Knowledge management practices and economic complexity in BRIC countries from 2001 to 2014

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Abstract: The aim of this paper is to investigate the main practices of knowledge management (KM) employed by BRIC countries (Brazil, Russia, India, and China) from 2001 to 2014 in relation to their economic complexity (EC). The research is constructed by employing The Atlas of Economic Complexity database and gathering data related to the BRIC countries’ EC ranking and the projected global growth throughout 2024. The country with the best outlook of ascension regarding EC is India, which has the largest number of KM practices. Russia, having the least amount of KM practices, has the worst EC projection.

Keywords: BRIC; knowledge management practices; economic complexity.


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1 Introduction

Due to consumers’ lack of knowledge, day-to-day life demands help from dentists, lawyers, plumbers, car mechanics, and other professionals. These demands enable the companies that retain the knowledge held by a few to reach many (Hausmann et al., 2013). Therefore, the creation of organisational knowledge is a process of amplifying the available knowledge of an individual and allocating it to the knowledge system of a company (Nonaka and Von Krogh, 2009).

Organisational knowledge can be acquired through employees, other companies, suppliers, customers, the company’s financial situation, its competition, market trends, technological development, and others (Darroch, 2003). To accumulate, transfer, and preserve this knowledge, it is necessary to incorporate it into a network of individuals and organisations that employ this knowledge in the productive process. Otherwise, the knowledge will disappear (Hausmann et al., 2013).

Due to the relevance of knowledge within organisations, they started to control it. Acquiring, creating, sharing, and retaining knowledge have become essential tools for competitiveness. Thus, the more knowledge created in the organisation, the higher its technological and innovation potential will be (Klafke et al., 2016; Holsapple and Joshi, 2000). This control of knowledge can be defined as knowledge management (KM), which according to Choy et al. (2006) is one of the main sources of competitive advantage, leading the company to organisational success. According to Heisig (2009), the objective of KM is the systematic acquisition and potential administration of knowledge within the organisation, with the purpose of enhancing performance. Klafke et al. (2016) and Zack et al. (2009) argued that effective KM is essential to every organisational management and strategic planning effort in terms of presenting better economic development and higher competitiveness than its competitors.

Due to the importance of knowledge for the purposes of organisational and economic competitiveness, methods to optimise and measure this knowledge have been created. KM practices, with the objective of enhancing a company’s efficacy and efficiency, are reported as an optimisation (Andreeva and Kianto, 2012). The practices can be regarded as innovations in the organisation, encompassing pronounced changes in the strategy and in the usual management practices (Marqués and Simón, 2006). The literature presents several KM practices, but each organisation has the responsibility of adapting them according to its reality (Klafke et al., 2016).

Economic complexity (EC), as a measuring method, measures the productive ability of each country through the knowledge employed in its products and its export capability.
Every product from an organisation or country has its origin in knowledge, and its incorporation into products requires that the involved parts understand the knowledge (Hausmann et al., 2013). Every product requires a considerable amount of non-commercial inputs, named capabilities. These capabilities determine whether the product can be produced (Hausmann and Hidalgo, 2010). For instance, it can be affirmed that toothpaste, which is composed of chemical products that promote dental hygiene, is a product that incorporates knowledge to that end. Thus, every product developed in the market incorporates knowledge of mechanical engineering, metallurgy, design, and others (Hausmann et al., 2013).

The complexity of each product or country is measured through the export competitiveness of its production systems (Tacchella et al., 2013). However, not all products manufactured in a country are exported, implying an inability to export those products, that is, an indication of low productivity or quality, or knowledge deficiency in product elaboration (Hausmann et al., 2013).

The indicators suggest that high-income countries export more complex products, which increase their income, whereas low-income countries export less complex products and therefore tend to decrease their income (Felipe et al., 2012; Tacchella et al., 2013). Countries that compete with the same products in the market share the same capabilities (Felipe et al., 2012; Hausmann et al., 2013).

Considering KM practices and EC, this study analyses BRIC countries (Brazil, Russia, India, and China), whose commercial representatives’ purpose is to propose measures to expand economic and commercial cooperation among the countries involved (Brasil. Ministério das Relações Exteriores, 2016).

BRIC countries have rather different characteristics in regard to their history, social reality, and cultural reality (Klafke et al., 2016). Their productive characteristics are as follows: China is a great manufacturer at a global level; India stands out for exporting qualified and technological manpower; Brazil leads in grain exports in Latin America, and Russia stands out in energy exports worldwide (Ardichvili et al., 2012; Yao and Liu, 2011).

This study aims to investigate the main KM practices employed by industries in relation to the EC of BRIC countries from 2001 to 2014.

Previous studies, such as Klafke et al. (2016), pointed out the main KM practices employed by the industries in BRIC countries in the time period from 2001 to 2010, encompassing the alliance’s starting year until the integration of South Africa, which was not included in the study. Ivanova et al. (2016) measured EC through the economic complexity index (ECI) and the number of patents owned by a country, developing equations to reach the patent complexity index (PatCI). Tacchella et al. (2013) addressed EC and proposed a new method of non-monetary measurement for product complexity. This new method provides important information about the countries’ economic and competition systems, and it can be employed as a tool for the analysis of financial markets.

This study’s originality is, firstly, in evidencing the interface between KM and EC and, secondly, in correlating KM and EC in BRIC countries. Within the theme proposed for study, no similar research studies or inferences are found in the literature.
2 Practices of knowledge management and complexity economics: a few definitions

2.1 The main practices of knowledge management applied in BRIC countries

Organisational KM practices are a set of management activities that result in the delivery of knowledge-based assets (Inkinen et al., 2015), aiming to enhance the company’s efficacy and efficiency (Andreeva and Kianto, 2012).

KM practices are related to organisational innovation that involves relevant changes to strategies and traditional management practices (Marqués and Simón, 2006). Scarce studies have analysed the impact of implementing KM practices on a company’s innovation performance (Inkinen et al., 2015).

The literature presents different approaches to KM practices. This work employs the approach of Klafke et al. (2016), which encompasses the KM practices employed in BRIC countries, as shown in Table 1.

<table>
<thead>
<tr>
<th>Main KM practices mentioned in this study</th>
<th>Brazil</th>
<th>Russia</th>
<th>India</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational learning and best practices</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Supplier relationship management</td>
<td>X</td>
<td></td>
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<tr>
<td>Management skills</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KM through occidental companies benchmarking or external training</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hiring the scientifically trained students leaving the best universities, bringing what is the newest in the market</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Motivation may inspire the managers to pursue international management system – ISOS application</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Tacit knowledge embedded in the company’s culture, structure and leadership as a complement to the explicit knowledge embedded in the company’s technology and documents</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Knowledge portal to learn about the details of problems encountered and the solutions found by other plants</td>
<td></td>
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<tr>
<td>Knowledge circles where employees are encouraged to give presentations on their topics of interest</td>
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<td>X</td>
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<tr>
<td>Customer-focused knowledge; knowledge alliance</td>
<td>X</td>
<td></td>
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<tr>
<td>Manuals/record of proceedings</td>
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<tr>
<td>Learning from reviews/internal learning</td>
<td>X</td>
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</tbody>
</table>

Source: Klafke et al. (2016)

Organisational learning is a practice present in all of the BRIC countries (Klafke et al., 2016). Organisational learning is a transformation in the company caused by acquired knowledge (Argote and Miron-Spektor, 2011), through the development of new learning and perceptions resulting from the experience of everyone involved in the organisation (Huber, 1991; Slater and Narver, 1995). This practice results in competitive advantage
and the enhancement of organisational performance (Brockmand and Morgan, 2003; Dodgson, 1993; Gnyawali et al., 1997).

Best practices emerge from the identification and development of management practices that have obtained positive results (Acosta-Prado and Valencia, 2015). According to Patton (2001), there are many ways for a company to achieve a goal, but some paths may be easier or more expensive.

Supplier management suggests a closer relationship between the parts, with the objective of enhancing information, sharing responsibilities, and transferring knowledge (Klafke et al., 2016). This is a long-term, high-commitment relationship. Both parts are interested in establishing collaboration, reducing costs, and increasing benefits for the involved parts at the highest degree (Giannakis et al., 2012). Supplier management has become a strategy for the survival of companies (Tseng, 2014).

The practice of competence management has the purpose of managing the abilities within organisations (Cabral and Seminotti, 2007), including the outline of attributions, abilities, and possible solutions to overcome deficiencies (Batista et al., 2005).

External sources, such as benchmarking, contribute to the development of new ideas and approaches, and they can be instituted and commercialised with the purpose of generating innovations (Björkman et al., 2007). Benchmarking can also be utilised as a comparative tool for organisational compositions, management practices, and business strategies (Drew, 1997).

According to Melo and Filho (2015), the knowledge transfer from universities and technological and scientific research centres to the business sector is crucial for a country’s economic development. The necessity of aggregating value to processes and products is deeply related to universities’ capabilities of transforming knowledge into technological development.

International management standards also integrate KM practices, for instance, the adoption of practices such as IS0s, standardisation of procedures, and reduction of documentation and rework, which yield benefits for companies, such as more efficient internal communication, rapidness in terms of response to customers, operational gains, and competitiveness gains (Khanna et al., 2010).

Knowledge can be divided into explicit knowledge and tacit knowledge (Nonaka, 1994; Gupta et al., 2000; Singh, 2008). Both are independent and have the purpose of achieving success for the company. However, explicit knowledge has been increasingly utilised as a management tool (Singh, 2008). Explicit knowledge is easier to transfer as concrete data or coded procedures through individuals. Tacit knowledge, however, is the knowledge that is subconsciously understood or applied through direct and experience-based actions that can be shared through conversations and other methods (Pan and Scarborough, 1999). These types of knowledge can be converted into four different forms: socialisation, externalisation, combination, and internalisation (Nonaka, 1994).

KM also aids in the solution of problems found in the organisation, through identification, selection, organisation, disclosure, reuse, and transfer of the relevant information (Singh et al., 2006). Regarding the knowledge circle among the employees, Singh et al. (2006) argued that organisations have learned to diminish losses with tacit knowledge by encouraging forums of discussion, knowledge portals, and practical communities.

According to Puri (2007), the KM process is vital for the construction of alliances between the involved parts, particularly standing out among the community and the customers. According to Fidel et al. (2015), customers contribute to KM through the
adaptation of products and the detection of new market opportunities, as they maintain
their loyalty to a firm.

Records of proceedings refer to every process within an organisation that must be
described and documented to standardise them and avoid rework. Therefore,
documenting the knowledge embedded in the process optimises the employees’
performance and consequently decreases the production time (Tong and Mitra, 2009).

Finally, internal learning is essential for organisations to function because it optimises
KM activities (Chou et al., 2005) and is reflected in the cooperation and the results that
the company is able to achieve (Möller and Svahn, 2004). The company also needs to
share internal knowledge with all the sectors that face similar challenges (Bartlett et al.,
1995) to increase the chances of success.

Knowledge is inserted in organisations throughout the process of KM practices; the
more the practices are applied, the better the optimisation of its processes will be. KM
practices are entirely connected to knowledge, as well as to EC, which will be addressed
in the next section.

2.2 Economic complexity and countries’ economic progression

For EC to exist, the individuals must, at the very least, be able to read, write, and handle
symbols, such as mathematical functions – that is to say, they should have an education.
In addition, many abilities or experiences are required according to the production needs
(Hausmann et al., 2013). These demands are necessary because the complexity of a
product is determined by the capabilities necessary to develop it. The more capabilities
that a product requires for its production, the more complex it will be (Felipe et al., 2012;
Hausmann et al., 2013). Products that are considered more complex include chemicals
and sophisticated machines, and the least complex products in the world are raw
materials or simple agricultural products (The Atlas of Economic Complexity, 2016).

Complex economies are those that aggregate relevant knowledge through a network
of people and generate a variety of products with strong knowledge aggregation.
On the other hand, simpler economies have less productive knowledge, which results
in simplicity and less product diversification, which demands fewer interaction circles
(Hausmann et al., 2013).

A country’s EC is measured through the complexity of its exports (The Atlas of
Economic Complexity, 2016), through the number of locally available resources (Felipe
et al., 2012; Hausmann et al., 2013), and through the complexity of its interaction
network. In summary, the amount of productive knowledge that the society mobilises is
reflected in a country’s productivity. The complexity is estimated by observing the
product diversification in a country’s production (Hausmann et al., 2013).

The search for product diversification and exports is not definitive, but such concern
must start from a wide governmental analysis regarding industrial activity (Ivanova et al.,
2016). In this aspect, the government must foster knowledge sharing and cooperation
between organisations to render the products more complex (Hausmann et al., 2013).

More diversified exports (Mariani et al., 2015), infrastructure, human and physical
capital, and institutions (Hidalgo et al., 2007) are characteristics of rich countries,
whereas poor countries have more intense non-qualified work and rural work (Hidalgo et
al., 2007), displaying low product diversification (Felipe et al., 2012; Ivanova et al.,
2016) and presenting difficulties in the commercialisation of their products in the external
market (Felipe et al., 2012). Due to their low complexity, these products are exported by
countless countries (Mariani et al., 2015). In the degree that poor countries develop, they diversify their production, export more, and consequently increase their income (Ivanova et al., 2016).

According to Ferrarini and Scaramozzino (2016), a country’s capability of developing and expanding its complex production requires access to a set of abilities or capabilities that are adaptable to technological change. Hausmann et al. (2013) affirmed that the only way for a country or society to grow in terms of EC is through promoting the interaction of individuals with distinct knowledge. Hidalgo and Hausmann (2009) noted that the development of new products requires the combination of capabilities not yet explored with the previously available capabilities.

Hidalgo and Hausmann (2009) proposed an analogy with Lego bricks, in which a product is a Lego brick and a country is a Lego bucket. The countries will produce products out of their bricks, that is, the ones for which they have enough production capability, in the same way, a child will produce a Lego model only if the bucket contains all the required bricks. Thus, each country’s EC results from the diversity and exclusivity of their productive parts, or the bricks that are inside its Lego bucket.

Every country has its own particularities, diverging in the quantity and nature of resources that impact its products (Hausmann and Hidalgo, 2010). Products that require more resources will be available to fewer countries (less ubiquity). Likewise, product manufacturing that requires more capabilities will be accessible to fewer countries (Hausmann and Hidalgo, 2010; Hausmann et al., 2013). Therefore, a country can only produce the products for which it has enough capabilities (Hausmann and Hidalgo, 2010). For instance, medical imaging equipment is manufactured in a few countries (e.g., the USA and Germany) that also export a wide diversity of products. From that, it is possible to conclude that this type of equipment is highly complex because only a few countries have the necessary knowledge to develop it. Countries do not manufacture all the products that they need—they manufacture the ones that they are able to through employing the knowledge of individuals and organisations (Hausmann et al., 2013). Countries that are considered complex do not tend to export only high-complexity products, but rather a variety of products (The Atlas of Economic Complexity, 2016).

Each country tends to manufacture products that are similar in their production. Assuming, for instance, that a country has adequate conditions to explore apple cultivation, it will also be able to explore pear cultivation because it certainly has the structure, climate conditions, and the necessary technology for that endeavour. The proximity between the products makes the exploration easier (Hidalgo et al., 2007). For that reason, industries tend to establish themselves in regions containing developed technology, which in turn makes it harder to attract industries to regions that are technologically distant from the activities (Neffke et al., 2011).

The necessity of expanding knowledge for the development of diverse productive lines must also be considered (Hidalgo et al., 2007; Hausmann et al., 2013). Despite the facility provided by the proximity of production, it is advantageous to be close to the development of a complex product in relation to a simple product (Hausmann et al., 2013). This facility has an impact on the country’s productivity, directly influencing its productive capability. Therefore, the difference in a country’s income can be explained by EC (Hidalgo and Hausmann, 2009; Felipe et al., 2012; Hausmann et al., 2013). In addition to affecting the income, EC stimulates a country’s future growth (Hausmann et al., 2013).
The economy grows to the degree that products progress, exports increase (Hidalgo et al., 2007), and production diversity increases (Cadot et al., 2013). Therefore, complex production tends to develop a country more rapidly (Felipe et al., 2012), performing a decisive role in economic development (Ferrarini and Scaramozzino, 2016). Higher EC leads to higher growth in a country’s economy (Ferrarini and Scaramozzino, 2016). EC is not easy to achieve, but the countries that are able to accomplish it tend to benefit from positive results (Hausmann et al., 2013).

3 Methodology

The research’s text corpus was constructed through The Atlas of Economic Complexity database, as it is an interactive tool that allows the viewing of economic data from 200 countries independently. This tool is available online for free on The Atlas of Economic Complexity website.

The study is centred on the countries that are members of BRIC, in the period from 2001 to 2014. The selected period comprises the beginning of the alliance between the member countries of BRIC. South Africa was not included because its admission to the group occurred in 2011, and that would compromise the analysis of the evolution of the group’s characteristics. Data related to the following variables were gathered:

- EC ranking of each BRIC country
- Projected growth in EC through 2024.

The EC ranking is determined by the ECI, a measurement of economic development that classifies the exports of a country by their diversity and complexity. The ECI considers diversity, that is, a country’s capability of exporting different products, and ubiquity, which involves ascertaining the number of countries that are able to export these products. From that information, the index combines the metrics of diversity and ubiquity, utilising one factor to correct the other. This indicator can be found on the database website under the tab ‘rankings’, organised by year. Each year, a new list of country rankings is presented (The Atlas of Economic Complexity, 2016).

The global growth projection in EC through 2024 is calculated from the current level of EC, product localisation in terms of proximity, and gross national product (GNP). With these data, it is possible to project the economic situation of any country for five to ten years. The projection can be found on the database website under the tab ‘Country Growth Projections’ (The Atlas of Economic Complexity, 2016).

The variables employed by this study were not calculated, but rather originated from The Atlas of Economic Complexity database. The gathered data were transcribed to Excel® spreadsheets for better viewing and treatment. Descriptive statistics were employed to evaluate the study’s variables. The research was realised in July of 2016.

4 Results and discussion

EC is measured by the ECI, which classifies how diversified and complex the exports are each country (The Atlas of Economic Complexity, 2016). The atlas ranks every country...
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Based on their ECI, and through that information, the EC ranking of each BRIC country was obtained. Figure 1 displays the BRIC countries’ rankings over the years.

**Figure 1**  EC rankings (see online version for colours)

Since it is a ranking, the higher the country’s position, the better its condition (closer to the first place). China was the country that stood out the most, climbing 19 positions and becoming the highest-ranking BRIC country. The other countries, however, have lost positions in the ranking.

The projection of EC growth of each BRIC country through 2024 is displayed in Figure 2.

**Figure 2**  Projection of EC growth through 2024 (see online version for colours)
Among the 124 countries considered by the atlas, India is the country with the biggest perspective of growth, leading the ranking with a growth projection of 6.98%. China is in the 27th position, with a projected growth of 4.28%. Subsequently, Brazil appears in the 49th position, with a projected growth of 3.34%. Finally, Russia appears in the 98th position, with a projected growth of only 1.96%.

The data show that Brazil had its best performance on the ECI in 2001, when it was in the 36th position in the ranking. However, its index oscillated, arriving at the 58th place in 2013. In 2014, Brazil gained a few positions, reaching 54th place. Considering the period from 2001 to 2014, Brazil lost 18 positions, which means a loss in its products’ complexity.

Despite the loss of complexity, according to Klafke et al. (2016), Brazil has a larger number of applied KM practices among BRIC countries, surpassed only by India. Brazil utilises seven practices, and among BRIC countries, it is the only one to employ two of the practices, supplier relationship management and management skills. The main practices adopted by the country are linked to the development of human capital and intellectual capital, with an emphasis on the relevance of knowledge development and the ability to stimulate skills and competencies.

Despite Brazil’s loss in complexity, the relatively high number of KM practices has contributed to the effective propagation of knowledge in the country’s production, which is projected to have a growth rate of 3.34% in EC through 2024.

According to Cirera et al. (2015), Brazil does not lack elements for knowledge creation, but its diversification does not meet expectations. To solve that, the country must support product diversification, including relevant knowledge, investments in research and development (R&D), and investments in products that attract other countries. According to Hummels and Klenow (2005), compared with the rest of Latin America, Brazil is one of the most diversified economies. However, the country is behind other emerging economies, such as China, in terms of export diversification.

In less developed countries such as Brazil, working with existing natural and technological resources is not a determining factor for export performance. Instead, the effort to create a new and unique technology strongly impacts a country’s export performance (Cirera et al., 2015).

China was the country with the best performance on the ECI. In 2001, it was placed in the 38th position in the ranking, arriving at the 39th position in 2005. In 2009, it started improving in the ranking, achieving its best position in 2014 (19th position). That means that its EC greatly improved over the years as it gained 19 positions in the ranking.

China’s evolution corresponds to a developing country that invests in a wide array of technologies that perform different strategic purposes in organisations (Fisher-Vanden and Jefferson, 2008). According to Gackstatter et al. (2014), China exports the highest technology among BRIC countries, due to its capabilities in innovation, competitiveness, R&D investments, patents, number of researchers, and scientific publication.

China has developed significantly over the last three decades. Since 1980, its GNP has grown more than 9% and surpassed Japan to become the second largest economy in the world (Jenkins, 2015), behind only the USA (Jenkins, 2015; Melo and Filho, 2015). The growth of Chinese exports corresponds to approximately 70% of the growth of global exports. To export more, the country is investing in capital, work, natural resources, and cheap resources (Bingzhan, 2011).

The growth of Chinese exports corresponds to a growth in the number of products exported. Both the Chinese government and Chinese companies need to change the
direction of their exports, and should be focusing on product quality over quantity. The current type of growth is damaging to sustainable economic growth because it compromises natural resources, for instance, by causing environmental pollution. Solving how to increase export diversification is an essential factor for the future of China’s growth (Bingzhan, 2011).

Although China is the highest-ranking country in EC among BRIC countries, Klafke et al. (2016) affirmed that China employs fewer KM practices, with only three practices. It is the only country to adopt the practice manuals/record of proceedings. Its practices aim to focus on the local culture to evolve the knowledge of its collaborators regarding management practices.

Despite low effectiveness in KM practices, according to Zhao et al. (2012), China was at the heart of KM’s onset in 2000, as the country focused on developing human and financial resources. However, only 20% of Chinese companies have knowledge stored and documented, which is a key factor for success in economic knowledge.

In spite of the small number of KM practices adopted, China’s growth projection through 2024 is inferior only to India’s, which has the most KM practices adopted among BRIC countries.

India’s complexity index was the lowest among BRIC countries from 2001 to 2007 and in 2009 and 2011. Its lowest position occurred in 2010, when it was placed 57th in the ranking. However, considering the entire period studied, India gained one position in the ranking, closing 2014 in the 45th position; that is, it had the second highest index among BRIC countries, behind only China.

Even though India has yet to stand out in EC, according to Klafke et al. (2016), it has adopted the most KM practices compared with the other BRIC countries. From the total of eight practices, four are only employed by India: hiring scientifically trained students leaving the best universities, bringing the newest information to the market, motivating to inspire managers to pursue an international management system (an ISOS application), knowledge portal to learn about the details of problems encountered and the solutions found by other plants, and knowledge circles where employees are encouraged to give presentations on their topics of interest. Judging by its KM practices, India seeks collaborators with skills and competencies to manage organisational knowledge.

Even though it was challenging for India not to oscillate significantly in the EC ranking until 2014, the country will be able to achieve a better position in the ranking by 2024 due to its high number of KM practices. India’s economy is expected to grow the most through 2024. Allied with its KM practices, its EC will increase.

According to Muralidhar (2013), India’s economy is currently the fastest growing among BRIC countries. It is placed among the 20 countries with the most export products, and the tendency is for its economy to surpass China’s. This projection is also due to the economic reforms that took place in India in 1991 (Malik and Velan, 2016; Nagaraj, 2014; Debnath et al., 2014), which led India toward more exports. Exports corresponded to only 3.5% of India’s GNP in 1970, 5% in 1980, and 17% in 2012. The same growth happened with imports, which went from 3.6% of its GNP in 1971 to 28.5% by the end of 2011 (Debnath et al., 2014), making India’s economy one of the fastest growing in the world (Muralidhar, 2013; Malik and Velan, 2016).

Russia had the highest ECI among BRIC countries from 2001 to 2006, with its highest point in 2002 (27th position in the ranking). However, from 2007 on, Russia lost positions in terms of complexity, arriving at the 54th position in 2013 and 50th position in 2014.
According to Klafke et al. (2016), Russia has adopted only two KM practices, the smallest number of strategies to retain knowledge among BRIC countries. Its practices aim to stimulate competitiveness, individualism, and professional qualification. Russia employs KM through personnel training.

With its few KM practices, Russia has the worst prospects for growth in EC, with an increase of only 1.96%. According to Peltola (2008), Russia has the least favourable innovation index among BRIC countries, a result of political turbulence. However, it has scientific elites at its service, despite having the lowest increase in the number of researchers among the countries analysed and despite a decreasing number of scientific publications. Russia’s high-tech exports are similar to Brazil’s, even though Russia has three times as many researchers. Therefore, it has become evident that Russia will have difficulties in expanding its levels of commerce.

Dreger et al. (2016) pointed out that the Russian economy does not present developed industrial diversification. Its main exports on the global level are centred on oil and gas, as Russia is deeply dependent on natural resource exports.

Although not all of the countries have great prospects, in the view of Doctor (2009) and Joseph et al. (2010), China, India, and Brazil tend to remain in ascension, as they are developing strong technology sectors. According to Gackstatter et al. (2014), these countries will soon achieve technology sectors that could be considered state-of-the-art. Biggemann and Fam (2011) argued that BRIC countries produce a considerable portion of the goods and services consumed worldwide and have the best economic performance levels. Çakır and Kabundi (2013) observed that by 2050, due to rapid development, BRIC countries will have surpassed the development level of most current developed countries. Finally, Muralidhar (2013) classified BRIC countries as the future engines of the global economy.

The alliance between the countries provides its members with the opportunity to start making economic arrangements, according to Çakır and Kabundi (2013), who found that the country with the most adopted KM practices, India, has the most optimistic outlook for 2024. On the other hand, Russia, employing the least KM practices, has the most pessimistic projection. Along these lines, Table 2 was elaborated, summarising this study’s main data.

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of KM practices</th>
<th>EC Ranking 2001</th>
<th>EC Ranking 2014</th>
<th>EC Ranking projection 2024</th>
<th>EC growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>7</td>
<td>36</td>
<td>54</td>
<td>49</td>
<td>3.34</td>
</tr>
<tr>
<td>China</td>
<td>3</td>
<td>38</td>
<td>19</td>
<td>27</td>
<td>4.28</td>
</tr>
<tr>
<td>India</td>
<td>8</td>
<td>44</td>
<td>45</td>
<td>1</td>
<td>6.98</td>
</tr>
<tr>
<td>Russia</td>
<td>2</td>
<td>28</td>
<td>50</td>
<td>98</td>
<td>1.96</td>
</tr>
</tbody>
</table>

Source: The authors (2016)

Finally, knowledge is a determinant for the development and growth of an organisation and, consequently, of a country. It is connected to the KM practices adopted by companies as a form of process optimisation and in the economy with the development of complex products. Therefore, this study verified that the countries with the most adopted
KM practices have the best prospects for growth in EC, which tends to ensure a more promising economic future.

5 Conclusion

The purpose of this work was to investigate the main KM practices employed by industries in BRIC countries and their EC from 2001 to 2014. The objective was accomplished through reviewing the literature regarding KM practices and through analysing each country’s ranking in terms of EC and projected growth in EC through 2024.

In conclusion, the study revealed that the country with the best chance of ascension in EC is India, which has the most adopted KM practices. However, Brazil, which employs seven KM practices, projects less growth in EC than China, which utilises only three KM practices. Russia, having the smallest number of KM practices, also has the worst growth projection in EC through 2024. Therefore, the country with the most KM practices has the best prospect of ascension in EC, and the country with the fewest KM practices has the worst outlook in terms of growth in EC. This comparison can also be utilised as an indicator for BRIC countries within the scope of KM and EC.

This work recognises the following limitations: being restricted to countries that were members of BRIC up until 2010, analysing only the time period after the start of the alliance between the countries, and not studying their previous evolution.

As a suggestion for future work, it would be possible to widen the time period for analysis to compare the evolution before and after the alliance between BRICS countries, include South Africa in the study (as a member country of BRICS), and compare BRICS countries with countries of higher EC.

References


Knowledge management practices and economic complexity


Note

1In order to formulate the ranking, 123 countries were evaluated between 2001 and 2004. From 2005 on, 124 countries were evaluated.