic paper. In this instance, the concept of business turnaround overlaps with the concept of business exit, as per Porter (1976), Harrigan (1980) and Harrigan and Porter (1983) (Figure 5).

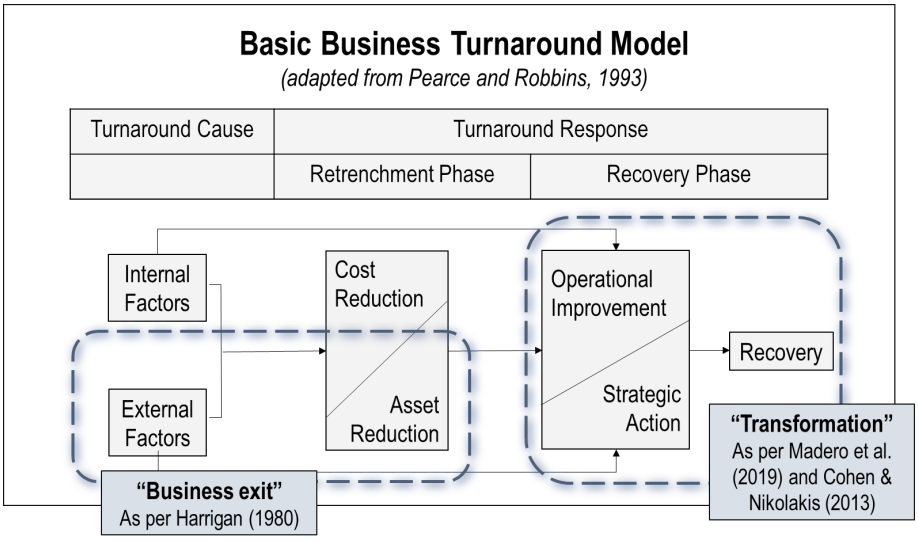

Figure 5. Linking the concepts of business turnaround, exit and transformation.

Within the forest products literature, Madero et al. (2019) suggest that the term "transformation" as frequently used in the forest industry may be a more palatable way of describing the concept of business turnaround. There are indeed many similarities between the two concepts. For example, investigations into business transformation by Cohen and Nikolakis (2013) and Madero et al. (2019) highlighted the importance of simultaneous operational improvements and strategic changes. However, neither study mentioned specific retrenchment activities. It is possible that the reason the theme of retrenchment was absent from the interviews was simply because the interviewers did not ask about it. However, given that frequent retrenchment is often the norm in cyclical resource industries such as forestry, the absence of retrenchment from discussions of transformation may indicate a difference between the concepts of turnaround and transformation. In this context, transformation could be described as the second, repositioning phase of a turnaround (Figure 5). If firms have already completed their retrenchment activities, or were relatively financially stable to begin with, a "transformation" (be it strategic, operational, or a mix of both) would be the logical next step.

If firms cannot free up enough resources from retrenchment alone to fund their recovery activities, where should this money come from? Nearly a quarter of the firms in the study underwent some degree of financial restructuring, in addition to their retrenchment activities. The observations of this study indicate that the basic turnaround model, and by extension much of the theory upon which it is based, offers an incomplete explanation for capital-intensive businesses such as pulp and paper.

4.3 Questions for Future Research

In the process of investigating pulp and paper companies' recent strategic actions, this study has generated several new questions. Most important is the unexpected result that the company documents consulted in the study mentioned fiber supply and government incentives roughly as often as they mentioned declining demand. It is not clear whether this result indicates that declining demand is indeed unimportant to over half of the companies examined, or if there is another factor at play. For example, the company documents may have intentionally stressed some topics over other ones, and the two-step (abductive search plus inductive coding) may also have led to some themes being over- or under-counted. To gain a better understanding of the relative importance of the different issues, a quantitative method such as a survey of industry executives would be useful.

The companies' apparent interest in government incentive programs indicates that such programs are both widespread regionally and attractive to the companies. How do the impacts of such programs match their objectives and what could different regions learn from each other? A policy-related complement to this company-focused study would be an add-on study of government documents outlining different national or

regional policy objectives, comparing such objectives with the results of this study.

The role new products, including emerging bioproducts, will play in future company portfolios is another important question. As discussed in section 4.1, the increasing importance of new product development in general, and biorefineries in particular, has been a strong focus of recent literature. However, new products have received less emphasis in the company publications than in the scholarly literature, and actual investments in emerging products have been even less common. It is possible that firms have focused more on specialization (producing fewer products) in the recent past, but are considering diversification (producing more products) for the future. Examining the timeline of when companies began mentioning and then adopting new biorefinery technologies could provide insight into whether such products will receive more emphasis in coming years.

A final question for future investigation is theoretical: if the resources freed up through retrenchment are inadequate for funding strategic repositioning or operational improvements, how should a turnaround model incorporate firms' need to raise additional funds? Future studies should both ask this question and explore models that incorporate funding as a dimension.

4.4 Limitations

The research undertaken in this study must be taken with a caveat. As in any qualitative study, the relative frequency and importance of the indicators in the study do not necessarily represent their actual frequency in the population. Indeed, the company documents examined in this study may not have contained all of the issues that were important to the companies, and the data search and coding processes may not have identified every issue. In addition, there was more data available for some companies (i.e., larger, publicly owned firms) than others, which could sway the conclusions. Furthermore, content analysis of public data cannot capture all types of adaptive change. For example, changes to culture and human resources are still important, but hard to measure and rarely documented publicly.

5. Conclusion

Pulp and paper companies in North America and Nordic Europe have been challenged to adapt to a rapidly changing business landscape. This study took a detailed look at exactly what types of actions these companies have been taking to do this. Drawing upon the business turnaround literature to create a list of change indicators, the study searched company publications with a broad range of potential change activities in mind. The emerging picture was of an equally broad panorama of company situations and corresponding turnaround options. While it is clear that many firms making graphic paper will need to expand into other products, not all companies have the deep pockets required to invest in new mills. Indeed, nearly a quarter of the companies in the study have undergone at least one round of financial restructuring. Nevertheless, lower-cost options have been successfully piloted, such as the conversion of newsprint mills to linerboard. These observations have been shared with companies in the pulp and paper industry, enabling them to identify actions that could also work well for them.

Using abductive content analysis as a methodology and a diverse sample of companies added an angle of nuance to the extant scholarly forest products knowledge base. Much of the extant literature has focussed on such optimistic themes as expanding into new products (including emerging forest-based bioproducts); however, such widely discussed solutions are not available to many companies. By carefully examining the actions of both large, public firms and smaller, lesser-known firms, this paper illuminated a wider landscape of adaptive action within the pulp and paper industry.

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Appendix 1: Studies Exploring Change in the Pulp and Paper Industry

Study	Method	Bio-product emphasis?	Title
Respondent-based studies			
Brunnhofer et al. (2020)	Delphi	Yes	The biorefinery transition in the European pulp and paper industry – A three-phase Delphi study including a SWOT-AHP analysis
Cohen & Nikolakis (2013)	Interviews	No	Changing gears: insight on transformation in the North American & European forest sector
Hämäläinen et al. (2011)	Survey + Interviews	Yes	Forest biorefineries – A business opportunity for the Finnish forest cluster
Hurmekoski et al. (2018)	Delphi	Yes	Diversification of the forest industries: Role of new wood-based products
Karltorp & Sandén (2012)	Interviews + data	Yes	Explaining regime destabilisation in the pulp and paper industry
Madero et al. (2019)	Interviews	No	Business transformation in the British Columbia forest industry
Näyhä (2019)	Interviews	Yes	Transition in the Finnish forest-based sector: Company perspectives on the bioeconomy, circular economy and sustainability
Näyhä (2020)	Interviews	Yes	Finnish forest-based companies in transition to the circular bioeconomy – drivers, organizational resources and innovations
Näyhä & Pesonen (2012)	Delphi	Yes	Diffusion of forest biorefineries in Scandinavia and North America
Näyhä & Pesonen (2014)	Interviews	Yes	Strategic change in the forest industry towards the biorefining business
Pätäri et al. (2016)	Delphi	Yes	Global sustainability megaforces in shaping the future of the European pulp and paper industry towards a bioeconomy
Toppinen et al. (2017)	Delphi	Yes	The European pulp and paper industry in transition to a bio-economy: A Delphi study
Studies that examine company actions or characteristics			
Ghosal (2015)	Case study + financial analysis	No	Business strategy and firm reorganization: Role of changing environmental standards, sustainable business initiatives and global market conditions
Lamberg & Peltoniemi (2019)	Historic analysis	No	The nanoeconomics of firm-level decision-making and industry evolution: Evidence from 200 years of paper and pulp making
Pätäri et al. (2011)	Conceptual + financial analysis	Yes	Opening up new strategic options in the pulp and paper industry: Case biorefineries
Novotny & Laestadius (2014)	Case studies + interviews	Yes	Beyond papermaking: technology and market shifts for wood-based biomass industries - management implications for large-scale industries