

KNOWLEDGE MANAGEMENT AS A MEANS TO IMPROVE PERFORMANCE IN THE FOREST INDUSTRY VALUE CHAIN

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ABSTRACT

The forest industry has always invested considerable efforts in improving its performance in order to remain competitive. In the current business context, actors of the forestry supply chain must coordinate their actions to respond to economic, social and environmental requirements. Shared decision-making becomes inevitable and involves challenges such as the definition of common objectives and integrated planning of their forest supply chain. Also, new perspectives on performance measurements have emerged. In this context, information and knowledge become strategic resources for organizational performance. Decision makers in forestry must therefore learn to manage these intangible assets that have a direct influence on decision results, which, in turn, influence organizational and supply chain performance. In this paper we propose a knowledge management holistic approach to improve decisions performance and ultimately the overall performance of the forestry supply chain. Our results are based on a thorough literature review and an action research empirical experiment. The method was applied in the context of wood supply chain planning activities conducted by a large integrated forest products company in Canada.

Keywords: knowledge management, decision performance, forestry industry value chain, performance in forestry industry value chain

INTRODUCTION

Knowledge plays a central role in the differential competitive advantage of organizations and must be managed so as to enable knowledge workers to better accomplish their tasks and take better decisions (Drucker, 1999; Hansen *et al.*, 1999). This perception requires more from organizations than simply streamlining their operations and optimizing their resources and processes. These streamlining practices cease to contribute to the differential competitive advantage in the long-term perspective, but rather become standards of quality, compliance and measures of productivity (Lorino, 2001).

In the forestry sector the traditional concept of performance, based on productivity and efficiency, has benefited from the contribution of different methods, algorithms and mathematical models. These models and methods include various factors related to optimal resource allocation and decision-making in the forestry supply chain (Beaudoin *et al.*, 2007 D'Amours *et al.*, 2008). However, despite the potential to provide solutions for complex problems encountered in forestry and the advances of these models, the resulting decisions have not been optimal in the real world.

In the current business context, actors of the forestry supply chain must coordinate their actions to respond to economic, social and environmental requirements. Shared decision-making becomes inevitable and involves challenges such as the definition of common objectives and an integrated planning of their forest supply chain (D'Amours *et al.*, 2009). Recent researches have suggested strategies, models and tools for integrated planning in forestry. Furthermore, new perspectives on performance measurements that take into account intangible assets have emerged, also in forestry context (Drole and LeBel, 2010). In this perspective, knowledge turns out to be a strategic resource for forestry supply chain performance (Mosconi and LeBel, 2010).

The main objective of this paper is to present a knowledge management (KM) holistic approach for the improvement of organizational performance (OP) based on decision performance and ultimately the overall performance of the forestry supply chain.

In this paper, we briefly present theoretical foundations that underscore organizational knowledge, its characteristics and knowledge management-related dimensions for an integrative approach. Then, we present our multidimensional and integrative framework by orienting KM towards OP based on decision performance. The theoretical and empirical results of this research work are discussed, emphasizing aspects of the contribution of knowledge based decision-making in the wood supply network. Lastly, we present some implementation aspects and partial results of our ongoing work in a forestry products company.

THEORETICAL FOUNDATIONS

Knowledge management in organizations

Knowledge is essential to the management of organizations and over the last few years has been recognized as a strategic resource for their performance (Drucker, 1999; Hansen *et al.*, 1999). KM is a management function which creates, identifies and manages organizational knowledge for long-term benefits (Darroch, 2003). It is a collection of activities that are organized and systematized to meet corporate objectives (Malhotra, 2001) and managing the knowledge resource has become an essential capability to create value within organizations (Marr *et al.*, 2004). A deeper examination of the literature on KM reveals that few studies propose an OP-oriented framework, despite the fact that reference is often made to OP in KM definitions (Ipe, 2003; Hazlett *et al.*, 2005).

Integrative frameworks that show links between the needs of the organization and strategic objectives are even more scarce (Rivard and Roy, 2005, Perrin *et al.*, 2006). However, organizations that excel in the areas of innovation and financial performance have generally,

within their strategy, adopted a culture that encourages cooperation, creation and knowledge sharing, since they have recognized the value of knowledge (Rivard and Roy, 2005).

To present the framework that we propose in our work we discuss knowledge components, characteristics, and dimensions of KM in organisations for an integrative and strategy oriented framework.

Knowledge within organizations

Despite the importance of this resource, the term “knowledge” is subject to multiple classifications and several interpretations. In order for knowledge to be used effectively in organizations and improve decision performance, three components must be managed: data, information and knowledge.

The components of knowledge

Literature on KM commonly refers to knowledge components from a hierarchical view, i.e.: data, information and knowledge per se (Bhushan and Rai, 2004).. The components of knowledge can be understood along a continuum of degree of formalization as well as added value for an organization’s decisions and strategic objectives.

- Data are facts about activities. Data which are placed in context, categorized, classified, corrected and condensed constitute information
- Information is a group of data, which has meaning and can be applied in decisions that are not too complex.
- Knowledge is linked to action, the ability to generate, extrapolate and deduct new knowledge as a result of its use.

Knowledge differs from information in that it is rooted in the capacity to increase one’s ability to understand information in a given context so as to enable the creation of new knowledge (Nonaka and Takeuchi, 1995). In an organizational environment, knowledge takes these three forms, which can be represented along a continuum where the degree of codification reveals the added value of knowledge with respect to data. Knowledge must be mastered and managed in such a way that it can be read, interpreted, understood and applied by individuals to a function or a specific activity in an organization’s business processes, particularly in business decisions.

The characteristics of organizational knowledge

The value of knowledge for an organization is intrinsically related to the context in which it was created and its use. In order to fully grasp the dynamics of knowledge in an organization, its various characteristics must first be considered (Hazlett *et al.*, 2005; Quintas, 2008).

Four aspects are most often mentioned concerning decision making in the literature: it’s nature, ownership, learning and context. These knowledge characteristics affect KM in organizations. Knowledge characteristics are important to determine how to manage this knowledge and its role as a resource for the organization (Mosconi *et al.*, 2010). According to Quintas (2008), the various characteristics of knowledge reveal their inter-related nature, and this inter-related nature must be taken into consideration in knowledge management.

As well, knowledge must therefore be managed from a strategic point of view in order to enable individuals, referred to by Drucker as “knowledge workers”, to better accomplish their daily tasks and to make better decisions to meet their strategic objectives (Drucker, 1999).

KM dimensions oriented toward OP

Dimensions are determining aspects for the success of KM initiatives, practices and approaches within organizations and in order to properly manage knowledge in an organization it is essential that the characteristics of available knowledge and their different related dimensions be taken into account (Rivard and Roy, 2005). Moreover, KM alignment with strategic orientations requires an integrative framework that considers a multidimensional perspective. Rivard and Roy (2005) have stated that strategy-oriented KM needs to consider that “organization, culture and processes are determinant as information technology” [our translation] p. 30.

- Culture: defining roles and responsibilities for a sharing environment based on trust;
- Means and tools: whether or not to define or adapt tools and technological means;
- Process and activities: defining KM activities;
- The organization: defining the organizational structure to meet KM objectives.

These dimensions integrate both organizational and technological dimensions for a successful KM approach with regard to the actions required for OP (Rivard and Roy, 2005). This view is shared by Perrin *et al.*, who specify that KM must take into account a combination of technological, structural, strategic and cultural practices in order to make effective contributions to the organization. These frameworks proposed by Perrin *et al.* (2006) and by Rivard and Roy (2005) present similar visions concerning KM shortcomings and potential contribution of these frameworks of KM to OP. This suggests that literature on KM has evolved over recent years, and that KM, often criticized for its partial approaches, is making significant contributions to management theory and practice. However, most frameworks studied do not provide an overview of knowledge value and fail to establish direct links between KM and OP (Hazlett *et al.*, 2005).

Kalling (2003) conducted an empirical study where it was shown that OP is sustained by KM-related practices. Findings suggest the more integrative and holistic KM approach functions in such a manner as to use the knowledge resource for the benefit of the organization (Kalling, 2003).

KM, OP and decision performance

Holsapple (2008) affirms, “decision making is a knowledge-intensive endeavour” (Holsapple, 2008, p.21). The author also states that “To understand decisions and decision making, we need to understand knowledge and knowledge management” (Holsapple, 2008) p. 21. It is apparent that improving decision performance is a major challenge for managers in all industry sectors (Wang and Benbasat, 2009; Holsapple, 2008) and decision performance is limited by intention and the way information and knowledge is used in organizations (Wadhwa and Saxena, 2007). Furthermore, they also contribute to task achievement and the decision-making required for OP, as suggested by Holsapple (2008).

RESULTS

Theoretical results: A multidimensional KM reference framework

Our proposal is founded on a set of dimensions to facilitate KM in the organizational context, culture, processes and the technological environment. This proposal for a conceptual reference framework thus encompasses the four dimensions proposed by Rivard and Roy (2005) and Perrin *et al.* (2006): structure, culture, processes and technology and tools, illustrated and described in Figure 1. However, in order to connect the KM approach to an organization's strategy, we based our approach on the proposal by Holsapple (2008), who believes that in an organization, activities likely to create value and affect performance are related to decisions. This author stresses the importance of KM to support better decisions and to contribute to the enhancement of OP.

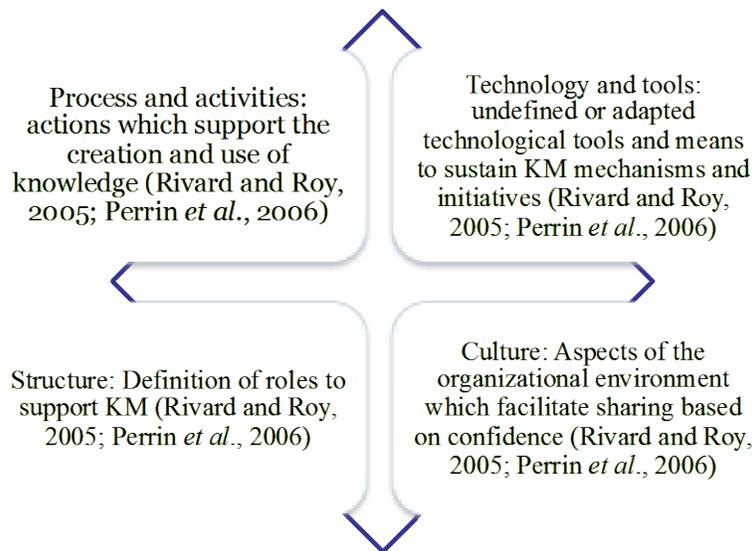


Figure 1: OP-oriented KM dimensions

In addition, Holsapple (2008) underscores the fact that a decision encompasses a body of knowledge with multiple characteristics, i.e. explicit knowledge (data, information and structured information) and tacit knowledge (insight, judgment, decision). The result of the decision is therefore composed of the knowledge available in the organization and becomes new knowledge during the decision-making process supported or not by a system. The various organizational, technological and human dimensions are essential to maximize the creation and use of the “knowledge” resource. We have adopted this view in our model, since it enables us to link the daily activities and the “knowledge” resource used to produce the decision-making results which, as a whole, should in turn support OP. This is the basis of our proposal for a conceptual framework and approach, as illustrated in Figure 2.

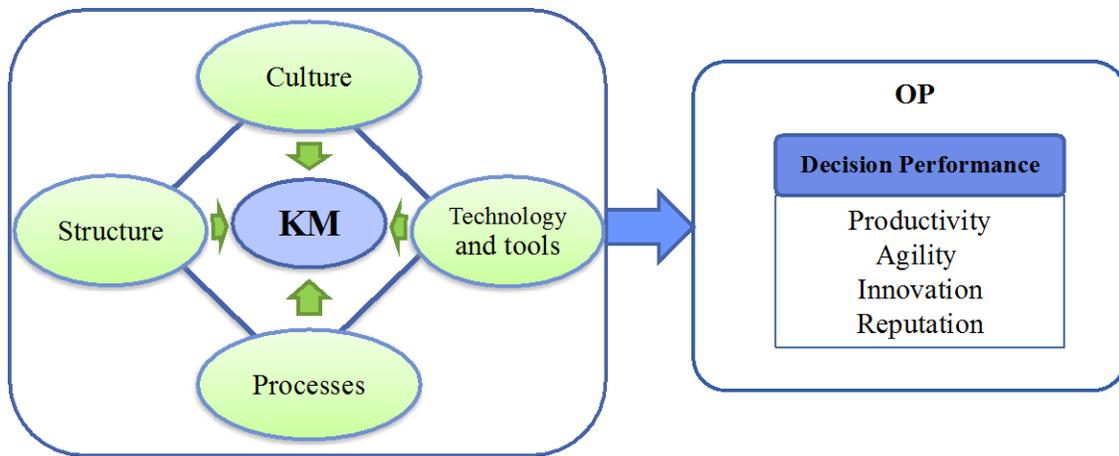


Figure 2: Multidimensional KM reference framework as a support to OP improvement

This multidimensional reference framework takes into account the knowledge available in an organization and its use in producing better decisions concerning business activities and processes regarding OP. Knowledge must be created and used to improve the decisions results in the daily tasks of individuals in order to achieve the expected KM benefits to OP. OP is measured through quantitative (objective) and qualitative (subjective) OP indicators, based on decision results and performance.

Empirical Results: KM in forestry industry products

In order to evaluate empirically our KM multidimensional framework, we adopted an action research methodology for conducting this empirical research. We developed a partnership relationship with an integrated forestry products industry, called here by the fictive name “Wood Value” and we worked together during the last three years. Action research is an iterative approach that supports researchers interventions in real organizations by proposing and working with practitioners in a transformative way (Baskerville and Myers, 2004). We adopted a five-step cycle for each research phase.

In our action research we started with a definition of common objectives and a scope of the empirical research within the organization. Managers from “Wood Value” chose the forecast of wood supply operations planning (Forecast) as a specific process for our collaborative project. Our practical research objective was to investigate how KM can support decision performance within the Forecast process and as a consequence, contribute to OP.

Improving the performance in the forestry sector has often been oriented to decision making support, particularly related to machine productivity, the optimal allocation of raw materials and other tangible resources. These advances have contributed to better understand the business and operating processes of the forest, and also investment in research and development in tools for decision support for forestry operations. Particular attention was paid to forest planning and management, due to the complexity of decisions that must be taken throughout this process central to the performance of wood supply network (WSN). Decisions made in the WSN have a significant impact on the performance of business processes, as well as the entire network of value creation in the forestry sector (D'Amours *et al.*, 2009). This is explained by the fact that the

RAF's operations represent about 50% of final product costs (PWC, 2008). Moreover, these decisions affect performance of the entire supply planning, and therefore, for the processing and other activities of the value chain of the forest industry (Beaudoin *et al.*, 2007).

We discuss with the practitioners and managers that are concerned by Forecast activities and decisions and we illustrate the context and some aspects of the complex decision making within the Forecast in Figure 3 for the Wood Value context. For “Wood Value”, Forecast is a strategic monthly process that allows understanding the real state of WSN and anticipating decisions for the following months as well as predicts the main bottlenecks for the coming year.

In order to evaluate our framework we started the empirical work by undertaking a business process modelling based on the Vernadat (1996) approach and we adopted UML (Unified Modelling Language) as the formalism for our diagram representation. For knowledge mapping we adopted the CommonKADS (Schreiber *et al.*, 2004) approach to knowledge mapping and engineering. The main objective of this modelling and mapping is to better understand knowledge needs, knowledge flows, decision points and performance indicators. We combine these two approaches to map the Forecast planning process. The main steps were:

- Define processes units: activities, resources, actors and knowledge flows;
- Identify decision points: the critical decisions points, needs and goals of each point;
- Identify knowledge needs: sources (the modes of transmission, interaction and acquisition, know-how), means for storing and sharing information;
- Identify actor's role: who are the actors, their main tasks, and skills missing, the relationship between the actors;
- Formalize and represent business process: knowledge characteristics and actors.

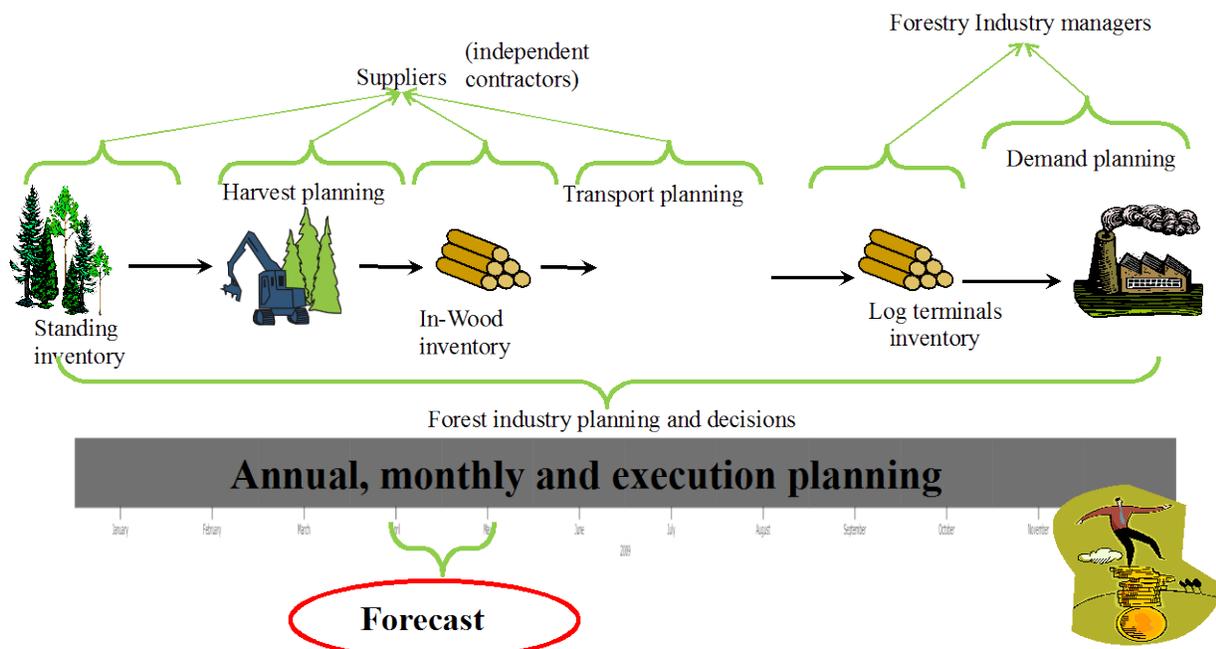


Figure 3: “Wood Value” chose the forecast of wood supply operations planning

Some statistical aspects from this mapping show the complexity and the challenges for managers and practitioners from Wood Value.

We identify that:

- 67 activities are accomplished within the Forecast process;
- 27 systems and tools (such as OR tools and other decision supports) are used;
- 23 information formats need to be processed and converted;
- 20 persons need to share information and knowledge in different decision points
- 19 decision points concerning forest operations are evaluated;
- 8 decision makers in 3 management levels participate in decisions
- 12 performance indicators are monitored.

During the workgroup sessions for knowledge mapping we identify some interesting aspects related to decision performance and some barriers for KM within the Forecast. The partial view or limited view of the decision impact along the process and the value chain is the most important problem identified. Concerning KM, the partial understanding of knowledge value, the limited comprehension of knowledge flows and the incomplete vision of knowledge available within the organization are the main challenges.

Based on our KM framework, we identify initiatives and mechanisms that can help improve KM within the Forecast. Interventions related to all four dimensions from our framework. Some initiatives supported different interventions, for example, a graphic representation of the Forecast process was presented in a focus group session with the aim of validating and sharing comprehension among managers, practitioners and us. Their feedback allowed us to propose some specific interventions in the process and activities. Also, discussion of the overview of activities allowed a shared comprehension about knowledge needs, flows and “knowledge gaps”. Moreover, the discussions benefit a better understanding of decision points and their impacts for other actors in the WSN. We have worked to implement changes and improve practices in KM to better support decision performance.

At present we have a great volume of data to analyze that comes from six interviews with people who work in the Forecast process. Our next step is a data analysis phase to know more about the perception of managers and practitioners concerning the support of KM in decision performance. Our field observation revealed that continuous efforts are needed to meet the challenges and overcome the barriers in KM and decision performance. However, we observed interesting progress in shared understanding of knowledge value and awareness in the holistic view of the Forecast process.

DISCUSSIONS ABOUT PRELIMINARY RESULTS

This paper presents theoretical and empirical results of our research work on KM oriented to OP, based on decision performance. At first, the question of KM and its tangible contribution to OP served as the motivating force behind this article. Knowledge recognized as a strategic resource for OP must be managed as an essential capability for the creation of value. However, most

proposals have failed, and have not brought forth any real benefits with regard to effort in terms of performance improvement. Our results are based on a thorough literature review and an action research empirical experiment. The method was applied in the context of wood supply chain planning activities conducted by a large integrated forest products company.

A literature review was conducted to study the concept of knowledge and its various characteristics for the purpose of better understanding the concept as a strategic resource for OP and this understanding enabled us to identify OP-oriented KM approaches reported in the literature to properly define the dimensions that need to be considered in a more systemic view of KM in organizations. The dimensions identified were taken into consideration in our OP-oriented multidimensional KM conceptual framework.

In addition, we also identified an approach that enables the value of knowledge to be incorporated into organizations to improve performance. This approach is based on the use of organizational knowledge to improve the decisions results made in daily activities. We highlight the important aspect of KM to facilitate knowledge application in decision points in order to improve decision performance as foundations for OP.

Concerning empirical results, based on our multidimensional KM conceptual framework presented, our action research was guided and supported. We observed, made interventions, and proposed changes, which aimed to improve the way that knowledge was managed in the Forecast process. We observed some improvements in KM concerning the limited view of impacts of decision points and also partial understanding of knowledge needs, flows and knowledge value. Our interventions guided by the multidimensional framework supported changes in different aspects for each KM dimension, for example by modelling and mapping Forecast business process we are able to call attention to knowledge needs and streamline understanding of knowledge flows. Managers and practitioners interpret this modelling and mapping as a good opportunity to evaluate how they treat and make decisions based on their better understanding of the process. These aspects favour the adoption of new technological tools as a decision support system and facilitate their definition of problem solving. Also, managers and practitioners interviewed mentioned that Wood Value has lot of potential to better use knowledge available in the Forecast decision and to contribute to all forestry value chain.

CONCLUSION

Our findings suggest that if knowledge is mastered and managed by the individuals who will use it in a specific function or activity, or in the business processes of the organization, it can support OP and supply chain performance. Knowledge therefore becomes a true resource, as proposed by knowledge theory, and can thus be used to help meet strategic objectives and improve OP, as suggested by Grant (1996) and Foray (2004).

Decision makers must therefore learn to manage intangible assets as well as available knowledge for better decision results. Preliminary results suggest that the proposed knowledge management holistic approach for improving decisions performance (DP) and ultimately the overall performance of the forestry supply chain can support properly managing knowledge resources.

Improving decision performance is a challenge for business units in different sectors as well as in forestry. Our framework is available to support other empirical research in order to improve certain aspects and identify new ways to implement KM and support decision performance and OP. More research is needed to generate reference business models in forestry in order to facilitate the adaptation and application in different contexts where decisions are likely to be complex and can contribute to organizational performance for all actors in the value chain.

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