

Wood supply predictability: Definition and Impediments

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Abstract

Value chain performance can be affected by a lack of predictability from suppliers. In recent years, several entities composing the eastern Canadian forest value chain have identified the lack of predictability in wood supply as a factor hindering their competitiveness. While several publications refer to supplier reliability, no common definition for wood supply predictability has been proposed by the scientific community. Moreover, in practice, stakeholders do not seem to share a common understanding of wood supply predictability. This study aims to fill this gap. First, a series of 20 interviews with a broad spectrum of forest supply chain stakeholders was conducted. Then, a case study within one of Quebec's largest pulp and paper mills supports the investigation of how wood supply predictability is managed at an operational level. Evidence of a lack of supply predictability within the supplier-buyer relation was found. An assessment method based on data collection, contract allocation policy, and the buyer's forecast methods was applied. Based on our results, we define wood supply predictability as the ability to anticipate wood supply over time, with a certain degree of precision.

Keyword: Wood supply predictability, supplier performance, wood procurement, forecasting.

Introduction

As Mercure (1996) once stated, the mission of the wood procurement department is to ensure a reliable and steady wood flow. This is not as trivial as it may seem; the lack of wood supply predictability is currently perceived as a factor hindering competitiveness. Some consider this issue as one that concerns long-term supply needs, while others suggest that it must be addressed at an operational level. While the importance of wood supply predictability is largely acknowledged in the sector, it appears difficult to share a common vision of its meaning and even more complex to identify impediments to high predictability performance. Answers regarding both of these issues would benefit the forest sector, providing a solid basis to identify practices that would raise the ability to generate more accurate delivery forecasts.

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Since the 1980s, most forest companies have outsourced their harvesting operations. Hence, contractor-buyer interactions have become common in wood procurement throughout the world (Eriksson et al. 2015). The units composing the forest operations became independent suppliers (contractors), and mills became clients, with formal expectations regarding their procurement (on time deliveries, quality, etc.). Progressively, contractors started to have additional responsibilities in their new supplier role. In parallel, mills started to buy more wood as a raw material, through favorable procurement contracts, instead of buying harvesting services for stands on which they manage the operations. We hypothesize that the mill's need for better supplier predictability at the operational level was mainly born from this change. Consequently, this paper aims at studying the lack of predictability in wood supply with a focus on the buyer-supplier relationship. It has two specific objectives: 1) define the concept of wood supply predictability, and 2) identify impediments of high predictability.

Methods

A large hardwood pulp and paper mill located in southern Quebec wanted to better understand why it seemed to suffer from a lack of predictability from some of its suppliers. Accordingly, a case study, a method that allows researchers to focus on real problems within a firm (Ellram 1996), was conducted. The case study was carried out in two different steps. First, in the summer of 2016, multiple meetings with buyers allowed us to understand their challenges regarding supplier predictability, their daily tasks, forecast methods and how follow-ups on agreements were made. These meetings allowed us to examine the tools wood buyers were using; mainly Excel spreadsheets. The second step occurred in 2017, and allowed us to collect data on supplier deliveries for the past 5 years and the corresponding forecasts.

Since the first specific objective is to define the concept of predictability as it applies to wood procurement, a literature review was conducted to seek for evidence of the concept in the scientific literature. Little was found. An enlargement of the research criteria allowed us to find relevant use of this concept in other industries, which led to retaining a definition from Handfield and Bechtel (2004) to serve as a foundation for our proposition.

Two main elements regarding wood supply predictability led to the use of a qualitative approach to gather the necessary data. Not only had the concept of wood supply predictability seen a recent rise in its use by many actors of the forest value chain, but no study addressing this issue was found through the literature synthesis. Qualitative approaches are suitable when there is a need to collect stakeholders' points of view about a problem (Morange *et al.* 2016). We chose to proceed to semi-structured interviews. This method allows the researcher to get more elaborate answers (Q. Qu and Dumay 2011) while keeping the qualitative data analysis more easily feasible. A questionnaire based on the work from Helstad (2006) was first created. Helstad's study aimed at exploring how purchasing sawmills managed procurement of saw logs. The questionnaire she developed served as a basis to understand how wood purchasers achieve their daily tasks. It was then adapted according to our objectives. One of our goals was to obtain a broad spectrum of information regarding wood supply predictability from entities that are located all along the wood value chain. We contacted 27 potential participants. At the end of the study, we had conducted interviews with 20 participants. These participants were either employees

from the industrial partner, suppliers, or wood procurement experts. We used the same questionnaire for all participants. The interviews were recorded with a mobile phone application, and a transcription of the full interview was realized. Using the Taylor-Powell method, a list of codes was created to support the analysis of the results (Taylor-Powell and Renner 2003). The codes were then used to synthesize the relevant information extracted from each interview. A micro-program developed by the FORAC consortium allowed us to extract the information and corresponding code into Excel spreadsheets to proceed to an iterative analysis of the information. The results of the interview made it possible to retrieve the participants' perception on what characterizes the concept of predictability. The information also serves to list some of the causes for a lack of predictability.

Results and Discussion

Through the literature review, we found that the definition of predictability proposed by Handfield and Bechtel seemed to be well suited to fit our need of a universal definition for this concept. These authors suggest that predictability is:

“A characteristic that accounts for past behavior and other information to address probabilities of future performance” (Handfield and Bechtel 2004).

Before suggesting this definition to the participants, we first asked them their own definition of wood supply predictability. We then asked if they agreed with the one proposed by Handfield and Bechtel. Proceeding in this order made sure that the participants' points of view would not be tainted by our initial findings. Table 1 details the relevant elements identified following the analysis of the participants' personal definitions.

Table 1: Frequency of predictability key elements identified through the analysis of the participants' definitions of supply predictability

Key element	Frequency ¹	Percentage of participants
Ability to anticipate	12	60%
Global wood supply	9	45%
Compliance with commitment	8	40%

The ability to anticipate is the key concept that was most often suggested by participants, at a rate of 60%. Global wood supply is the second key concept in importance, at a rate of 45%. The participants specified that, for a firm, having predictability is characterized by an ability to foresee wood flow at a global scale, not only from specific suppliers.

¹ The number does not sum up to 20 since some participants indicated more than one key element

Compliance with commitments is the third and last concept that was suggested by respondents, at a rate of 40%.

Table 2 shows the frequency of level of agreement with Handfield and Bechtel definition.

Table 2: Frequency and level of agreement with Handfield and Bechtel definition of supply predictability

Level of agreement	Frequency	Percentage of participants
Totally agree	8	40%
Partially agree	9	45%
Totally disagree	0	0%
Did not answer	3	15%

These results allow us to state that the definition from Handfield and Bechtel contained important elements, but that it could not stand alone to define the concept of predictability in the context of the study. All the participants who were partially in agreement with the proposed definition indicated that it should not be assumed that past performances are good predictors of future results. Participants also indicated that it was important to be aware of the probability of occurrence of a future performance when making forecasts.

In light of this information, we believe that it is possible to draw on the definition we obtained through the literature review, but adjustments are necessary. The new definition should account for the key concepts identified through the interview analysis and those reported by stakeholders of the forest supply chain. We therefore propose that, for a firm, wood supply predictability is

“The ability to anticipate wood supply over time with a certain degree of precision.”

We decided to omit “compliance with commitment” from the proposed definition since we believe that it is a means to obtain predictability, not a characteristic of it. Secondly, we decided to adapt the element “probability” from Handfield and Bechtel’s definition to “degree of precision.” We believe that the quest for a perfect forecast is hardly attainable. Instead, buyers should be aware of the extent of possible gaps between forecasts and deliveries.

The second objective of the work was to identify the impediments to high predictability. During the analysis of the interview, 542 segments that suggested some causes of a lack of predictability were identified. An iterative process allowed us to reduce all these elements to a series of 52 impediments concerning every aspect of wood procurement in the study region. In parallel, the case study allowed us to identify two more causes that were not suggested by the participants. Therefore, a generic list of 54 impediments was constituted. Causes were subsequently regrouped in five categories and sub-categories. The categories are “Client,” “Supplier,” “Public forest supply,” “Private forest supply” and “General.”

Our findings extend beyond the buyer-supplier relationship. For the purpose of this paper, we will focus on five impediments that are specific to client practices (Table 3).

Table 3: Lack of predictability causes specific to the “Client” category

No.	Impediments	Category	Sub-category
1	Unspecified supplier performance evaluation criteria	Client	Supplier performance assessment and selection
2	Lack of evidence to compare supplier performance	Client	Supplier performance assessment and selection
3	Difficulty to use available data to compare suppliers based on historical performance	Client	Supplier performance assessment and selection
4	Few tools are available to compare suppliers between them according to their historical performance	Client	Supplier performance assessment and selection
5	Low use of indicators for monitoring forecast’s quality	Client	Contract management tool

Table 3 highlights five impediments linked to client practices. The case study revealed that buyers are responsible to produce or obtain a forecast for every supplier. We observed that these forecasts are mostly based on their personal experiences. Factual data and supplier’s historical performance was rarely used. The reason for this was that reliable data was not available to decision makers. Moreover, supplier performance assessment was not systematically performed. Performance criteria for suppliers were not clearly specified, except for price and volume. We gathered from the literature that leaders in other industries will conduct such evaluation on a regular basis. One of the primary criteria that is used in other industries is delivery reliability (Dickson 1966; Weber et al. 1991; Mohammed et al. 2018). Obviously, it is irrelevant to ask for more predictability from a supplier unless delivery reliability is monitored. Moreover, few records of earlier forecasts were kept to allow for an assessment of a supplier’s past delivery reliability. Consequently, the data available are of limited use to compare the supplier’s historical performance in view of drafting a contract that would entice more predictable supplies. Moreover, we observed that few tools allow buyers to compare suppliers based on more than one performance criteria. Regarding contract management tools, we found that there was a very low use of indicators for monitoring the forecast quality. Some basic measures, such as deviation in percentage, are used but none allows the recognition of systematic bias in forecast.

Conclusion

In this paper we have developed a definition for wood supply predictability that reflects elements that were identified in the literature review, and information collected through field interviews. Our results lead us to define wood supply predictability as:

The ability to anticipate wood supply over time with a certain degree of precision.

The ability to anticipate is the key concept in this proposition. Predictability revolves around the idea of forecasting. We obviously include “wood supply” in the definition to ensure contextualization. The notion of “degree of precision” is borrowed from Handfield and Bechtel (2004).

The impediments to high predictability identified in our research highlight the fact that the buyer’s behavior or strategy influences delivery performance. For one, it is important that supplier’s evaluation is performed correctly and systematically over time. This is required to establish a database regarding past performances. Buyers will then be able to use reliable data in addition to their own knowledge when establishing forecasts. Historical performance should serve as a guideline for buyers, and a good forecast quality monitoring system will help reduce gaps. Considering these elements, a question arises and would require further research: Is it suppliers that are not predictable, or is it the forecasts that are not accurate?

Finally, no matter how much data are collected, it is unthinkable that actions can only be taken by the buyer to obtain more predictable outcomes. Actions need to be taken by both parties to ensure efficient communication, trust and commitment. Coupled with high quality data, those are the means that will entice great predictability over time.

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