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Dynamic capabilities for cooperation in Brazilian multinational and factors determining its management

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ABSTRACT

In the context of emerging companies' growth, current challenges depend on the local generation of product and process innovations, as well as dynamic capability to generate innovative solutions cooperatively and new globe business models. The objective of this study is to analyse the determining managerial factors for the dynamic capability of cooperation in Brazilian multinationals (BMNs). A survey was conducted with a sample of 60 BMNs, and a structured questionnaire and statistical tests with factorial analysis and Cronbach's alpha were used. The aggregate analysis of the results indicates that BMNs are going through a transitional process between the operational capability of cooperation and the capability for dynamic cooperation, which are relevant to the continuous adaptation of already-established cooperative management routines and the evaluation and incorporation of the relational capability of management practices that consider systemic flows, open innovation and integrate strategic intentionality into cooperative processes.

1. INTRODUCTION

Markets have become increasingly dynamic nowadays and new forms of competition have arisen. Companies seek adaption and are explore changes in their business environments, looking for opportunities to create new technological and strategic cycles (TEECE, 2007). Living and exploring changes are inherent developments to business activity; however, to survive and thrive under changing conditions, companies must develop "dynamic capabilities" to create, extend and modify the ways in which they survive (HELFAT *et al*, 2007).

To develop "dynamic capabilities", especially those related to innovation, it is necessary to understand its dispersion (ANDRADE, 2010). This implies that a company alone does not have all the skills they need - on the contrary, they are increasingly scattered in internal and external contexts. These capabilities are not developed in isolation and often depend on interactive innovation processes or simple exchanges (CHESBROUGH, 2008).

Dynamic capacity to innovate and manage attributes of dispersion and interaction are therefore essential factors to survival and success of a company in the 21st century. In the past, this was only a necessity for a select group of established large companies in developed countries, but today it is also a priority for many emerging companies originating in developing countries (HITT, 2008).

It should be noted that in the context of growth and competitiveness of emerging companies, current challenges depend not only on the local generation of product and process innovations, but also involve the dynamic capability to generate innovative solutions and new business models on a global scale, which emerge from the competitive challenge of internationalisation (DOZ *et al*, 2001). To mobilise

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and share dispersed knowledge globally, emerging multinationals can innovate more effectively and with superior results than rivals who remain in their country of origin. It is at this point that a company's value is determined by the creation, expansion and modification of the ways it stays innovative and competitive in the local and global market, as well as where cooperation with external sources starts to take a prominent role (LEYDESDORFF; MEYER, 2006).

Considering these reflections, it is necessary to articulate the concept of cooperability in the context of emerging multinationals, whose definition can be summarised: cooperability is the intentional ability to dynamically develop cooperative projects in which partners create and/or share technological and innovative resources in local and/or global contexts to generate sustainable competitive advantages that are distinctive and difficult to imitate. In addition to the conceptual definition, it is worth noting that cooperability is determined by the intentional and systematic capability of organisations to create, modify and extend their basic technological and innovative capabilities through partnerships. The original definition of dynamic capabilities refers to a firm's capability to integrate, build and reconfigure internal and external competencies in an environment of rapid change. In this definition, organisational skills denote managerial and organisational processes or current models of technological governance (TEECE, PISANO, SHUEN, 1997). The work of Eisenhardt and Martin (2000) has enhanced and expanded the original definition of dynamic capabilities, setting them as business processes that use resources to adjust and create market changes. In this concept, dynamic capabilities take the form of organisational processes, such as product development, partnership and acquisition capabilities, resource allocation routines and knowledge transfer.

Thus, it appears that the approach of dynamic capabilities is especially relevant to cooperability. The ability to accumulate and combine new internal and external resources, especially if these interactions contribute to the construction of distinctive competencies in areas such as R&D, new product development and technological innovation, among others, is more important than the current inventory of resources. The ability to cooperate, defined here as cooperability, thus assumes a strategic role, because it is a potential source of knowledge, innovation and technology. However, to maintain and leverage this capability, it is necessary to understand and manage open innovation models that have various actors (with varying senses of urgency), who are separated by considerable geographical and cultural distances. They must be able to find dynamic and unique ways to share knowledge, competencies and technology and generate innovations that are difficult and/or unfeasible to generate individually. It is therefore necessary to articulate relational capabilities (LORENZONI; LIPPARINI, 1999).

The development of relational capabilities is only possible through the establishment of partnerships with a focus on learning and achievement for future returns. To be able to efficiently orchestrate a network of partners, a company must accumulate practical experience in conducting partnerships, being able then to develop greater flexibility in terms of exchange (access to and transfer of knowledge and competencies), choose the most appropriate governance structure for each partnership and extract value from internalised knowledge, among other competencies (FERRO, 2010).

Adopting, therefore, the concept of cooperability (i.e., relational capabilities), the challenges of emerging multinationals are more complex as these companies must develop and systematise strategies, structures and management practices for the search, selection, implementation and management of local and global cooperative relations. Moreover, the concept of cooperability predicts that cooperation, particularly focused on innovation and technology, can be developed with various external partners. This requires multinationals to develop organisational skills to cope and manage relationships with different sources of innovation.

Despite the relevance of cooperability for emerging multinationals' competitiveness and the strengthening of national economies in developing innovation systems, the fact is that the pure concept of cooperation with external sources of technology is not new, with its barriers and facilitators already established in the literature. However, what is being analysed again are the managerial factors of cooperability.

In this context, the objective of this study is to analyse the determining managerial factors for the dynamic capability of cooperation in Brazilian multinationals. This research is related to BMNs (the parent company as the research locus) that are

defined here as companies (1) of national capital (greater than or equal to 50% of the controlling capital), (2) with productive or commercial units abroad and (3) maintain international R&D units or have cooperative projects with foreign scientific and technological institutions (ICTs).

2. DYNAMIC CAPABILITIES, OPEN INNOVATION AND RELATIONAL CAPABILITIES

Dynamic capability includes the ability with which one identifies the need or opportunity for change, formulates a response to such a need or opportunity and implements a course of action (EISENHARDT; MARTIN, 2000; WINTER, 2003; HELFAT et al, 2007). In this context, Helfat et al (2007) defines "dynamic capability" as the ability of an organisation to purposely create, enlarge and modify its resource base. The "resource base" of an organisation includes tangible, intangible and human assets (or resources), as well as the capabilities that the organisation owns, controls and has access to through partnerships.

Thus, it appears that the approach of dynamic capabilities is especially relevant to innovation and cooperation, where the ability to accumulate and combine new internal and external resources is more important than the current resource base, especially if these interactions contribute to the construction of distinctive competencies in areas such as R&D and new business models, products and processes, among others (CHESBROUGH et al, 2008).

Chiaroni et al (2010) argue that the adoption of an open innovation strategy demands new systematised actions and competencies in collaborative activities via processes and routines within a company. Ferro (2010) also emphasises that the success of an open innovation strategy is based on the development of certain competencies and resources. This development process involves the identification of the main sources of innovation for the company, which are able to bring sustainable competitive advantages. Then, the company must devote itself to understanding the features and functional dynamics of the activities developed by these sources and outline the selection criteria of these different sources. They also need to set guidelines for their attraction as well as for the establishment and conduct of the partnership relations with each type of source. Furthermore, efforts are needed to define processes, evaluation metrics and the internalisation of learning that result from these partnerships. After this, it is possible to say that a company has developed its relational capabilities in a way that enables the establishment of routines of interaction with one another, and, if necessary, create tools to facilitate access to each of them.

According to Wassmer (2010), companies learn to manage individual partnerships, and with the accumulation of experience, develop a relational capability to identify partners, initiate partnerships, manage them, promote their restructuring and closure, and generate tangible and intangible collaborative benefits (HEIMERIKS et al, 2007). In real terms, relational capabilities are involved in the deliberate establishment of interactive networks with the intention of building and refining a firm's resource base (LORENZONI; LIPPARINI, 1999). These capabilities involve technical and interpersonal competencies necessary for the efficient management of the partnership process as a whole, from the identification of partnership opportunities (including the definition and coding of procedures for its implementation and conduct), to reviewing and internalising results in a continuous learning process, which are (preferably) formalised in a role/area of the enterprise (FERRO, 2010).

The development of relational capabilities is only possible through the establishment of partnerships with a focus on learning and achieving future returns. This means that, to be able to efficiently orchestrate a network of partners, the company must accumulate practical experience in conducting partnerships (being able then to develop greater flexibility in terms of exchanging knowledge and competencies), choose the most appropriate governance structure for each partnership and extract value from internalised knowledge, among other competencies (LORENZONI; LIPPARINI, 1999; FERRO, 2010).

It is also highlighted that relational capacities can also be affected by managerial factors, thus requiring the development of a governance structure based on management factors and practices essential to cooperation, such as :

- The development of trust and mutual understanding to generate reliable and timely responses; promote proactivity and sensitivity to needs; sustain contact and seriousness towards the opinions, ideas and circumstances that involve partners; and facilitate the transfer of knowledge between

actors (KIM; SONG, 2007; SCHREINER; KALE; CORSTEN, 2009; TOMLINSON, 2010).

- The socialisation of cooperation through the development of open information systems, workshops, visits and joint discussions to build relational capital that is complemented by social rules, appropriate reward mechanisms, reliability and commitment (TOMLINSON, 2010).
- The selection of partners focuses on the needs and opportunities of the parties involved (GASSMANN; ENKEL, CHESBROUGH, 2010; SCHILKE; GOERZEN, 2010).
- Communication in the partnerships, which involves formal and informal sharing of information and knowledge between partners in a credible, timely, accurate and complete way (SCHREINER *et al*, 2009).
- The development of governance mechanisms, such as contractual arrangements, specialised coordination and formal evaluation procedures (CHIARONI; CHIESA, FRATTINI, 2011; LEE, 2011).
- Inter-organisational coordination of cooperative activities to identify and build consensus on the tasks and requirements of partnerships, which considers the interdependence of partners, the specification of the working procedures, the responsibility of each participant to perform tasks and the possible of adaptation in changing circumstances (SCHILKE; GOERZEN, 2010; SCHREINER *et al*, 2009).
- Coordinating the portfolio of partnerships focused on innovation (SCHILKE; GOERZEN, 2010; WASSMER, 2010) to leverage interdependence between individual partners of a company; avoid duplicating actions (GOERZEN, 2007; KOKA; PRESCOTT, 2008); create a base for a more substantial experience in order to accelerate learning on how to design and manage partnerships focused on innovation; simultaneously access a wide range of resources from different partners as an effective means of improving the stock of resources and capabilities (BRUNEEL; ESTE, SALTER, 2010; HOFFMANN, 2007) and to expand opportunities for the formation of additional partnerships (GOERZEN, 2007; RAISCH; BIRKINSHAW, 2008; YAMAKAWA; YANG, JOHN, 2011).
- Evaluation of the performance of partnerships involving individual partnerships, the portfolio and the company's cooperation strategies (ASAKAWA; NAKAMURA, SAWADA, 2010; HOFFMANN, 2007).
- Finally, we stress that relational capacities generate value by (a) creating assets that are specific to the partnership; (b) mutually accessing complementary resources; (c) having the existence of a substantial flow of knowledge exchange between partners with established routines; and (d) having effective governance mechanisms to limit transaction costs between the companies involved. These actions are systematically developed by companies through a careful selection of partners, and by investing and deliberating strategies of cooperation with external sources (HELFAT et al, 2007).

3. RESEARCH METHODOLOGY

The research was quantitative (LIMA, 2008) as we sought to identify the variables from "Managerial Factors" that can determine cooperation capabilities, including administrative practices that are implemented during phases of planning and implementation of cooperative projects (Table 1).

A survey was used, which according to Kerlinger (1980), seeks to determine the incidence and distribution of a population's characteristics. This is done by obtaining and studying the characteristics and opinions of people in a sample, which is presumably representative of the population.

The research's universe was represented by 166 industrial, commercial and service providing BMNs with production or commercial units abroad, which were identified through secondary sources, such as the GINEBRA Project, the Dom Cabral Foundation, the Economic Value and SOBEET. In this universe, there was stratification to meet the scope of the research and to identify the BMNs that hold international R&D units or had developed cooperative projects with foreign ICTs in the last three years. To accomplish this stratification, telephone contacts of those responsible for R&D or

Tab. 1
Description of variables for the "Management Factors".

VARIABLES	OPERATIONAL DESCRIPTION	THEORETICAL BASIS
Adopted technological empowerment strategies	Investment in companies with promising technologies or with the potential to generate them; Technological exchange of know-how without licensing novel technologies (patents), where two or more companies swap technologies to achieve strategic objectives, without necessarily having a cross-licensing agreement type; Licensing of patents and intellectual property to other companies; Creation of a new company (a spin-off or joint venture) to share skills; Technological benchmarking of competitors/suppliers; Acquisitions for the optimisation of efforts in R&D and innovation, especially start-ups; Purchasing of external technologies (patented or not); Mergers between companies to optimise R&D and innovation efforts; Funding research centres to gain flexibility in R&D and add external ideas and efforts to research activities; Creation in the parent company of an area or unit dedicated to the development of R&D and other innovation activities; Empowerment and continuous training of R&D team; Hiring specialised consultants for R&D and innovation; Development of an open innovation pilot project to define and later administrate procedures and routines; Establishing solid partnerships with international ICTs; Realisation of cooperative projects with defined scope, focused on research activities prior to the stages of creation and development of new products and technologies; Carrying out cooperative short-term projects focused on the development of a technology, a product line or a specific products that already exist; Realisation of cooperative projects with an open scope that can set up a network to investigate a problem or common technological challenge and generate results that can serve as a base to support future research and technological developments.	Eisenhardt e Martin (2000), Winter (2003), Helfat et al (2007), Chesbrough et al (2008), Chiaroni et al (2010) and Ferro (2010).
The purpose of cooperation for innovation	Sharing technological and innovative competencies; Exchange of researchers; Technology acquisition; Technical services; Creation of new technological and innovative competencies; Generate new scientific and technological trends; Generation of process innovations; Generation of product innovations; Creation of new business.	Lorenzoni e Lipparini (1999), Kim and Song (2007), Heimeriks et al (2007), Schreiner, Kale and Corsten (2009), Wassmer (2010) and Tomlinson (2010).
The adoption of criteria for the decision to cooperate	Assesses the scientific and technological skills of potential partners; Maps the knowledge and technology that the company needs to find from external sources to supplement or build R&D and innovation competencies; Evaluates the complementarity between the new partnership and the portfolio of established partnerships; Prospects national R&D institutions that are references in the areas of company operations; Prospects international R&D institutions that are references in the areas of the company's operations; Assessing the risk of developing projects in cooperation with external technology sources; Uses indications of the current collaborators and technology partners to select new partners; Evaluates the history of partnerships that have already been established with external technology sources; Considers the geographical proximity between the company and potential partners.	Tomlinson (2010), Gassmann, Enkel and Chesbrough (2010) and Schilke and Goerzen (2010).
The action planning	Defines the scope of the partnership individually; Establishes the work methodology individually; Sets, individually, a physical and financial work schedule; Sets short, medium and long-term goals individually; Establishes, individually, roles and responsibilities in the current scientific partnerships; Establishes, individually, roles and management responsibilities of existing partnerships; Defines the objectives of the partnership individually; Establishes, individually, the metrics for partnership evaluation; Sets, individually, evaluation metrics for the actors involved in the partnership; Establishes the work methodology in conjunction with partners; Defines the scope of the partnership together with partners; Establishes, together with partners, roles and management responsibilities in existing partnerships; Defines the objectives of the partnership together with partners; Sets short, medium and long-term goals with partners; Establishes, with partners, roles and responsibilities in the prevailing scientific partnerships; Defines, together with partners, a physical and financial work schedule; Defines, together with partners, evaluation metrics for the actors involved in the partnership; Establishes, together with partners, metrics for evaluating partnerships.	Schreiner *et al (*2009), Chiaroni, Chiesa and Frattini (2011) and Lee (2011).
Follow-up actions	Prepares reports of the results achieved in partnerships; Adopts software to monitor partnerships with an interface for both parties, companies and universities; Holds meetings between the parties involved to discuss the progress of partnerships; Checks whether the goals and terms of partnerships are being met; Promotes the synergy and complementarity of established partnerships.	Goerzen (2007), Raisch e Birkinshaw (2008) and Yamakawa, Yang and John (2011).
Knowledge management actions	Adoption of computerised communication networks and database on a large scale to record and disseminate the knowledge acquired in already finalised cooperative projects; Use of documents and reports for the systematisation of concepts; Dialogue and collective reflection for creating concepts and hypotheses; Sharing of experience and technical skills; Sharing scientific and technical know-how; and Socialises the results of partnerships between the actors involved.	Hoffmann (2007), Goerzen (2007), Koka and Prescott (2008), Schilke and Goerzen (2010), Wassmer (2010), and Bruneel, Este and Salter (2010).
Evaluative actions	The assessment of partner's ability to generate knowledge that meets the company's needs; Evaluation of the knowledge base and technology created by partnerships; Partner skill assessment to understand the technological needs of the multinational; The ability to evaluate negotiations of the actors involved in partnerships; Assessment of the quality of interaction of the actors in partnership; Evaluation of the ease of interaction of the actors in partnership.	Asakawa, Nakamura and Sawada (2010) and Hoffmann (2007).

Source: The authors

engineering areas were found. Moreover, we resorted to the use of institutional websites and annual reports of the publicly traded BMNs, which are available on the CVM website. The stratification resulted in 73 BMNs that had internationalised internal activities or R&D cooperatives, and from this, a total of 60 BMNs expressed an interest in participating in the research.

A structured questionnaire was used for sampling the 60 BMNs, which predominantly used the seven-point Likert scale that contained prepared statements in order to obtain the perception and/or opinion of respondents on the capability for dynamic cooperation, managerial determinants and achieved results. The questionnaire was made available on the internet and in Microsoft Word to facilitate easy access. After, directors and coordinators of R&D and innovation areas of the parent company were invited to do the survey via email. It should be noted that the analysis of the data was processed by the Statistical Package for Social Sciences (SPSS) version 17.0 and statistical tests were performed with Cronbach's alpha and factorial analysis (HAIR et al., 2005).

4. RESULTS OBTAINED

On the determining managerial factors for dynamic cooperation capabilities, it is noted from Table 2 that three factors explain 76% of the variance of the responses, which related to the importance of technological empowerment strategies adopted by the BMNs, with a significance of 1%. These explanatory factors and their constituent categories allowed the following classification: (factor 1) empowerment strategies for the outflow of open

Tab. 2
Technological empowerment strategies adopted by the BMNs.

FACTORS *	Load Factor	Cumulative variance explained
FACTOR 1: EMPOWERMENT PRACTICES OF OPEN INNOVATION OUTFLOWS		16%
Investment in companies with promising technologies or with the potential to generate them	0.394	
Technological exchange of know-how without licensing novel technologies (patents) where two or more companies exchange technologies in order to achieve strategic objectives, without necessarily having a cross-licensing agreement	0.443	
Licensing of patents and intellectual property to other companies	0.382	
Creation of a new company (a spin-off or joint venture) to share skills	0.386	
FACTOR 2: EMPOWERMENT PRACTICES OF OPEN INNOVATION INFLOWS		32%
Technological benchmarking of competitors/suppliers	0.786	
Acquisitions for the optimisation of efforts in R&D and innovation, especially start-ups	0.683	
Purchasing external technologies (patented or not)	0.673	
Mergers between companies to optimise efforts in R&D and innovation	0.635	
Funding research centres to gain flexibility in R&D and add external ideas and efforts to research activities	0.561	
FACTOR 3: EMPOWERMENT PRACTICES IN INTERNAL AND COOPERATIVE R&D		76%
Creation in the parent company of an area or unit dedicated to the development of R&D and other innovation activities	0.945	
Empowerment and continuous training of R&D staff	0.904	
Hiring specialised consultants in R&D and innovation	0.874	
Development of an open innovation pilot project to define and later even administer procedures and routines	0.851	
Establishing ongoing partnerships with national ICTs	0.821	
Creation in foreign subsidiaries of an area or unit dedicated to the development of R&D and other innovative activities	0.728	
Establishing solid partnerships with international ICTs	0.635	
Realisation of cooperative projects with a defined scope that are focused on research activities prior to the stages of creation and development of new products and technologies	0.626	
Carrying out cooperative short-term projects focused on the development of a technology, a product line or a specific product that already exists.	0.568	
Realisation of cooperative projects with an open scope that is able to set up a network to investigate a problem or common technological challenge and generate results that can serve as a base to support future research and technological developments	0.501	

Legend: *KMO = 0.758; Chi-square = 882.345; p = 1%.
Source: The authors

innovation; (factor 2) empowerment strategies for the inflow of open innovation; and (factor 3) empowerment in internal and cooperative R&D strategies. It is noticeable that the greatest degree of explanation is related to the factor 3 (44%), i.e., empowerment strategies in domestic and cooperative R&D, followed by factors 1 (16%) and 2 (16%), which involve output and return flows of knowledge and technology provided by open innovation.

It is worth noting that, from among the considered empowerment strategies, the highest loading factor was for the parent companies' creation of a unit dedicated to the development of R&D and other innovation activities, as well as the empowerment and continuous training of R&D staff. It was also found that the empowerment strategies' characteristics for open innovation assumed a low loading factor. This included investing in companies with promising technologies or with the potential to generate them, the licensing of patents and intellectual property to other companies and the creation of a new company (a spin-off or joint venture) to disseminate and share technological expertise. These results therefore show that the outflows of open innovation, as regarded by Chesbrough et al (2008), have low explanatory power for the importance given to empowerment strategies adopted by the BMNs (Table 2).

Regarding the importance of the purpose of innovation cooperation in BMNs, it was found that two factors explained 72% of the answers' variance, with a 1% significance level. The analysis of the factors generated, as well as their respective constituents categories, resulted in the following classification: (factor 1) purposes related to the extension or modification of existing resources and (factor 2) purposes connected to the creation of new resources. Thus, it became clear that the greatest degree of explanation is linked to factor 1 (48%), i.e., purposes linked to the extension or modification of existing resources, followed by factor 2 (24%), involving purposes related to the creation of new resources (Table 3).

Tab. 3
Purpose of cooperation for innovation in BMNs.

FACTORS*	Factor loading	Variance explained
FACTOR 1: PURPOSES RELATED TO THE EXTENSION OR MODIFICATION OF EXISTING RESOURCES		48%
Sharing technological and innovation competencies	0.925	
Exchange of researchers	0.914	
Technology acquisition	0.862	
Technical services	0.742	
FACTOR 2: PURPOSES CONNECTED TO THE CREATION OF NEW RESOURCES		72%
Creation of new technological and innovation competencies	0.564	
Generate new scientific and technological trends	0.562	
Generation of process innovations	0.547	
Generation of product innovations	0.487	
Creation of new businesses	0.321	

Legend: *KMO = 0.837; Chi-square = 956.731; p = 1%..
Source: The authors

It was also found that certain cooperation purposes assumed a high loading factor, particularly the sharing of technological expertise and innovation, the exchange of researchers and the acquisition of technology. It is noteworthy that on average, the items related to the creation of new businesses and generation and innovations of products and processes received a low loading factor. This indicates that the BMNs still do not recognise the importance of partnerships whose purpose is to obtain innovative solutions, which moves away (in part) from the precepts of open innovation (Table 3).

Tab. 4
Adoption of criteria in the decision to cooperate in the BMNs.

FACTORS*	Factor loading	Variance explained
FACTOR 1: SYSTEMATISED DECISION-MAKING CRITERIA		**34%**
Assesses the scientific and technological skills of potential partners	0.656	
Maps the knowledge and technology that the company needs to look for external sources in order to supplement or build R&D and innovation skills	0.601	
Evaluates the complementarity between the new partnership and the portfolio of established partnerships	0.506	
Prospects national R&D institutions that are references in the areas in which the company operates	0.467	
Prospects international R&D institutions that are references in the areas in which the company operates	0.409	
Assessing the risk of developing projects in cooperation with external technology sources	0.332	
FACTOR 2: NON-SYSTEMATISED DECISION CRITERIA		**81%**
Uses current collaborators and technology partners to select new partners	0.978	
Evaluates partnership histories that have already been established with external technology sources	0.846	
Does the geographical proximity between the company and potential partners	0.821	

Legend: *KMO = 0.964; Chi-square = 896.634; p = 1%.
Source: The authors

The following table shows that two factors explain 81% of the responses' variance related to the frequency of adoption criteria when deciding to cooperate, with a significance of 1%. These explanatory factors and their constituent categories allowed the following classification: (factor 1) systematic decision-making criteria and (factor 2) non-systematised decision-making criteria. It is noteworthy that the greatest degree of explanation is for factor 2 (47%), that is, the adoption of non-

Tab. 5
Action planning implemented in partnership by BMNs.

FACTORS*	Factor loading	Variance explained
FACTOR 1: INDIVIDUALISED PLANNING PRACTICES		**19%**
Defines the scope of an individual partnership	0.905	
Establishes the work methodology individually	0.786	
Sets, individually, a physical and financial work schedule	0.719	
Individually sets short, medium and long-term goals	0.681	
Establishes, individually, roles and responsibilities in current scientific partnerships	0.652	
Establishes, individually, roles and current management responsibilities in partnerships	0.579	
Defines the objectives of individual partnership	0.546	
Establishes, individually, evaluation metrics for partnerships	0.436	
Individually sets evaluation metrics for actors involved in the partnership	0.412	
FACTOR 2: SHARED PLANNING PRACTICES		**78%**
Establishes the work methodology in conjunction with partners	0.932	
Defines the scope of the partnership with partners	0.876	
Establishes, with partners, roles and responsibilities in existing management partnerships	0.767	
Defines the objectives of the partnership with partners	0.765	
Sets short, medium and long-term goals with partners	0.731	
Establishes, with partners, roles and responsibilities for the prevailing scientific partnerships	0.724	
Defines a physical and financial work schedule with partners	0.689	
Defines, with partners, evaluation metrics for actors involved in the partnership	0.462	
Establishes, with partners, evaluation metrics for the partnerships	0.434	

Legend: *KMO = 0.765; Chi-square = 742.834; p = 1%.
Source: The authors

systematised criteria by the BMNs regarding the decision to cooperate, followed by factor 1 (34%) that addresses systematised decision criteria (Table 4).

Regarding the decision to cooperate, it was found that a large amount of decision-making criteria adopted by the BMNs directed current technological partners and collaborators when selecting new partners. Furthermore, a long partnership history with an external source and geographical proximity between the company and potential partners show the pervasiveness non-systematised criterion, as pointed to by Powell et al (1996). The decision-making criteria that assumed a low loading factor were the prospecting of national and international R&D institutions, who are references in the companies' areas of operation, and the evaluation of the risks of developing projects with external technology sources. This indicates the underuse of the BMNs' decision-making processes to cooperate in regards to the internationalisation of partners and risk management. This therefore does not support the arguments of Chesbrough *et al* (2008) and Helfat *et al* (2007) that deal with the importance of developing a business model for open innovation based on decision-making processes and intentional/systematised management to share, acquire or offer knowledge, innovations and/or technologies in national and international contexts (Table 4).

In relation to the frequency of planning actions implemented in partnerships, two factors explained 78% of the answers' variance with a significance of 1%. As well as their respective constituent categories, the analysis of the generated factors resulted in the following classification: (factor 1) individualised planning and (factor 2) shared planning. Thus, it became clear that the greatest degree of explanation is related to factor 2 (59%), i.e., shared planning of cooperative projects by BMNs and their partners, followed by factor 1 (19%), which involves individual planning (Table 5).

Note that certain action planning showed a low loading factor, especially for the establishment of individual and shared evaluation metrics for partnerships and actors. These results indicate that, despite the prevalence of action planning to formalise the scope of partnerships and define the work method, it is also necessary that the BMNs and their partners seek the maturing of planning processes, with respect to the planning of evaluation metrics, for a more detailed assessment of the results achieved at the end of the cooperation process (Table 5).

As Table 6 shows, two factors explain 88% of the responses' variance for the frequency of follow-up actions implemented in partnerships, with a significance of 1%. These explanatory factors and their constituent categories allowed the following classification: (factor 1) accompanying instruments and (factor 2) monitoring routines. It is noticeable that the greatest degree of explanation is linked to factor 2 (73%), i.e., systematic monitoring routines for cooperative projects, followed by factor 1 (15%), which addresses the implementation of formal monitoring instruments for both parties, businesses and ICTs. During the implementation of cooperative projects, it was found that the meetings between parties to discuss the progress of partnerships indicated a high loading factor. The adoption of software to monitor partnerships with an interface

Tab. 6
Follow-up actions implemented in the BMNs' partnerships.

FACTORS*	Factor loading	Variance explained
FACTOR 1: MONITORING INSTRUMENTS		**15%**
Prepares reports of the results achieved in partnerships	0.769	
Adopts software to monitor partnerships for both parties, companies and universities	0.306	
FACTOR 2: MONITORING ROUTINES		**88%**
Holds meetings between the parties to discuss the progress of partnerships	0978	
Checks whether the goals and terms of the partnerships are being met	0.805	
Promotes synergy and complementarity of established partnerships	0.792	

Legend: * KMO = 0.984; Chi-square = 986.739; p = 1%.
Source: The authors

Tab. 7
Knowledge management actions implemented in the BMNs' partnerships

FACTORS*	Factor loading	Variance explained
FACTOR 1: KNOWLEDGE MANAGEMENT INSTRUMENTS		**21%**
Adoption of computerised communication networks and large-scale databases to record and disseminate knowledge acquired in finalised cooperative projects	0.874	
Use of documents and reports for the systematisation of concepts	0.643	
FACTOR 2: KNOWLEDGE MANAGEMENT ROUTINES		**72%**
Dialogue and collective reflections for creating concepts and hypotheses	0.903	
Sharing of experience and technical competencies	0.871	
Sharing technical and scientific know-how	0.786	
Socialise the results of partnerships between the actors involved	0.704	

Legend: *KMO = 0.786; Chi-square = 734.512; p = 1%.
Source: The authors

for both parties, businesses and ICTs received a low loading factor, indicating that there are still specific initiatives for integrated computerised monitoring of cooperation in the BMNs and their partners.

Regarding the frequency with which knowledge management actions were implemented in partnerships, it was found that two factors explained 72% of the variance of responses, with a significance level of 1%. The analysis of the factors generated, as well as their respective constituents categories, resulted in the following classification: (factor 1) knowledge management instruments and (factor 2) knowledge management routines. Thus, it was observed that the greatest degree of explanation is related to the factor 1 (51%), i.e. the systematisation of knowledge management routines in cooperative projects, followed by factor 1 (21%), which involves deploying formal instruments of knowledge management for both parties, businesses and ICTs (Table 7).

The presence of a low loading factor for the adoption of computerised communication networks and large-scale database to record and disseminate knowledge acquired in cooperative projects was also observed, showing that the formalisation and shared record of already finalised results from cooperative projects are still poorly adopted in the BMNs (Table 7). The knowledge generated by completed cooperative projects can therefore be lost over time, making it impossible to reuse it in future applications in both the BMNs and ICT partners. Thus, the need to establish an intentional and systematic model for the management of knowledge in cooperative projects is evident, where the transfer process, recombination

Tab. 8
Evaluative actions implemented in the BMNs' partnerships

FACTORS*	Factor loading	Variance explained
FACTOR 1: ASSESSMENT PRACTICES OF TECHNICAL CAPABILITY		**53%**
Evaluation of the partner's ability to generate knowledge that meets the company's needs	0.902	
Evaluation of the knowledge and technology base created by partnerships	0.785	
Evaluation of the ability of partner to understand the technological needs of the multinational	0.773	
FACTOR 2: RELATIONAL CAPABILITY ASSESSMENT PRACTICES		**76%**
Evaluation of the negotiation skills of the actors involved in the partnerships	0708	
Assessment of interaction quality of the actor in partnerships	0.465	
Evaluation of the actors' ease of interaction	0.361	

Legend: *KMO = 0.767; Chi-square = 804.634; p = 1%.
Source: The authors

and creation are developed and then institutionalised and translated into routines in the BMNs and technological partner, as highlighted by Helfat *et al* (2007).

In the following table, it became clear that two factors explain 76% of the answers' variance for the frequency with which evaluative actions were implemented in partnerships, with a significance of 1%. These explanatory factors and their constituent categories allowed the following classification: (factor 1) technical capability evaluation and (Factor 2) evaluation of relational capabilities. It is noteworthy that the greatest degree of explanation is linked to factor 1 (53%), the institutionalisation of actions to evaluate the technical capability developed from the partnerships, followed by factor 2 (23%), which addresses the evaluative actions of the relational capability (Table 8).

It was also found that certain actions need to be leveraged when evaluating cooperation processes in the BMNs. The evaluation of the quality and ease of interaction of the actors involved in the partnerships indicates the underuse or absence of qualitative criteria to analyse relational capabilities, such as reciprocity, complementarity, the building of trust, negotiation and communication (Table 8).

5. CONCLUDING REMARKS

The aggregate analysis of managerial factors reveals that the analysed BMNs are closer to an intermediate stage of maturity with respect to the dynamic capability of cooperation. The prevailing governance model of cooperability tends to put in the background the creation of new resources that are able to generate effective technological results through systematic decision-making criteria with effective instruments for empowerment, planning, monitoring and evaluation of open innovation.

Finally, it is concluded that the BMNs are undergoing a process of transition between the operational capability of cooperation and the capability for dynamic cooperation. There is a need to continuously adapt already-established cooperation management routines and evaluate and incorporate some relational-capability management practices that include systemic flows and open innovation, as well as the integration of strategic intent into cooperative processes, which include:

a) Adoption of open-innovation empowerment strategies, such as investing in companies with promising technologies (or with the potential to generate them), licensing patents and intellectual property to other companies and creating new companies (spin-offs or joint ventures) to disseminate and share technological expertise.
b) Definition of purposes that are linked to the creation of new businesses and the generation of product and process innovations.
c) Adoption of systematic decision-making criteria, such as the exploration of national and international R&D institutions that are references in the areas where the company operates, and developing risk assessments for projects in cooperation with external technology sources.
d) Use of shared planning with technology partners, regarding the prior definition of supporting evaluation metrics, so that a more detailed assessment of the results at the end of the cooperation process can be achieved.
e) Systematic instruments to monitor projects and knowledge management, including the adoption of an interface software for parties, businesses and ICTs.
f) Adoption of relational-capability evaluation practices that include the assessment of the quality and ease of interaction of the actors involved in partnerships.
g) Scope of innovative results in cooperative projects involving the licensing of technology and the emergence of new technologies.

Regarding the limitations of this research, it is emphasised that these findings are directly related to the three case studies and 60 companies participating in the survey, since the sampling process was intentional, not random. The findings should be analysed sparingly as this type of sampling does not allow for generalisations about the conclusions of this work. For proposals of future studies, we suggest an in-depth analysis of multinational cooperability in developed economies, and performing quantitative studies that compares the determining elements for the results of cooperation capability in BRIC (Brazil, Russia, India, China and South Africa) multinationals.

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Capacidade dinâmica de cooperação nas multinacionais Brasileiras e seus fatores gerenciais determinantes

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RESUMO

No contexto de crescimento das empresas emergentes, o desafio atual não depende unicamente da geração local de inovações de produtos e processos, mas envolve a capacidade dinâmica de gerar cooperativamente soluções inovadoras e novos modelos de negócio em escala global. Em virtude deste contexto, objetiva-se analisar os fatores gerenciais determinantes da capacidade dinâmica de cooperação das Multinacionais Brasileiras (MNB). Para tal, foi realizado um levantamento junto à uma amostra de 60 MNB, que responderam um questionário estruturado e, os testes estatísticos realizados foram o Alpha de Cronbach e Análise Fatorial. A análise agregada dos resultados indica que as MNB estão passando por um processo de transição entre a capacidade operacional de cooperação e a capacidade dinâmica de cooperação, sendo, portanto, pertinente a adaptação contínua das rotinas de gestão da cooperação já instituídas e a avaliação e incorporação de práticas de gestão da capacidade relacional que de fato contemplem os fluxos sistêmicos e abertos de inovação e integrem também intencionalidade estratégica ao processo cooperativo.