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# Restructuring the Forest Value Chain using Intermediaries: A Methodology with Application to Community-Managed Forest

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**Abstract.** This paper seeks to map out and define the concept of Integrator-Supplier (IS), a means towards integrative planning in the context of public forests management. Basically, the IS is an intermediary that opens the planning process to a broader variety of stakeholders including the government, the forest industry, regional and local organizations, recreational and tourism companies, and first nations; it is responsible for plan reconciliation and execution, and it manages the relationships between the forest entrepreneurs (including logging and silviculture contractors, transportation and equipment operators, etc.) and their business partners. It is believe to enable a lean approach to conducting forest operations. The paper first presents a perspective about intermediation, coordination and collaboration in value chain. A methodology is then proposed to restructure the forest value chain using intermediaries when socioeconomic and environmental constraints are brought to the forefront and productivity should be redefined. The proposed methodology is illustrated using a case study in the province of Quebec, eastern Canada, a jurisdiction preparing for a major overhaul of its forest policies. Potential scenarios for which different actors in the supply chain assume the strategic role of IS are described. Our analysis indicate that the IS concept offer opportunities to improve the efficiency of the timber supply chain. It is proposed that the government entrusts to an IS the responsibilities of reconciling and executing tactical and operational plans.

**Keywords**. Intermediation, wood supply chain, coordination, collaborative planning.

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# 1 Introduction

The forest value chain (FVC) is commonly associated with its timber-production networks. These networks include several actors that must ensure all the activities for the management of the forest (including planning, harvest operations and silviculture treatments), the deployment and maintenance of a road network, the transport of trees, logs and residues, forest products manufacturing, and distribution. Actors are expected to exchange information at different levels in order to maximize their profits while meeting social, environmental, operational and economic constraints. Many of the upstream actors are logistical services suppliers, general entrepreneurs, forest cooperatives, forest management groups, silviculture workers or transportation units (referred to interchangeably as *suppliers* or *forest entrepreneurs* in the remainder of this paper) that possess their own local or regional business network (Fig. 1) (adapted from Azouzi and D'Amours, 2011). These entrepreneurs own production machinery and have agreements with forest products companies (FPC), usually formalized via contract in which the obligations of the entrepreneur are specified. In some cases, and especially for silvicultural work, forest entrepreneurs can be hired directly by the land owner.

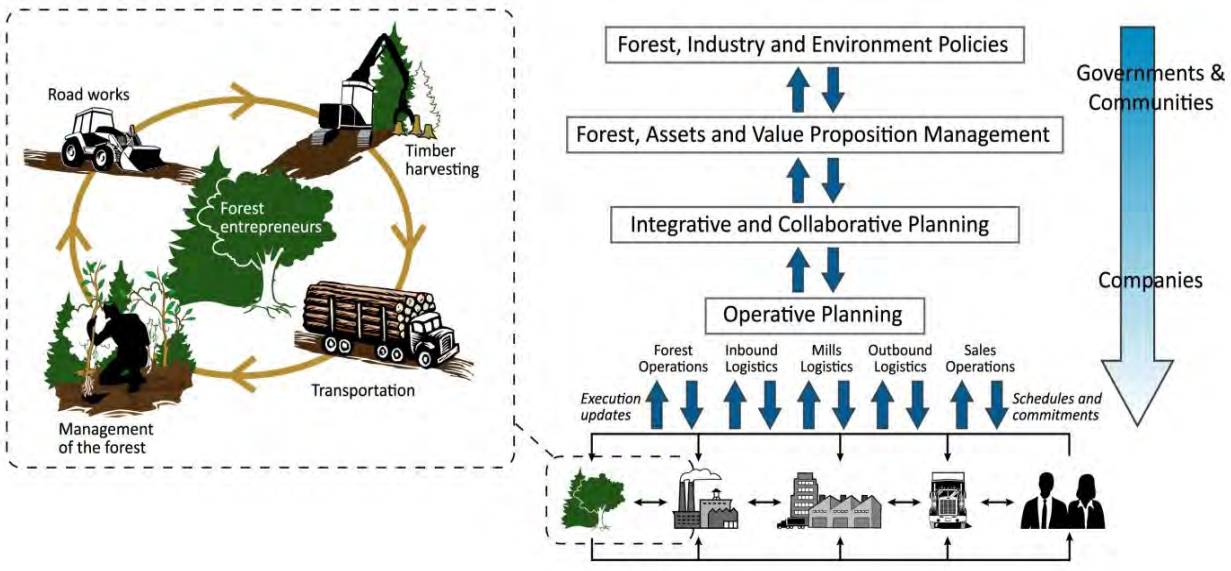


*Fig. 1. Wood supply chain within the forest value chain and the decision scales for the planning of the FVC (adapted from: Azouzi and D'Amours, 2011)*

The government, through its local representative, can play a significant role in the FVC especially when it owns large expenses of forests. It may be responsible for determining the volume of wood to allocate to enterprises, establishing strategies to ensure forest sustainability, locating forest road network, establishing tariffs and credits associated with forest use, etc. The national government usually has to work in close cooperation with local governments and members of local communities. This is the case in community forestry where forestry operations must demonstrate global benefits to gain approval from local government, community group, First Nation or aboriginal representatives.

On the other hand, the FPCs, whether they are small, specialized (e.g. sawmill) or fully integrated (where different transformation stages are controlled by one organization), generate value from forest resources and are to be involved in several planning decisions in the short-term, mid-term and long-term horizons. Their levels of involvement depend among other things on the role played by the government as well as on the size of their company. As shown by the shaded downward pointing arrow in Fig. 1, the planning process in the FVC is a continuous process; there is no clear cut demarcation between the plans made at the strategic, tactical or operational levels, and a collaborative involvement of all levels of management from separate organizations is expected. Collaborative relationships (e.g. entrepreneurs–FPCs, Timberland owner/Government–FPCs, etc) are likely to generate tensions or conflicts in such a distributed environment. These conflicts are believed to be in part attributable by attempts to seek local optimisation in a global environment. Hence, the different organizations need to operate more cooperatively. Coordination here consists in managing the interdependencies between the activities of the different organizations. Essential data and decisions need to be communicated. According to Ceroni and Nof (2001), communication must take place in a timely basis in order to be an effective integration facilitator and allow organizations to minimize their coordination efforts and costs.

In order to address this complex problem of coordination and collaboration, this paper argues that it is beneficial for groups of actors localized within a forest area to seek the service of a third party agent as an intermediary or to assign this role to one specific group member. In both situations it is important to define this third party agent's role. This intermediary will be responsible to establish a network of partners and the contractual agreements needed to manage it. The paper proposes a methodology to structure a FVC using intermediaries when socioeconomic and environmental constraints are brought to the forefront and productivity is redefined. The proposed methodology leads to a strategic vision of the intermediary including its value proposition and its required competencies. It is then illustrated using a case study of the community-managed forests of the province of Quebec, in eastern Canada. The paper is organized as follows. Section 2 presents a perspective about intermediation, coordination and collaboration in value chain. The proposed methodology is presented in section 3. Section 4 presents its application through a case study. Finally, section 5 provides concluding remarks.

## 2 Perspective on intermediation in value chain

In industrial sectors that have seen great evolution, such as the automotive and the aerospace industrial sectors, firms don't merely compete against firms. Indeed, as observed by Ambe and Badenhorst-Weiss, (2010) value chains are increasingly competing against other value chains. Thus increasing productivity and value requires a comprehensive strategy. In complex and multi-tiered supply chains, suppliers, producers and entrepreneurs must work together to increase their productivity and to raise end products value. By analyzing their value chain, these actors can often identify intermediation opportunities that offer increased efficiency, economies of scale, reduction of transaction cost, or value added in the chain. Entrepreneurs and businesses are often the first to identify these opportunities and act on them.

The term "intermediation" is typically used in the finance, commerce/marketing and intermodal transportation literature. Spulber (1999) proposes an "intermediation theory" that basically stipulates that it is more advantageous to refer to reliable intermediaries who make credible promises than to only count on negotiation for recurrent short term contracts. The author further explains that this advantage results from coordination that reduces searching cost (for suppliers and for prices) by pooling and sharing information between traders, from some sort of scale and scope economy, and from the motive for long term business and reputation. Spulber sees intermediaries as the principle responsible for the buy and sell activities, or for connecting actors. He does not exclude that the intermediaries could be responsible of logistics activities in the manufacturing sector.

Fulconis et al. (2006) present the logistical service provider or 4PL (fourth-party logistics) as an intermediary who's business is to design and sell global supply chain solutions coordinating the activities of carriers, storage operators, subcontractors, packaging, and other elements of the supply chain. Fréry (1998) indicates that "it [the 4PL] globally plays the same part as the management of an integrated firm as regards its operational functions except that these are assigned to financially autonomous firms." According to a report from Industry Canada (2008), the 4PL offers a more strategic service to its customers than the 3PL (third-party-logistics provider) that is known to be focused with moving freight and less concerned with management and control. This report also refers to an emerging sector, called the 5PL sector, and defines it as an organization that will "plan, organize and implement logistics solutions on behalf of a contracting party (mainly information systems) by exploiting the appropriate technologies." Basically, the 5PL intermediary strives to turn its customers' supply chain into an IT-managed system linking the suppliers and buyers. The key point here is that, at the very basic level, the use of intermediaries in large organizations offers the possibility to decentralize, and thus motivate key resources that are delegated the power to control activities they know extensively, responding better to local conditions, and more importantly, preventing the decision makers at large organizations from taking complicated decisions because of the great deal of data they are delivered (Mintzberg, 2008).

### *2.1 Intermediation in manufacturing*

In manufacturing, the intermediary facilitates and increases mutual understandings of the objectives and the logic of decision makers and more directly, efficiently addresses the asymmetries between the actors or stakeholders. It helps them to address performance issues that may be due to inaccurate forecasts, low capacity utilization, excessive inventory, inadequate customer service, poor order fulfillment response, etc (Ramdas and Spekman, 2000). The intermediary does this by coordinating and planning the interdependent (legally and financially independent but in the same chain) activities between actors or stakeholders. A good example of this can be found in the automotive industrial sector. This sector has prefigured and initiated the organizational innovations that have since then been disseminated to other sectors of the economy and continue to play a key role in structuring value chains through outsourcing efforts, reorganization and optimization of supply chains, or partnership strategies (Bipe, 2010).

Some consultants assert that, with 45% of the cost of an automobile controlled by suppliers, the success of the industry is rooted in the establishment of key partnerships (Deloitte & Touche, 2001). Notice that the forest sector is globally facing the same challenges and trends as the automotive sector. The two industries are not only plagued by high costs, low profit margins and accelerating competition, but are also facing environmental challenges and general macroeconomic and financial circumstances such as energy cost, and exchange and interest rates.

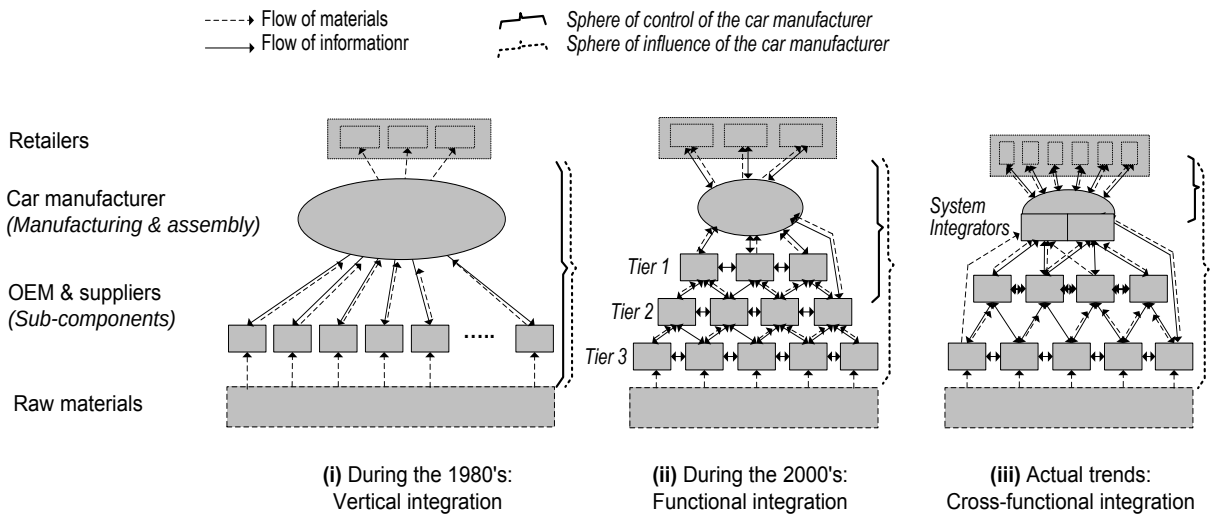


*Fig. 2. Structures of the automotive industry during the (i) 1980's, (ii) 2000's and actual trends (adapted from: Humbert et al., 2004)*

Figure 2 highlights the three major structural changes the automotive industry was subjected to during the last thirty years (adapted from Humbert et al., 2004). During the 1980's, the industry was vertically integrated. The car manufacturers had experienced important technological advances and organizational improvements compared to their many suppliers. They had direct buyer-suppliers relationship with low upstream cooperation. Relations between suppliers were limited. Under the growing and continuous effect of constraints such as international competition, markets fragmentation, and the appearance of new environmental and safety regulations, to name only a few, car manufacturers have evolved to a tiered supply chain model. In that model, they have close and privileged ties with suppliers (those that were called tier 1 in the early 2000's). These suppliers were given more responsibilities and thus developed the competencies required to manage the complex supply chain. Car manufacturers found it profitable to outsource certain components because the suppliers would be able to cope with part of this complexity, could achieve economies of scale, had technology expertise, lower labor costs and more efficient work and labor practices. In many cases, the manufacturers received better service from external suppliers than from internal suppliers (Grienitz et al., 2009). Furthermore, outsourcing offered the car manufacturers the opportunities to focus on their core business, free up internal resources for other purposes, access resources not available internally, make capital funds available, share risk, and have access to lean and world class practices. Today, in many regards, the car producers have become assemblers rather than manufacturers, by establishing close relationships with selected tier 1 suppliers (Vonderembse, Mark, Dobrzykowski, D., 2010). These are identified as "system

integrators" (Deloitte & Touche, 2001) and the general business relationships are illustrated in Figure 2 (right). These business relationships can only be established if collaborative business models are developed. Collaborative business models offer possibilities for cost reduction and make it easier to adopt new communication and technology standards between different actors of the value chain, and to share operational and financial risks.

The point could be made that FPCs have long been structured like the automotive industry of the 1980s (vertical integration) but has since transformed into the structure of the automotive industry of the 2000s (functional integration), and that additional steps (cross-functional integration) could yield the same benefits that today's automotive industry has achieved.

### *2.2 Coordination and collaboration using intermediaries*

Very often, the terms coordination and collaboration are used interchangeably without clearly distinguishing them from each other. As Hammer (2006) puts it, "Whereas coordination is mainly conducted by sending the right signals or sharing the right information and the same policies, collaboration indicates a joint, interactive process that results in joint decisions and activities." Malone and Crowston (1991) determined that coordination implies processes for identifying goals, mapping goals to activities, mapping activities to actors, and managing interdependencies (e.g. resource allocations, sequencing, and synchronization). These processes should encompass, at a lower level, processes for group decision making (some decisions to be accepted by the group of actors), communicating via standardized means, and perceiving common objects (e.g. shared variables and common knowledge). Since transactions between the firms in supply chain are generally managed by contracts, then all the means that help to achieve coordination will be restricted by contracts. As pointed out by (Liu et al., 2005), the supply chain contract is a coordination mechanism that provides incentives to all actors so that the decentralized supply chain behaves as nearly or exactly the same as the integrated one. On the other hand, collaborative planning raises the need for specific methods to support the decision-making process and ensure the stability of the relationship (Audy et al., 2010). The plans of the different decision-makers need to be integrated vertically (with customers, suppliers and internally across functions) and horizontally (internally, with competitors, and with non-competitors (e.g. sharing manufacturing capacity)) (Barratt, 2004). For better performance, this integration should not be limited to operational level but extended to tactical and strategic levels. However Barratt (2004) pointed out that "…organisations need to realise that the resource intensive nature of collaboration means that they need to focus their attention on a small number of close relationships rather than trying to collaborate with everyone".

From the above, it is clear that the positioning of the intermediary in the value chain is important. Audy et al. (2010) proposed five generic coordination mechanisms for logistics activities intended to help managers design their collaboration schemes. These mechanisms were differentiated by their planning function, their sharing approach and the information, decision and financial flows. They assumed that the planning function could be performed by a third party or with a joint planning process between the collaborating units. However, they did not elaborate on the business context in which this function could be performed nor its position within the chain.

### *2.3 Guidelines for defining intermediary competencies*

At this point we bring to the forefront two statements from the literature that can be used to draw fundamental principles for defining the role and functions of an intermediary and adapting the value chain to additional constraints (e.g. new socioeconomic and environment constraints). The first statement is by Porter and Kramer (2011) for whom "No company is self-contained. The success of every company is affected by the supporting companies and infrastructure around it. Productivity and innovation are strongly influenced by clusters or geographic concentrations of firms, related businesses, suppliers, service providers, and logistical infrastructure in a particular field". Their paper develops the concept of *shared value* and they emphasise the need to connect societal and economic progress in order to achieve global growth. The second statement was made by Cachon (2003) in a paper that addresses supply chain coordination using contracts: "A contract is said to coordinate the supply chain if the set of supply chain optimal actions is a Nash equilibrium, i.e., no firm has a profitable unilateral deviation from the set of supply chain optimal actions. Ideally, the optimal actions should also be a unique Nash equilibrium; otherwise, the firms may 'coordinate' on a suboptimal set of actions." From, these statements, it appears that the intermediary is well positioned to create winning scenarios for all the parties, connecting the suppliers, the producers and the government so that compatible goals are set and their activities synchronized. Thus, a great deal of attention should be paid on defining the mix of competences and experiences to be brought by the intermediary.

### *2.4 Intermediation in natural resources sectors*

The management of natural resources value chains (e.g. in agriculture, forestry, or *m*inerals/ petrochemicals sectors) encompasses complex socioeconomic and ecosystem processes and is characterized seasonality, uncertainty, information deficits and asymmetries (D'Amours et al, 2009; Ahmad, 2002; Gebetsroither et al, 2006). Thus, maintaining an economically viable, secure and reliable supply under such conditions is very challenging. Natural resources value chains have been traditionally governed by large firms that have the management capabilities required to coordinate complex relationships with suppliers and customers. This governance involves considerable cost in monitoring and enforcement (Humphrey, 2005). However, companies are constantly evolving and new business models are being adopted.

In their report to the FAO (Food and agriculture organization of the United Nations), Vorley et al. (2008), argue that "business models of modern processors and retailers [in agrifood industries] are being built on collaboration, co-investment and knowledge sharing between producers, suppliers, processors and retailers". These authors identified several models of business linkages, some driven by producers (e.g. cooperatives), some by buyers (e.g. processing and retail companies) and some supported by intermediaries (e.g. service providers) including NGOs. Intermediation models are primarily distinguished by increased knowledge management (to improve chain coordination and quality), closer links to buyers, and incentives for product and process upgrading. They drive change through processes of negotiation among actors. Improved efficiency is achieved through better organization, improved information flows and shared standards along the chain.

Unfortunately, it appeared to us that the literature is sparse regarding applied or action research about the use of intermediation or the restructuring of value chains, even more so as it pertains to forestry.

## 3 Proposed methodology for defining supply intermediaries in the context of community-managed forest

The most convenient way to 'define the intermediary' consists in formulating its strategic vision. For the company, the strategic vision plays a key role in the process of building and defending a competitive advantage. Internally, it is likely to generate the transformation of the organization and acquiring new skills. Externally, it aims at a profound reconfiguration of the competitive systems due to a transformation of the customer interface (or of the links the client maintains with the product), and the imposition of new rules (Metais and Roux-Dufort, 1997). Basically, a strategic vision should provide information regarding the following key questions: (i) What does the organization do? (ii) For whom does it do it?, and (iii) How does it excels doing it?

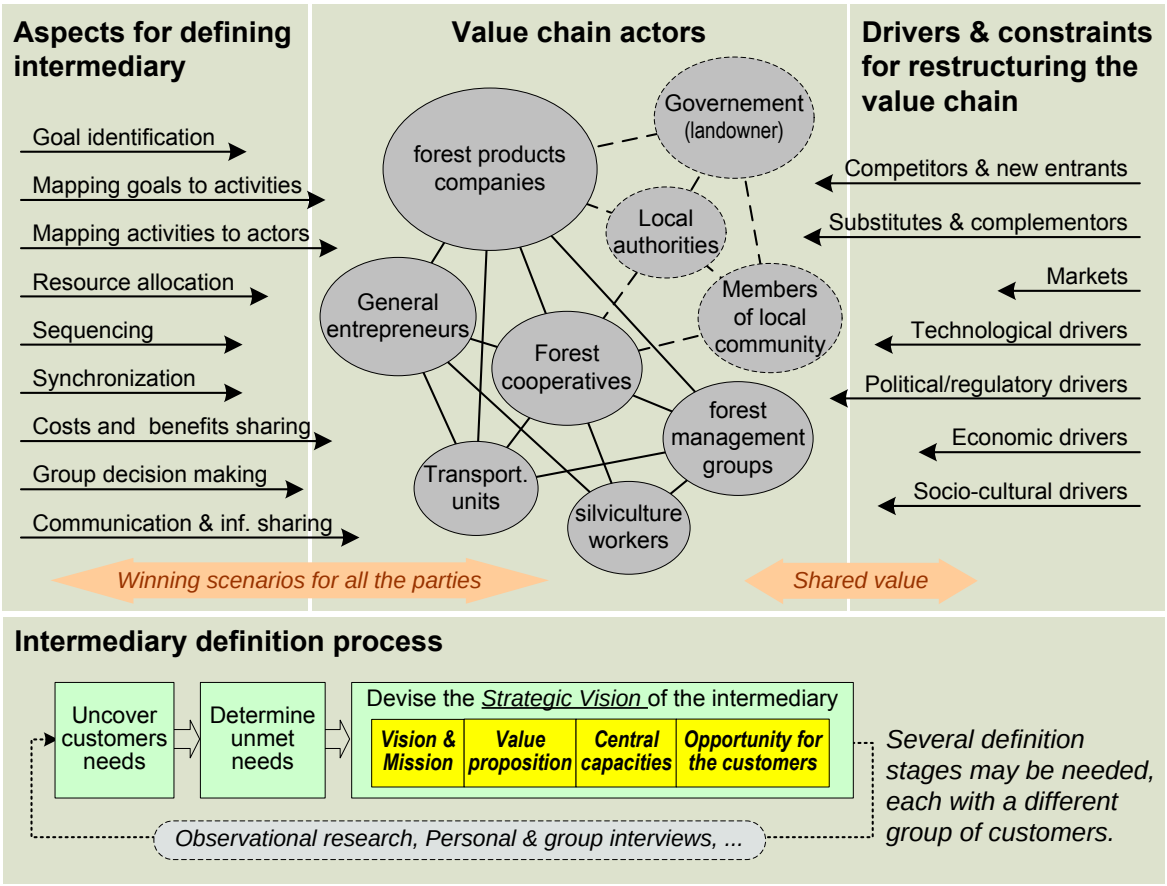


*Fig. 3. Aspects for defining intermediary, value chain actors, drivers and constraints for restructuring the forest value chain, and intermediary definition process*

While the answer for question (ii) is evident (Most of the actors in the value chain can be clients for the intermediary), the answers for questions (i) and (iii) must be carefully developed using the same precepts as for a strategic innovation and considering all the aspects discussed in the previous section. To do so, we center our methodology on Ulwick's outcome-driven approach to innovation (Ulwick, 2002). According to Ulwick and Bettencourt (2008), this approach has proven to be very effective when applied to product and service innovation as well as design, operational, organizational and business model innovation. The basic idea is to develop a product or a service based on the requirements of the job the customer is trying to accomplish using this product or service and not on the requirements of the product or the service itself. This is done by uncovering all the needs of the customer, determining which needs are unmet, and then devising solutions that specifically address the unmet needs. We refer to this methodology as Outcome-driven approach to IS definition.

Accordingly, the activities of the intermediary (producing services and/or products) should be designed in such a matter that they help the intermediary's customers to achieve their objectives (or meet their needs). This process is depicted in Figure 3. Ulwick and Bettencourt (2008) explained that such a process can be conducted through a combination of methods involving the customers (observational research; personal, small group or large group interviews; focus groups; customer visits). This definition process can be repeated at several stages, each stage involving different customers. At each stage, the concept's viability from a socioeconomical and technical point of view is reconsidered. Figure 3 also depicts the different factors driving or constraining the restructuring of the value chain in the context of community-managed forests.

## 4 Case study: Defining the Integrator-Supplier concept for the forest supply chain in Québec, Canada

In 2013, a new Forest Act will be effective in the province of Québec, eastern Canada. Basically, this act enshrines the principle of ecosystem management; entrust to regional authorities the responsibility of defining the framework for integrated resource management; and initiates an auction process for allocating timber from public forests. Tactical and operational plans for integrated forest management (T-PIFM and O-PIFM), were traditionally drawn up for each forest management unit by the forest companies granted harvest rights in this unit.In the new Act, it is the provincial government, in collaboration with local communities and forest companies, that has the primary responsibility of producing these land and resource management plans. The T-PIFM covers a five-year period and contains, among other things, the annual allowable cut (AAC) assigned to the unit, the sustainable forest management objectives, and the forest management strategies adopted to ensure that AAC is respected and objectives are achieved. On the other hand, the O-PIFM basically sets out the forest operations zones in which timber harvesting or other forest development activities are planned under the T-PIFM. It also contains the harmonization measures adopted by the Minister. The operational plan can be updated from time to time, to allow for, among other things, the gradual addition of new zones in which forest operations may be carried out.

In general, observers clearly see these measures as aiming at taking public forest management in government hands, and at strengthening local, regional and First Nations interests in the forest planning process. However, it is not clear how these measures are going to be implemented in practice and how they may affect operational efficiency. For instance, issues related to the sharing of costs engaged because of shared logistics remain major sources of confusion for all the actors involved in the forest-products value chain. In particular, the forest entrepreneurs (including logging and silviculture contractors, transportation and equipment operators, etc) are typically considered as an extension of their clients' operations (typically timber transformers). They have had to comply with policies implemented by the government or by contract givers that had always been conceived around cost reduction and technical and operational efficiency. Their performance is mainly oriented towards these parameters (Drolet and LeBel, 2010).

In an effort to address these issues, the Québec Federation of Forestry Cooperatives (QFFC) coined the concept of Integrator-Supplier (IS) as follows "…a leading contractor of forestry operations, responsible for a significant part of the operations in the forest management unit (harvesting of timber or of forest biomass, roads construction, transport, etc). It is responsible for planning the execution of all the activities in the territories (the schedules, the selection of equipment, etc), for the handling of unexpected events in real-time, and for optimizing the value chain. As such, the IS develops tools that keep him aware of the constant needs of his customers. He satisfies these needs by adapting operations planning in order to capture economies of scale from network for the benefit of all his customers. It works in close association with government forest resources planners in each region". To turn this concept into a reality, it must first be mapped. A detailed description of how the IS could be applied, corresponding interactions and information flow must be provided. This description should also include the identification of the processes and functions, and their concerned actors, their roles and responsibilities.

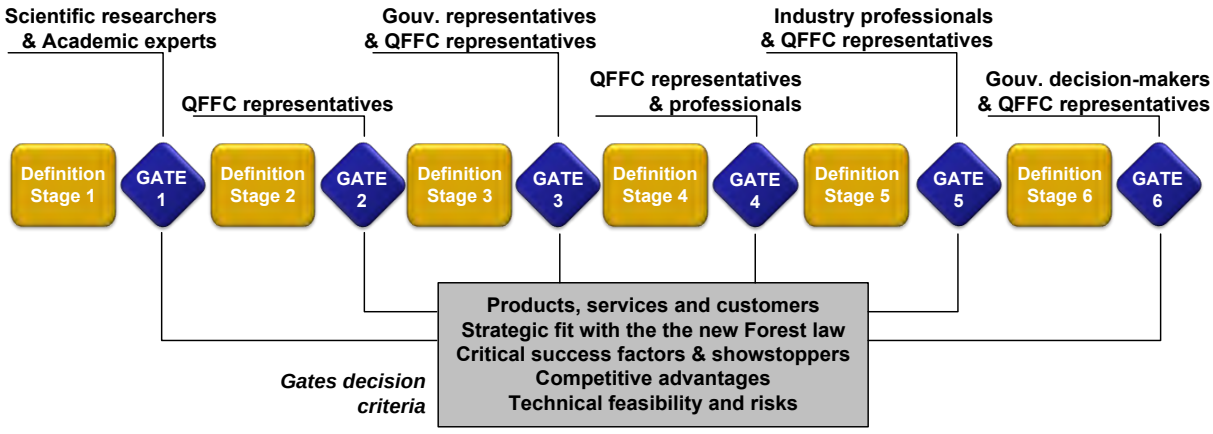


*Fig. 4. Definition stages and gates decision criteria for the case-study*

We therefore set to define the IS using the proposed Outcome-driven approach described in the previous section. Figure 4 shows that in all, six definition stages were conducted with different participants in the group interviews including forestry researchers and supply chain specialists; cooperatives professionals; FPCs professionals; and government representatives and decision

makers. The results are presented in section 4.2. Before conducting the case-study, we did a review of the different forms of intermediation that can be encountered in the forest value chain in North-America. The results of this review are presented in sub-section 4.1.

### *4.1 Observed Forms of intermediation in the forest products value creation chain*

In the current forest policy act, Quebec's public forest is divided into management units (MU) (also referred to as procurement area). The government allocates volumes of timber to mills through timber licenses (TL).. It specifies, on a yearly basis, the general areas from which wood for the mill can be procured, with predefined volumes of one or more tree species. A mill may hold a TL on more than one MU, and several TLs may be awarded to different mills on the same MU (whether or not under the same ownership), even for the same tree species. The mill must pay the corresponding fees (stumpage) and commit themselves to make sure that a new forest is established through various silvicultural treatments following harvest. Three documents must be prepared: a general forest management plan, a five-year forest management plan, and an annual forest management plan. The TL does not spatially locate harvest units. The five year plan does. All plans are prepared by the companies but must be approved by the government. To supply its mills, a company must coordinate its operations in several MUs and with those of other companies (Beaudoin et al., 2007).

It happens frequently that several mills are allocated TLs on the same forest area. It is obvious that this situation can easily lead to suboptimal usage of the forest resources. Typically, an agent (a FPC or a Mill representative, or a forest entrepreneur often referred to as the *mandatary*) is charge of the procurement services for many TL holders on the same MU. This agent takes responsibility of the woodharvest on behalf of all the TL holders. He may just be responsible for the management of the forestry activities and designate one or more other agents for the execution of the forestry activities. Then, these are referred to as the *management mandatary* and the *operations mandatary*. In general, the *management mandatary* acts in close collaboration with the operations *mandatary* to integrate the needs of the different mills and ensure their supply. He is usually appointed by his peers (other mills or TL holders). The main source of conflict involves the question of transaction prices to provide procurement services among the various companies. With this approach, the appointed company, typically the largest in the region, is at the same time a beneficiary and an intermediary. Thus, consensus may be reached in a simple and inexpensive way; however it is most likely far from being optimal for all the beneficiaries (Frayret et al., 2004).

While the intermediation form described above is frequently encountered in Québec, several other forms of intermediation in the forest products value chain have been practiced in other parts of the word. Table 1 gives an overview of these forms and gives some examples in North-America. In general, the intermediaries offer a variety of services including technical, commercial, financial, computer training and consulting services. However, they are oriented toward the production of fibre with the ultimate goal of maximizing profits for forest products companies. They are not attending to different stakeholder interests. In intermediation forms 2, 3 and 4, the decisions appear not to be taken in a global context, thus economies of scale can hardly be generated.

Accordingly, this brief review shows that integration remains a challenge while presenting opportunities.

*Table 1. Observed forms of intermediation in the forest products value chain in North-America*

| Intermediation form | Main role of the intermediary | Examples |
|---|---|---|
| 1 - Organizations created by some manufacturers that hold TLs on the same MU | Acts on behalf of the manufacturers, managing their TLs and assigning the operations to a forestry cooperative.<br>The costs for the silviculture treatments are shared based on the volume of resource allocated to each manufacturer. | Gestion FORAP |
| 2 - Companies that work in close cooperation with the government | Responsible for allocating and managing contracts with entrepreneurs, for execution monitoring and control and, ultimately, for the accountability for the technical and financial projects. | Rexforêt (rexforet.com) |
| 3 - Groups of general contractors | Specialize in timber supply (harvesting, road construction, transport).<br>Execute plans submitted to them or develop their own. | Gestion Rémabec (www.remabec.com) |
| 4 - Cooperatives created and operated by groups of forestry workers | Provide different forms of timber, forest planning, forest management and production of plants.<br>May develop a strategic alliance with the FPCs that hold TLs at a specific MU (managing totally or partly the MU; carrying out all activities related to forestry (including road construction and silviculture); and representing its clients at various stakeholders and government authorities). | Coopérative Forestière des Hautes-Laurentides (www.cfhl.qc.ca) |
| 5 - Privately held forest and timberlands management services companies | Provide a variety of forest resource and management and timberlands services for the long term sustainability of private forests and timberlands.<br>May provide consulting services in the acquisition and sales analysis, forest inventory, forest land appraisals and valuations, conservation and regulatory compliance, timber supply modeling, growth and yield modeling, GIS mapping and market studies. | Seven Islands Land Co., Prentiss & Carlisle, Orion Timberlands, Huber Resources, Canal Wood. |

### *4.2 Case-study results*

For all the participants in the group interviews, the IS should act as a catalyst for the optimization of the planning and execution of the forest operations and for achieving the objectives of all his customers and partners fairly. Its strategic vision was articulated as follows: "to become the main entities acting to capture the maximum value from the forested area while taking into account the interests of the different stakeholders." Its mission is "to maximize the achievement of the interests of all the stakeholders by reconciling the plans and by optimizing the performance of the activities related to land use and forestry operations".

Figure 5 shows how the IS was positioned within the FVC. Unlike the automotive sector, where the intermediary links the manufacturer to his tiered suppliers, the IS here links several companies consuming wood (TL holders) to a comprehensive network of suppliers. This network, that we call "IS network", consists of forestry cooperatives, entrepreneurs, independent carriers, etc, serving the MU assigned to the IS. The IS normally operates within a single MU. It is a part of the sphere of control of different stakeholders and not only the TL holders. In fact, it is at a position where the interests of different parties intersect. In practice, however, none of these parties can have total control of the IS. Hence its role as an integrator and reconciler of plans is of special importance. Indeed, as it was mentioned previously, the government has adopted a regional management

approach that brings together the industry, the regional authorities, first nation communities, and other land users in order to collaborate and build the T-PIFM and O-PIFM based on different government policies and strategic plans. Not only should the IS collaborate at the preparation of these plans but also it plays a key role in monitoring their execution and ensuring that they remain valid as time goes by. Thus, the value created by the IS is reflected in the following value propositions (VP):

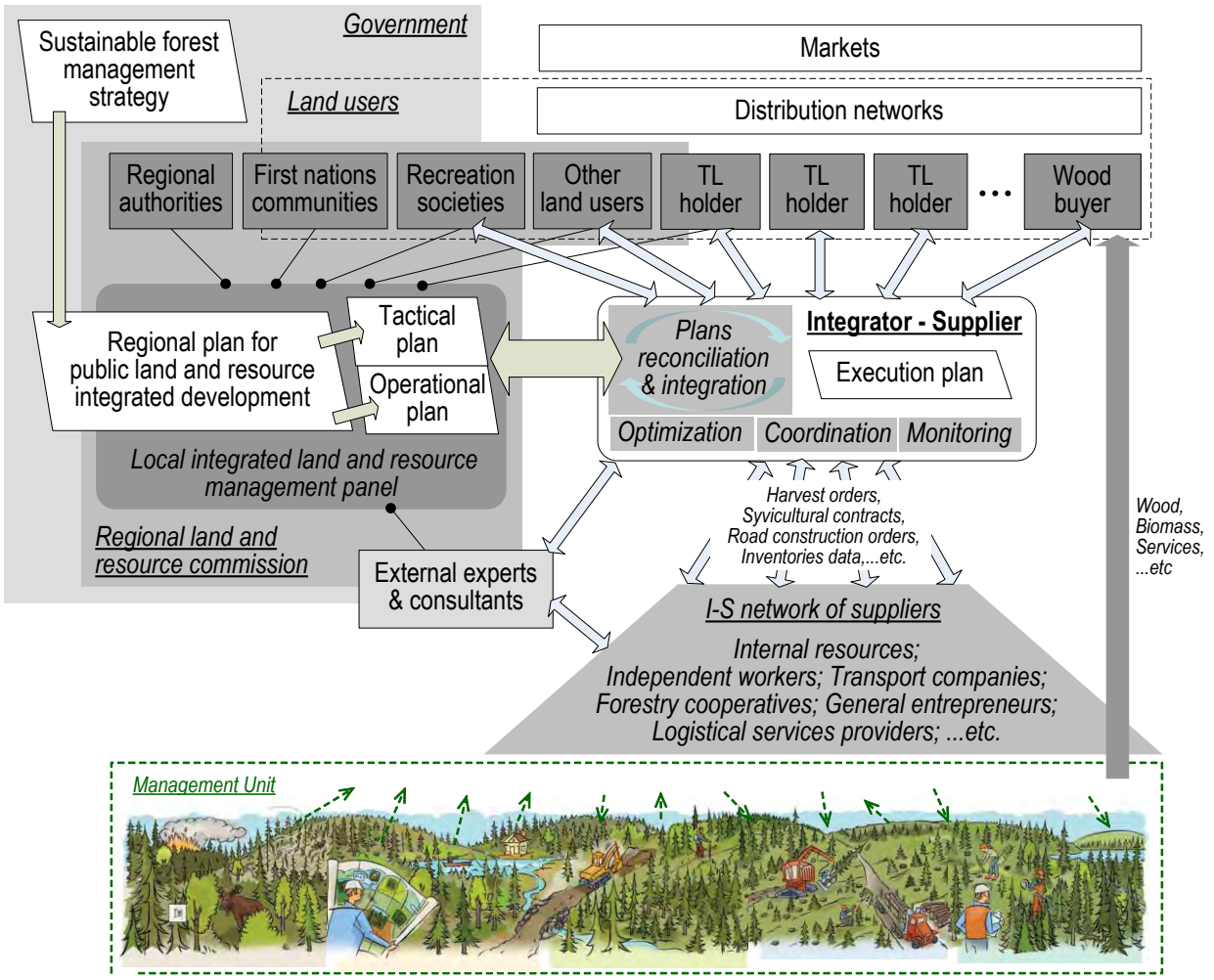


*Fig. 5. Positioning of the IS within the forest products value chain*

*VP1: Establishment of a collaborative mode of execution planning to optimize the achievement of the objectives of several interest holders in the forest*. The IS creates a true collaborative planning mode for the execution of all the activities in the forest, not only subcontracting relationships or the juxtaposition of skills. In addition, it facilitates for all his partners access to the best practices that give them the agility to respond to their aspirations in terms of quality, delivery and productivity; for the government, regional authorities and first nations communities, it is the manager that ensures compliance with the guidelines they laid down while maximizing the value created from the forest; for the land users (FPCs, recreation and tourism companies, etc.), it is the operator that delivers products and executes the desired work in the forest in

compliance with the quantity, timing and quality constraints; for the forest entrepreneurs and workers, it creates stability and simplifies the conduct of their mandates and the associated business and administrative modalities.

*VP2: Integrated production and services.* The IS and its network of suppliers are the extension of the supply chain of the FPCs to the forest. They improve the regularity of supplies to the factories.

*VP3: Competitive value/cost ratio.* The IS supplies several customers. The operating costs, including the cost engaged because of a shared logistics, are spread over a large volume of wood. However, the IS does not have a monopoly on the supply of the processing plants that hold a TL on the MU where it operates. It remains in competition with other integrators, FPCs that choose to make their forestry operations independently and, of course, private forests and wood imports.

*VP4: Certified products and services.* The IS delivers certified products and services (through proper programs such as Master Logger Program, PEFC, FSC certification, etc.). It makes available information on the entire traceability chain of the wood delivered by the suppliers in its network. For the government authorities, the certification of the products and services will eventually become a key part of a protocol for monitoring the actual intensity of timber extraction from the forest.

To succeed in this role, and at the same time make products and offer services with high added value, the IS must bring a comprehensive mix of competencies and experience and he should be viable from a business point of view. The following core capabilities (C) have been identified:

*C1: Building a network integrating different customers and stakeholders.* The IS sets up a business process built on inter-firms coordination for fulfilling orders (or requests for activities) and for the distribution of goods, services and information. The suppliers and the FPCs find themselves closely linked in a supply chain. They perform certain transactions in a totally integrated manner, even if are independent entities. The IS balances the interests and ambitions of all stakeholders.

C2: *Optimization and synchronization of the execution.* The FPCs are facing variable market dynamics, more stringent regulations and high customer expectations about prices and quality. Therefore, they need to review their forecasts and manage their applications. Notably, demand management requires a multi-level approach that uses every link in the supply chain. This can be very complex for FPCs without the cooperation of upstream stakeholders. The IS is well positioned to facilitate this task. It synchronizes execution plans with the demand plans of all its customers allowing them to increase the responsiveness of their production systems and to lower their inventory levels and their work-in-process. Changes in demand have a direct impact on forest operations. The fact that the IS serves several clients at the same time could mitigate the effect of these changes on plan stability. Being a mandatary acting on the behalf of the FPCs and taking on the management of their TL, the IS prepares an optimized execution plan that considers logistics aspects including road networks to access the areas of cut as well as and the availability of forest camps, supplies,

and production equipment maintenance in the forest. In addition, it addresses critical aspects for the FPCs such as their production schedules. All of this should generate significant economies of scale. The IS is responsible for equitable sharing of performance gains it achieves. Notice the IS concept remains applicable in situations like in Europe where forest products companies typically do not share procurement areas. Indeed, the value created can be through better cross-chains coordination. As shown by D'Amours and Rönnqvist (2010), the FPCs need to work together in order to lower their costs. They can do this by simply treating their supply and demand as common, and by looking for a solution that lowers the overall transportation cost.

*C3:* Conciliation of the execution plans with the T-PIFM and O-PIFM. The IS becomes a node of information that is critical for the management of all the inconsistencies that result from the aggregation and disaggregation of information between the plans made at the tactical, operational or execution levels (Beaudoin et al., 2008; Shapiro, 2006), or from the integration of data provided by different organizations. He reconciles the plans in close cooperation with the local integrated land and resource management panel. When the final plan appears to differ significantly from what was established initially (e.g, capacity needs had been underestimated or that some activities will cost much more than the high level estimate made initially), then recommendation could be made to relax some constraints and to regenerate the plan or ultimately to redefine some objectives based on new information.

*C4:* Suppliers d*evelopment.* The IS selects its suppliers based on their areas of expertise, their ability to deliver and the level of service they are deemed to offer. It continuously monitors their performance and helps them improve their capabilities. It supervises their technological progress, monitors their product quality approaches and management practices, and supports them in their implementations of new communication and information technologies.

*C5:* *Optimization of* the suppliers–*land users–Government authorities links.* The IS optimizes the flow of products, information and money between the different actors in the different supply chains. The IS attached to a given MU can work with the IS attached to another MU. It is able to adapt his business model to combine lean. Flexible and just-in-time operation processes according to the changing needs of his customers. Finally, he offers his customers and suppliers the possibility to sign short, medium or long term contracts.

*C6:* *Overseeing the implementation of activities in the forest.* The IS provides the supervision of the execution of the activities in the forest for his customers and for the government authorities.

*C7:* *Provision of logistic services in the forest*. The IS provides and maintains an infrastructure network for logging, refueling and servicing heavy equipment in the forest. Also, it may centralize certain purchases of products and services, and he promotes the exchange and sharing of resources (e.g. log yard) that can help improve performance.

*C8:* *Technological innovation.* The IS is large enough to justify investment in research and development for the automation of forestry activities and for the implementation of new collaborative business models.

*C9:* *Management of the information* regarding the *MU.* The IS relies on a predefined protocol to collect data on the activities in the forest, and to accumulate relevant knowledge that the government authorities could use efficiently to monitor the wood supply chain (e.g. to determine the actual intensity of harvest) and the other land users.

*C10:* *Acquisition and resale of timber* on the open market *in the interests of some clients.* To better serve its customers, the IS can buy wood in auction then he may sell it to his customers. Also, this enables him to skilfully manage the development of the wood available on his territory.

*C11:* *Traceability.* Traceability allows the IS to automate his relationship with its clients. It ensures that its suppliers will make available the data about the harvested wood and more generally the data about all the activities in the forest. This data can be used to validate the execution plans and the monitoring reports.

*Table 2. Opportunities created by the IS for his customers and partners*

| Forest products companies | Forest entrepreneurs and forestry workers | Government | Community groups | Other land users |
|---|---|---|---|---|
| Economies of scale<br>Fewer interlocutors<br>Better risk management<br>Improving their image<br>Focus on core business<br>Better response to the demand<br>Access to best practices | Economies in technical personnel and equipment<br>Sole and well known client<br>Better guarantee of work and therefore more stable<br>Wealth of information and single node for information exchange<br>More autonomy and capacity for initiative | Participatory management<br>More value from the forest<br>Innovation<br>Socio-political benefits | Local and regional development<br>Stable and quality jobs | Economies of scale<br>A neutral and accessible entity |

Table 2 summarizes the opportunities created by the IS for its customers and partners. Basically, the IS enables all actors in the value chain to generate network economies. These economies are critical because they compensate for inevitable increases in cost due to additional socioeconomic and environmental constraints associated with the new regulations. Another important opportunity brought by the IS is participatory management. This practice is challenging because it is difficult to combine with a financially oriented approach. The IS is well positioned to do this in a smart way; all the parties are given the opportunity to get more involved in the organizational decisions and in the management of the forest operations. The value chain is structured in a way that favors collaboration, synchronization of activities and value sharing.

### *4.3 Identified development scenarios*

The need for an IS in the FVC has been discussed in the previous sections. There are several issues that need to be addressed at this stage. We analyse here three issues that seem the most critical for the development of IS in the forestry sector on public land. For each issue, possible scenarios for implementation are identified.

Q1: *Who can become an IS?* This question can be answered simply by determining from the FVC which actors have (or are entitled to have) the IS competencies set out in Section 4.2. These

entities must adjust their relations with all others in their environment. Three models emerge from Figure 5: (i) the IS-Operator (IS-OP), (ii) the IS-TL holder (IS-TL), (iii) the IS-Administrated by the government (IS-GOV), and (iv) a new player (IS-NP).

In the IS-OP model, the integrator is a member of the network of suppliers, for example, a cooperative or a general contractor. It is characterized by its proximity to the forest and the wood users or processors; its deep knowledge of the territory; its social image or credibility; contribution to the development of the community in which it is anchored; extensive expertise and experience in planning; organizational structure that facilitates decision-making; and opening on value creation and innovation. The IS-TL can be seen as the continuity of the mandatary model long applied in the FVC in Quebec. The IS can be mandated at the same time for management and operations activities. It needs to integrate and reconcile its interests with those of other land users in accordance with the framework established by the new law. This IS remains well positioned for the development of most of the core capabilities required, however, it may be misunderstood by a portion of the population that opposes the management of public forest by an integrator that belongs to the FPCs family. This population would probably agree that government becomes the intermediary (IS-GOV model) especially that it is legally assigned the responsibility for the T-PIFM and O-PIFM. The government, through its representative at regional level, becomes among other things responsible for the reconciliation and integration of the plans as well as optimization, coordination and supervision of the execution on the ground. Concerns that the specialists often have regarding the involvement of the government are the lack of operational flexibility, bureaucracy and inexperience.

There are also other members of the FVC that could become IS. The common actors in the FPC (the TL holders, the members of the network of suppliers and the government) can indeed decide to identify a new player that shall develop the mix of competencies of the IS as defined previously. This player could be a consultant or a logistical service provider (a 4PL or a 3PL). The consultant could be active in the forestry sector or in the information technology sector. In the latter case, the consultant could be responsible for developing and operating innovative information and communication technology (ICT) systems that would automate the processes of the IS; facilitate the reengineering or the alignment of the procedures of the IS with its clients; and assist the different actors in the FVC to form collaborative and interorganizational relationships. On the other hand, when the IS is a provider of logistic services, it should rather be a 4PL than the traditional 3PL (see section 2).

Q2: *Who selects the IS?* This question is very important in the IS-OP or IS-TL models. Self-nominated candidates would not be acceptable by many land users neither by the population. Therefore, the intervention of a third party is necessary. Two possible courses of action may be developed: (i) supply chain logic, and (ii) public forest management right returned to the government.

The first course of action would not be very different from what is practiced by the TL holders (see the mandatary model in section 4.1). The TL holders would elect among them the one who allows the supply chain to fulfill its role for the benefit of all. The danger in such supply chain logic is that the focus would be on the harvesting of wood allocated by the

government to the TL holders. However, the latter need to be accountable also for many functions other than wood procurement. This might compromise the effectiveness of relationships between the different actors in the value chain including the different land users. According to the authors, this is against the spirit of the new forest law. There is a better consistency with the spirit of the law if the government is entitled the responsibility to select the IS (second course of action).

Q3: *According to what criteria is the IS be selected?* The criteria for selecting the IS, regardless of the adopted model (Q1) or possible course of action (Q2), are crucial to the development of the core capabilities defined previously. Two sets of criteria are recommended: (i) socio-economic impact criteria, and (ii) legitimacy criteria. The first set of criteria is more business oriented. On the other hand, the legitimacy criteria are rather more political than anything else. Table 3 gives an overview of the suggested criteria. The framework for the evaluation of each criterion needs to be defined.

*Table 3. Criteria for selecting the IS*

| Socio-economic impact criteria | Legitimacy criteria |
|---|---|
| Experience in optimizing the wood value chain | Consistency with the strategic profile and the driving force behind the organization |
| Cost control | Absence of conflict and apparent conflict of interest. |
| Operational agility | Public perception |
| Sensitivity to market signals | Clarification of roles and synergy |
| Ability to valorize the wood fiber | Accountability and transparency |
| Capacity to innovate | Use of available expertise |
| Local impacts and effects on territory occupation | |
| Ability in making jobs in the forest more attractive to professionals | |

Once the IS is selected, the duration of his contract and the criteria for evaluating his performance while in operation are among the other questions that need to be answered.

## 5 Conclusion

This paper identified the opportunity to restructure the FVC using intermediaries. First, it presented a perspective about intermediation, coordination and collaboration in value chains. The automotive industry was used as an example to illustrate how intermediation can be applied to drastically restructure a value chain. Then, a methodology was proposed in order to define the strategic vision of the intermediary including its value proposition and its required competencies. This methodology was based on a combination of methods involving the customers (observational research; personal, small group or large group interviews; focus groups; customer visits) and driven by the desired outcomes. It was illustrated using a case study of the community-managed forests in the province of Quebec, eastern Canada, and in the context of a total reform of the forest law in this province. The envisioned form of this province's future FVC was based on "Integrators-Suppliers" that act like hubs linking the forest to its users, streamlining their operations in accordance with the government policies and communities interests. The strategic vision of the IS including its value proposition and its required competencies was defined. Several development scenarios were identified. The participant in the research found that the IS concept would likely

improve the efficiency of the timber supply chain from the perspective where the responsibilities of different actors will change dramatically because of the new act. They accordingly proposed that the government entrusts to an IS the responsibilities of reconciling and executing tactical and operational plans. Although our description of the SI concept for forestry was illustrated through a case involving public forest, it is believed that our framework is relevant for private forest settings and any conditions where several products and services need to be procured to several users.

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