Available online at www.sciencedirect.com

RAI Revista de Administração e Inovação xxx (2017) xxx–xxx

http://www.revistas.usp.br/rai

Technological capability in the Brazilian naval industry: a metric for offshore support vessels

Loise Baginski, Claudio Pitassi *, Jose Geraldo Pereira Barbosa

Universidade Estácio de Sá (UNESA), Rio de Janeiro, RJ, Brazil

Received 13 August 2015; accepted 26 October 2016

Scientific Editor: Leonardo Augusto Gomes

Abstract

The objective of this study is to present an adapted technological capability metric for the offshore support vessel construction segment. Based on a literature review, a preliminary metric was developed and used to interview a group of researchers, professors, and managers from the naval industry. Through a qualitative approach, the collected empirical evidence was analyzed and organized in an analytical framework. A pilot test of the metric was then carried out at a shipyard in the city of Rio de Janeiro. The study's results indicate that the metric's application can offer firm managers and government policy-makers relevant information for the design and implementation of business and technological strategies for the supply vessel segment.

Keywords: R&D; Technological innovation; Technological capability; Innovation metrics; Shipbuilding industry

Introduction

Pre-salt enables Brazil to promote a conscious effort to develop national firms of oil and gas production chains, including the offshore shipbuilding segment, the focus of this study. Offshore support vessels are high-technology small- and medium-sized ships, which offer permanent logistical support to operating units in maritime waters (Ruas & Lugli, 2009).

However, it is possible to observe an expressive technological gap in this sector when it is compared with countries that are leading the industry, especially South Korea and Norway. For shipbuilding firms to concurrently address the objectives of developing their international competitiveness and to meet pre-salt demands at a given time, it is necessary to tune their competitive strategies to the dynamics required for the development of technological capability (TC). Bolder and integrated public policies are also needed.

At an organizational level, TC is an ability that results from a knowledge stock related to engineering, a stock that is being driven by different learning mechanisms, which allows the realization of production activities and high levels of innovation (Figueiredo, 2009). Since the pioneering studies of Katz in the 1970s and 1980s TC has been considered a key factor for the economic development of late-industrializing countries in Latin America.

In this article it is argued that, according to a view of strategic management based on technological innovation, measuring Brazilian naval construction firms' TC levels in relation to their counterparts in developed countries constitutes a critical step in the diagnosis that guides the technological catch-up process; however, the development of metrics used in each segment has not been exploited in TC literature.

* Corresponding author.
E-mails: loise.b@terra.com.br (L. Baginski), claudio.pitassi@gmail.com (C. Pitassi), jose.geraldo@estacio.br (J.G. Barbosa).

Peer Review under the responsibility of Departamento de Administração, Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo – FEA/USP.

http://dx.doi.org/10.1016/j.rai.2017.03.002

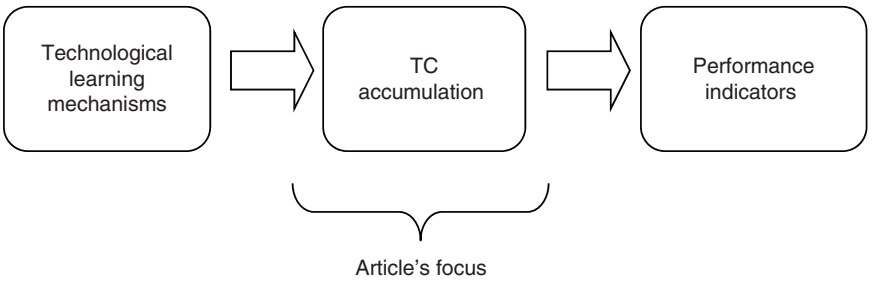

Figure 1. Dynamic TC accumulation process.
Source: Adapted from Figueiredo (2009, p. 5).

This research is therefore aligned with other studies based on the TC concept (Bell & Pavitt, 1995; Figueiredo, 2009; Lall, 1992) and is extended to focus on sectoral metrics (Moreira & Pitassi, 2013). The question that motivated the research is: At what level of technological capability are Brazilian shipbuilding firms of the offshore segment? The purpose of this article is to propose an adapted TC metric for the offshore support vessel construction segment.

This article contributes to theory by providing a metric for a sector that has not been contemplated in the TC literature. Regarding administrative practice, the metric can help managers of Brazilian shipyards in the development and implementation of technological catch-up business strategies. From the point of view of public policy (industrial, S&T&I, and commercial), the metric can assist in the development of projects such as the first Brazilian PSV, coordinated by Coppe/University Federal University of Rio de Janeiro (UFRJ), University of São Paulo (USP), and the Institute of Technological Research (IPT) in partnership with suppliers.

Theoretical framework

TC in late-industrializing economies

Technologies have a tacit nature involving multiple individual and collective organizational aspects of learning, which are embedded in organizational fabric and specific to the context in which they are developed (Bell & Pavitt, 1995). According to the *Oslo Manual* from the Organization of the Economic Cooperation and Development (2007), technological innovations include the introduction of technologically new products and processes and the achievement of significant technological improvements to them.

Q3 Research by Katz (1984) and Dahlman and Westphal (1982) generated numerous empirical studies on how firms of late-industrializing countries accumulate TC for the achievement of technological innovations. In the 1990s, a group of researchers based in England developed taxonomies and frameworks that gradually helped create a solid line of empirical research on the construction of TC in firms of developing countries (Bell & Pavitt, 1993, 1995; Lall, 1992).

Fig. 1 shows how TC accumulation begins with learning mechanisms, which interfere with the speed of TC accumulation. This is reflected in the performance indicators of firms, including innovation (Figueiredo, 2009).

Strategy and competitive factors in the naval industry

According to the literature, the key features of the shipbuilding industry are: (i) building ships by commission, with average construction deadlines of 12 months; (ii) involving complex production processes, large-scale production, and intensive manual labor; (iii) provide high value-added goods with long lifecycles, whose demand has been greatly affected by global financial crisis; and (iv) requiring large, fixed capital investments (Cho & Porter, 1986; Coutinho, Sabbatini, & Ruas, 2006; Pasin, 2002; Ruas & Lugli, 2009; Silva & Martins, 2007; Souza, 2009; Won, 2010).

In line with the analytical framework adopted in this study, Lacerda (2003) emphasizes the importance of technology transfer from developed countries for the Brazilian shipbuilding industry to grow, as this learning mechanism streamlines and reduces involved risks. However, according to De Negri, Kubota, and Turchi (2009, p. 36): "the experiences of countries such as Korea and China have showed that becoming a competitive industry is important to create understanding and reduce dependence on technological packages from abroad."

Bell and Pavitt (1995) demonstrate that there are industry standards for innovation that influence technological strategies of the firms present there. Given the competitive factors described in the section "TC in late-industrializing economies", it is assumed in this study that the shipping industry can be classified as "scale intensive". Therefore, a process of mastery of technology and products by firms is required. Innovations are incremental and derive from previous experiences in product design. In addition to engineering the actual shipyard, suppliers revert to an important source of innovation for process improvement and cost reduction.

Types of TC metrics

According to Figueiredo (2009) there are two types of metrics to measure technological innovation levels: (i) conventional, widely used in developed economies, whose focus is expenditure on R&D and patents; and (ii) based on TC, whose theoretical development has been focused on emerging countries

Please cite this article in press as: Baginski, L., et al. Technological capability in the Brazilian naval industry: a metric for offshore support vessels. *RAI Revista de Administração e Inovação* (2017), http://dx.doi.org/10.1016/j.rai.2017.03.002