

Falling behind in digital transformation capabilities? Exploring the implications of digitalization of the automotive value chain for Brazilian players' role in global innovation networks.

Ruy Quadros, Carla Kitsuta and Durval Garcia (LabGETI/DPCT/IG/UNICAMP)

(ruyquadros@gmail.com)

The purpose of the paper is to explore the implications of digital transformation in the automotive value chain for innovation capabilities accumulated by assemblers, OEM and service providers in Brazil. It is well known that the car industry in the largest and industrialized emerging countries have developed considerable innovation and technological capabilities. Brazil is one case in point. Over the past three decades, a continuous process of learning has raised Brazilian MNC subsidiaries and some local OEM in the car industry to the level of participating in the development of innovative, proprietary global products. Brazilian players have benefitted from their integration into global R&D networks. In some specific markets such as bio-fueled power trains and small and medium sized commercial vehicles, a considerable number of Brazilian subsidiaries, either assemblers or OEM, are reputed as global excellence centers. However, the global auto industry is undergoing an unprecedented wave of technical change that is quickly transforming it in almost every aspect – product concept, energy sources, manufacturing and business models. Digital technologies have an important role in this change and they do not coincide with the areas in which Brazilian automotive engineering and R&D have developed competencies. Thus it is plausible to ask how and to what extent does such massive wave of technical change in the automotive industry affect the role, mandate and status of local players in regard to their positioning in global innovation networks. Are innovation initiatives and activities related to connectivity, autonomy and mobility, and led by headquarters of incumbents and new entrants, involving Brazilian assembler and OEM subsidiaries, local OEM, local startups and local KIBS? Is the global automotive leaders' hectic move in capital venturing and acquisitions of ICT firms and capabilities to provide solutions for digital transformation also unfolding to the Brazilian automotive industry scene? To what extent technological capability limitations in software and electronic hardware innovation in Brazil hinders the possibility of greater involvement of local players in creating digital transformation?

In order to contribute to the understanding of these issues, the paper draws on collection and analysis of secondary data from two sources. On the one hand, patent search has been carried out in order to mapping out global patent activity of 20 major players in the automotive value chain in Brazil in 5 major digital technology fields. Players in Brazil comprise 9 assemblers, 7 OEM and 4 engineering services providers whereas initial key words for patent search in digital technologies comprise Internet of Things, Machine Learning, Computer Vision, Computer Graphics and Virtual Reality. The 5 broad key words have been unfolded in other 40 more specific key words. Patent mapping out has been meant to provide data on 1st priority country and on Brazil resident inventors as indicators for local innovation and R&D activities. On the other hand, search in Dow Jones-Factiva data base has been done in order to identify events of technological collaboration, business partnerships, capital venturing and acquisitions involving

the 20 major players and other firms and research institutions in areas connected with ICT and digitalization.

Findings show a strong contrast between Brazilian players and their counterparts in US, Europe and Japan. While global patent activity of the 20 players has presented steady and significant growth for most of the ICT technologies considered, their technological patent activity in Brazil in digitalization is scarce. It is also interesting to notice differences in strategy and patent activity between such players at the global level. Moreover, while some of those players are involved in a boom of acquisitions and partnerships with ICT firms in the US and Europe, there are only few and incipient equivalents involving local firms and research institutions. Such findings cast a major challenge for Brazilian players and Brazilian professionals acting in innovation and R&D in the auto industry. As digitalization and electrification advances and subvert the core and every part of vehicles and of the business, will the current technological and innovation capabilities accumulated in automobile firms located in Brazil become obsolete?