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# On the dynamics of innovation in Quebec's coastal maritime industry

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**Abstract**

Most studies of the maritime industry focus mainly on its structure and its economic impacts on national economies, without providing detailed insights into the economic and technological activities of the industry itself at the regional level. This study explores the nature of innovation activities in the maritime industry and identifies the extent to which these activities differ according to the size of the firms, knowledge intensity, and location within a cluster, and suggests in the conclusion possible action strategies that could help the maritime industry to be more competitive.


*Keywords:* Innovation activities; Barriers to innovation; Sources of information; Local cooperation for innovation; Maritime industry; Quebec's coastal region

## 1. Introduction

In 2001, the *Canadian Summit on Innovation and Learning* identified the maritime industry among the key sectors that needed to be supported and developed in Canada. Indeed, several traditional maritime industries had been undergoing severe structural changes, particularly those in fish and seafood products, and some fast-growing industries began to emerge, notably, those associated with ocean and marine technology. Moreover, the maritime industry is an important source of employment and of economic growth in the Canadian economy of peripheral and rural regions.

This study explores the nature of innovation activities in the maritime industry and identifies the extent to which these activities differ according to the size of firms, knowledge intensity, and location within a cluster. The conclusion will suggest possible action strategies that could help the industry be more competitive.

This research focuses on the maritime industry of Quebec's coastal region. Although it is relatively small, with 7563 employees in 96 firms, this industry is nevertheless an interesting case for at least two reasons. First, it is has received a lot of political attention over the last 10 years or so and, nowadays, action strategies for strengthening Quebec's coastal region maritime cluster have become the focus of economic development. Second, very few statistical data concerning maritime clusters are available in Canada. This is especially true at the regional level as there is no systematic compilation of information on the competitive strategies and innovation behaviors of maritime firms in Quebec's coastal region. This research will attempt to fill this gap by analyzing innovation processes in the region's maritime industry. It will also provide a stronger background for regional policymakers as they come to terms with understand the competitiveness of the maritime industry.

## 2. Literature review

### 2.1. Defining innovation

Innovation may be defined narrowly in terms of a firm's technology-related activities as it develops new processes or brings new products to market (Cumming, 1998). A broader definition of innovation has been suggested relating to changes in production functions and processes, whereby firms seek to acquire and build upon their distinctive technological competence; it is understood as

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the set of resources a firm possesses and the way in which these are transformed by innovative capabilities (Dodgson and Bessant, 1996).

North and Smallbone (2000, p. 147) have proposed a definition of innovation along four key principles:

(1) Innovation is about changes made by firms to maintain or improve competitiveness.
(2) These changes apply to products and services, market development, marketing, production processes, and technology used in administration.
(3) There are varying degrees of novelty for innovation.
(4) The sectoral context is significant, providing a framework for assessing the role of innovation as a factor influencing competitiveness.

Innovation is also defined as a process of know-how accumulation or a learning process involving elements of internal and external learning (Rothwell, 1994). Innovation is no longer seen as a linear process, but now understood as an interactive and systemic process. The interactive model of innovation has challenged the linear model by emphasizing the following three features:

1. Innovation is a means of problem solving involving different learning processes (Dosi, 1988). Learning may arise from learning-by-using, learning-by-doing, learning-by-sharing (Lundvall, 1988), whereas "external learning" refers to the absorptive capacity of firms, which corresponds to the amount of external knowledge that they are able to use (Cohen and Levinthal, 1990).
2. Innovation is an interdependent process (Kline and Rosenberg, 1986) stemming from many sources, both inside and outside the firm. These interdependencies and numerous feedback links exist at different stages of product development. Individuals and departments store their own knowledge assets. In addition, firms exchange codified and tacit knowledge with various external sources.
3. Innovation is an interactive learning process of a social nature (Asheim and Gertler, 2005). This involves interaction between firms and their environment, not only between users and producers, but also between businesses and the wider research community.

### 2.2. Innovation and firm size

Several studies have shed light on the relationship between firm size and innovation activity (Hausman, 2005; Edwards et al., 2005; Freel, 2005; Shefer and Frenkel, 2005; Wagner and Hansen, 2005; Avermaete et al., 2004; Bhattacharya and Block, 2004; Rogers, 2004; Audretsch, 2003; Romijn and Albaladejo, 2002; North and Smallbone, 2000; Cohen and Klepper, 1996; Dodgson and Rothwell, 1994).

Some authors argue that large firms are more likely to be innovative than small firms because they can access a wider range of knowledge and human capital skills and have greater resources to invest in innovation activities (Rogers, 2004). They are thus able to better support formal R&D efforts or employ technical experts. Furthermore, large firms can enjoy greater external awareness, monitoring external information sources on a global scale (Malecki, 1997). Their larger volume of sales implies that innovation costs can be spread over a large sales base (Cohen and Klepper, 1996). They are also better positioned to gain scale economies and are more informed about market opportunities and suppliers (Rothwell, 1994).

Other studies show that small firms are engines of innovation activities in certain industries, even though they only account for a minor share of R&D, as the latter is typically carried out by large firms (Audretsch, 2003; Pavitt et al., 1987). Small firms are often depicted as diametrically opposed to large firms. Small firms have the advantage of greater flexibility and of being more dynamic and responsive to shifts in demand and changes in various economic conditions (Hausman, 2005; North and Smallbone, 2000; Cohen and Klepper, 1996).

Small firms are also more active and innovative when it comes to engaging in interactive learning networks with other firms, customers and suppliers, and various external organizations (Cooke et al., 2000). Networks represent a complementary response to the lack of internal resources and to insecurity arising from the development and use of new technologies; they reduce the uncertainty associated with innovation and facilitate access to sophisticated technology and technical expertise (Doloreux, 2004). Other studies have stressed that small firms have a higher innovation per employee rate (Tether, 1998), and that they are more likely to be involved in making incremental rather than more radical and fundamental changes (Rosenberg, 1992).

### 2.3. Innovation and knowledge intensive firms

Knowledge has always been a central element in the innovation process. Knowledge intensity is now increasingly distributed across sectors, including creative industries (Britton, 2007), biotechnology, and other science-based and high-tech industries (Niosi, 2005), service industries (Wood, 2003; Gallouj, 2002), and traditional and mature industries (Doloreux, 2003; Kaufmann and Tödtling, 2002).

The relevance of knowledge in the current economic context is important across industries and is not restricted to a narrowly defined high-tech sector. However, the empirical literature that has tested the relationship between knowledge intensity and innovation activity shows that knowledge-intensive sectors (such as biotechnology and other science-based and high-tech industries) are naturally expected to be more innovative compared with other sectors that are less knowledge intensive. They are expected to invest more in R&D activity, to be more involved in recruiting qualified personnel, including scientists and