



1 Q1 A proposal for the application of multicriteria analysis to rank countries
2 according to innovation using the indicators provided by the WIPO

3 Q2 Marcela do Carmo Silva*, Luiz Octávio Gavião, Carlos Francisco Simões Gomes,
4 Gilson Brito Alves Lima

5 *Universidade Federal Fluminense (UFF), Rio de Janeiro, RJ, Brazil*

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8 **Abstract**

9 This article aims to analyze the ranking of Latin American and Caribbean countries in the ranking proposed by the World Intellectual Property
10 Organization (WIPO) in relation to Global Innovation Index (GII) using the multicriteria approach as an instrument. The methodology used is the
11 Technique of Ordination by Similarity with the Ideal Solution (TOPSIS), in order to support the reduction of subjectivity to the decision making
12 process of the global competitiveness models adopted by WIPO. It is based on literature research, through a review on the themes of innovation
13 works, marking the condition of the local productive networks, focusing on the approach of the Porter's Diamond proposal. The results of the
14 application of the technique bring a new perspective to the methodology of WIPO and allows to suggest new factors indicative that the countries of
15 Latin America and the Caribbean need to develop their networks and creative policies in such a way that the promotion of technological innovation
16 occurs quickly, so that innovation is transferred to society.

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19 **Keywords:** Multicriteria analysis; Porter's diamond; Global innovation indicators; World Intellectual Property Organization; TOPSIS

20 **Introduction**

21 Innovation improves the competitiveness of a country's production chain at the national and transnational level, since we're
22 going through the globalization of capital and, as such, the products and services in a country are exposed to the world
23 to overcome barriers to competitiveness.

24 Technological innovation in developing countries is occurring as a process that has its own characteristics, differentiating
25 it from countries with a high technological level. In this sense, observing innovation and the particularities of how it fits within
26 the framework of a country in accordance with innovation indicators and perspectives will reveal the competitive capacity of a

27 country – according to its global positioning – for the purposes
28 of economic development, which will lead to innovation over
29 the long term (Rocha & Duflath, 2009).

30 As such, the objective of this study is to use a multicriteria
31 method to analyze the innovation indicators in 22 countries in
32 Latin America and the Caribbean, observing the alignment of
33 the classification methodology performed in 2015 by the World
34 Intellectual Property Organization (WIPO) with the application
35 of the TOPSIS multicriteria method. Based on this objective, the
36 following research question is formulated: what is the robustness
37 of GII applied to the group of 22 countries when compared to
38 the results of the approach through the multicriteria decision aid
39 method?

40 Since this study is restricted to the field of global innovation
41 indicators, this research is restricted to the practices observed
42 by WIPO to identify the potential for innovation through indi-
43 cators of this institution at the national level, which lead to the
44 consideration of a ranking of the most innovative countries on a
45 global level.

46 * Corresponding author.

47 E-mail: marceladocarmo30@gmail.com (M.C. Silva).

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Because of the expansive meaning of the term “innovation”, its use as a scientific tool is restricted. As such, the epistemology is focused on Porter’s Diamond, since it finds itself within the stratification of the global innovation principles used by WIPO, extending to the maximum between the polarity of the terms “innovation” and “sustainability” because it’s centered around innovation as the competitive, but also sustainable advantage of companies in the global production chain (Freire & Freitas, 2009).

To this end, this paper was organized in five sections. The second section presents the context of innovation and of WIPO. The third section deals with the methodology applied. The fourth discusses the prospects of the tools within the quali-quant context. And the fifth section provides the concluding remarks regarding the information analyzed.

Innovation

Innovation has been a goal of different types of organizations. As such, those aspects should be observed that could either promote it or remove the barriers for it occurring in each situation. It is a complex construct, with different concepts, dimensions and contexts of application. As a consequence, it is understood through different theoretical approaches in various fields of knowledge, industries and industrial sectors (Bruno-Faria & Fonseca, 2014). The innovation phenomenon is of extreme relevance to the sustainability of organizations since it enables their sustainability both in terms of new products, more efficient and cheaper processes and even businesses that are more compliant with the needs of the environment. The infrastructure that an organization has for innovation is critical to its success and it comes in different shapes or complexities (Cruz, Frezatti, & Bido, 2015).

The epistemological constructs of the innovation concepts that were widely used until the mid 1970s dealt with the increase of mass production to keep producing vast amounts of revenue. However, with the trend toward quality management over production, the debate arose to bring the conflicting issue of the production chain to academia in order to maintain the high rates of economic output without compromising the environment (Martins, Lima, & Gomes, 2015).

By transcending geographical barriers and extending to the transnational level, the issue of competitiveness through technological improvement and adaptation to the environmental requirements required the development of strategic innovation strategies in order to keep up with global quality and performance standards (Freire & Freitas, 2009).

In this quest for a global competitive positioning, the geographic dimensions and the innovation perspective of local productive arrangements that exceed global competitors and position the company and the country at a higher innovation and technology level, reveal the positioning through international, national, regional and international partnerships, associations and alignments with innovations of related and supporting industries.

However, the concept and the identification of a country as innovating seeks to analyze and document the adaptations and

innovations (even if through benchmarking) so that the best practices in innovative production processes can elevate the national intellectual property (Cornell University, INSEAD, & WIPO, 2015).

World Intellectual Property Organization – WIPO

WIPO was established as an institution in Stockholm on July 14, 1967. It was tasked with promoting the global protection of intellectual property where there is innovation, creativity and contribution as a stimulus to economic development (Olwan, 2011). Each year the WIPO publishes studies with perspectives on the global innovation trends, identifying the countries with the highest levels of innovation, changing the conceptual methodology for each study launched per year, maintaining the flow of micro and macroeconomic analyses that promote innovation.

As such, the global innovation metrics will change so that the social and economic changes have equivalence regarding the surveyed indicators (Cornell University et al., 2015). When the years 2014 and 2015 are compared, for example, WIPO used a methodology with 81 indicators divided into 3 categories for 2014: 56 in raw data, 20 indicators of international agencies and 5 from questionnaires in economic forums. In 2015, on the other hand, 79 indicators were addressed divided in 3 categories: 55 in raw data, 19 compound indicators and 5 research indicators (Cornell University et al., 2015; Fonseca & Lima, 2015).

WIPO, therefore, develops indicators that are the result of studies and researches that identify countries with active innovative intellectuals, but it also analyzed the micro and macroeconomic aspects that characterize the country regarding its economic-social development (*ibid*).

In 2015, there were six principles that made up the Global Innovation Index (GII) of countries. These indicators should reflect the growing recognition that innovation is something in which all countries can and must be engaged in order to consider it for the creation and deployment of innovation policies for the strategic development of the countries. The six innovation policy principles defined by the WIPO in the 2015 index are listed below:

- a. Principle 1: innovation policies should focus on maximizing innovation across all industries in all economic, correlated and supporting sectors so that the global production chain can develop technological innovation;
- b. Principle 2: innovation policies should support all types and stages of innovation, because one of the errors of national innovation policies is to define innovation strategies on a microeconomic level, only focusing on the production of technological products, while innovation should extend throughout the whole chain of production in order to rethink the mix of products that make up the high value-added sectors of production;
- c. Principle 3: to empower creativity and creative destruction to grow in innovation, developing countries need to enable the rupture of production for something innovative that will enable new players to enter economic sectors, especially those

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