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MANAGING COMPLEX PROJECTS IN MULTINATIONAL ENTERPRISES

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Resumo

A gestão de projetos complexos tem recebido atenção de diversos acadêmicos, sendo considerada um processo que contribui para o futuro sucesso das organizações e dos seus negócios. Dentro deste contexto, organizações multinacionais apresentam características de negócios onde a aplicação dos conceitos de gestão de projetos se torna ainda mais crítica. Este trabalho foi desenvolvido com o objetivo de avaliar como Organizações Multinacionais de bens de capital gerenciam seus projetos complexos, especificamente dentro do segmento de produtos e serviços complexos. Através de um estudo de caso múltiplo, as técnicas principais adotadas por organizações representativas deste segmento são avaliadas dentro da revisão teórica. Conclui-se que determinados conceitos teóricos são adotados pelas organizações, porém ainda há uma distância entre as práticas organizacionais e as teorias adaptativas de gestão de projetos. Por último, se realizam recomendações para a continuidade de estudos acadêmicos nesta área.

Palavras-chave: Gestão de Projetos; Projetos Complexos; Organizações Multinacionais

Abstract

The management of complex projects has received the attention of several academics. It is considered a process that contributes to the future success of the organizations and its businesses. Within this context, Multinational Enterprises MNEs have specific characteristics where the correct use of the concepts of managing complex projects is a critical factor. This study was developed with the objective of evaluating how capital goods manufacturing MNEs manage complex projects in the segment of CoPS: Complex Products and Systems. Based on an evaluation of a multiple case study, the main techniques used by a MNE representative of the market segment are evaluated considering theory review. MNEs in this market segment do have some organizational practices aligned with the concept of project complexity, but there is a distance between the academic and the industry. Finally, recommendations are made to further expand the research in this area.

Key words: Project Management; Complex Projects; Multinational Enterprises



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1. Introduction

There is a convergence amongst authors regarding the increasing importance of project management (PM) within organizations. Project management is perceived as a strong contributor to business become more competitive and to ensure future success and is recognized as the process to enable organizations for future business success (Whitty & Maylor, 2009). Continuous demand for sustainable growth and innovation, including fast changes to technology, require companies to invest in new infrastructure intensifying the use of PM (Shenhar & Dvir, 2007). Furthermore, projects are being used as a form of work organization, including the need to innovate (Newell, Goussevskaia, Swan, Bresnen, & Obembe, 2008). According to Söderlund (2002, p. 419), there is a “projectization” which has led to changes in the way firms organize their product and process development. Finally, the use of PM system is spread along the majority of construction, product development and engineering efforts (Shenhar, 2001). Despite of this convergence regarding the use of PM as an important tool for the organizations to cope with the continuous state of change, the supporting theory for PM is recent and needs further development. As project becomes more complex, the need for more comprehensive literature and practical test of the existing theory is required as a means for understanding the practical implications on how to effectively use the concepts of PM (Shenhar, 2001).

The management of complex projects also received the attention of many authors. Approaches as per the Diamond concept (Shenhar & Dvir, 2007), the need for more qualified project managers through certification schemes like PMI – Project Management Institute are responses to these needs. The term complex itself has been subject to intense discussion. It may be confused with complicate (Whitty & Maylor, 2009), or perceived as a result of a combined factors as per the diamond approach. The managerial complexity can come from dimensions like mission, organization, delivery, stakeholders and team (MODeST dimension). Each of them with dynamical and structural complexity elements as defined by Maylor, Vidgen, and Carver (2008, pp. S19-S21).

Multinational Enterprises (MNEs) can be defined as organizations that own and control activities in two or more different countries. Data about the importance of MNEs are significant. MNEs are responsible for about 80% of global trade (estimated to USD 19 trillion) and Foreign Direct Investments are estimated to reach USD 1.8 trillion in 2015. According to data from the Brazil Central Bank (2014) the Foreign Direct Investments (FDIs) in Brazil have reached USD 33.7 billion in 2007 with an increase of 30% in 2008 (USD 43.9 billion) and USD 30.4 in 2009. The capital goods market segment accounted for 36%, in average, for the growth over this period.

According to Dunning and Lundan (2008, p. 116), MNEs engage in FDIs in order to increase the value of their assets as perceived by their owners. In addition, Kalasin, Dussauge, and Rivera-Santos (2014) state that organizations expand to international market in order to leverage their advantages in new environments. This internalization of an organization is determined according to a paradigm named as “OLI paradigm”. This concept offers a general explanation of the extend and pattern of MNEs foreign value added activities of an organization (Dunning, 2001). Projects increase the organizational innovation, facilitates the implementation of changes, and implement strategies to increase their competitive advantage (Shenhar & Dvir, 2007). Therefore, in order to increase the value of their assets, companies engage in some kind of project management.

The capital goods manufacturing segment has important characteristics not only in terms of importance to MNEs but also in terms of project complexity. Based on an evaluation of Mergers and Acquisitions retrieved basically from data published in the UNCTAD reports



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from 2010 to 2013, we identified that the capital goods segment accounted for USD 530 billion in terms of acquisition value (approximately 39% of the total amount of acquisition value – USD 1.360 billion) (UNCTAD, 2010, 2011, 2012, 2013). In terms of complexity, manufacturing capital goods includes a special type of products, best known as Complex Products and Systems – CoPS. The term is used to categorize high technology and high-value capital goods (Davies & Hobday, 2005, p. 6).

The main objective of this study is to explore how capital goods manufacturing MNEs manage complex projects within the market segment of CoPS. More specifically, we aim at investigating three main aspects: (i) the characteristics of complex projects, (ii) the management of complex projects, and (iii) the MNEs and their complex projects.

The relevance of the theme can be highlighted by the importance of this market segment to FDI investments, mergers and acquisitions and the unique characteristics of project complexity related to CoPS. In order to respond these questions, we initially performed a theory review covering project complexity, MNEs, capital goods (CoPS) and the management of complex projects in MNEs. Following the theoretical review, we presented the methodological procedures employed. We, then, demonstrated the results and discussed them. Finally, we appointed some conclusions and recommendations.

2. Theory review

Theory review is performed in four levels: (i) project complexity, (ii) multinational enterprises, (iii) capital goods – CoPS, and (iv) managing complex projects in MNEs. Table 1 summarizes these topics by mentioning some relevant works related to each of them.

Table 1

Theory Review	
Project Complexity	Maylor et al. (2008), Whitty and Maylor (2009), Browning (2014), Baccarini (1996), College of Complex Project Managers (2006), Shenhar and Dvir (2007), Sauser, Reilly, and Shenhar (2009)
Multinational Enterprises	Dunning and Lundan (2008), Harris, Kim, and Schwedel (2011), D'Aveni and Gunther (1994), D'Aveni, Dagnino, and Smith (2010), Dunning (2001), Hitt, Ireland, and Hoskisson (2011), Scholes, Johnson, and Whittington (2008)
Capital Goods – Complex Products and Systems	Davies and Hobday (2005), UNCTAD (2010), UNCTAD (2011), UNCTAD (2012), UNCTAD (2013), Central Bank of Brazil (2014)
Managing Complex Projects in Multinational Enterprises	Sauser et al. (2009), Wikström, Artto, Kujala, and Söderlund (2010), Pinto and Slevin (1988), Raz, Shenhar, and Dvir (2002), Shenhar (2001), Milosevic and Srivannaboon (2006), Shenhar (2004), Hass (2009)

2.1. Project Complexity

The first important aspect regarding complex project is the definition of the word *complex* and its distinction from *complicated*. Understanding the differences is an important baseline for its implication on managing projects. According to the Webster Dictionary, *complex* is defined as “composed of two or more parts; involving many parts” – *complicated* is something “difficult to analyze or understand”. The difference relates to the interconnection between parts. In complex parts, there is interdependency between them. In complex systems there are interactions amongst parts of the system producing neither linear nor predictable outcomes (Maylor et al., 2008). Further expanding this concept, Whitty and Maylor (2009, p.



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305), states that “a complex system is a system formed out of many components whose behavior is emergent”. The outcome of the complex system cannot be inferred from the behavior of its components.

Complexity is an attribute that does not depend on the observer in opposition to complicatedness. According to Browning (2014, p. 3), complexity is an objective characteristic of the system and complicatedness is a subjective one. Complicated may be related to the number of stakeholders involved. In complicated projects, complication can be managed with expertise, a better understanding of the parts that constitutes the system. Project complexity has been studied by a number of authors and there is a general understanding that the application of the same approach for different projects (one size fits all) is not effective (Baccarini, 1996; College of Complex Project Managers, 2006; Shenhar & Dvir, 2007). Project complexity is defined as a measure of project scope which reflects characteristics like the number and interdependency between tasks, as per Shenhar and Dvir (2007, p. 53).

Project complexity affects the way projects should be managed. According to Baccarini (1996, p. 201), complex projects requires a greater managerial effort during its execution. This author defines project complexity as “consisting of many varied interrelated parts and operationalized in terms of *differentiation* and *interdependency*”. Therefore, project complexity can be applied to different dimensions of the project management process, like organization, technology, decision-making, and environment. In such a way, when defining project complexity, one needs to state for which dimension the concept is being used (Baccarini, 1996). Complexity is a measure of the difficult to achieve the desired understanding of a complex system – although high levels of uncertainty are a fundamental aspect of complex projects, it is not an exclusive definition. In this sense, complexity is a variable and not a qualitative concept (Whitty & Maylor, 2009).

Another approach for the management of complex projects is the adaptive model, the Diamond concept. The underlying concept in this model is that different projects should be managed in different ways, in opposition to more prescriptive ways adopted by the body of knowledge framework. This concept requires a system to identify the basic differences between projects. These differences are related to four dimensions – NTCP: novelty, technology, complexity and pace (Shenhar & Dvir, 2007). In the contingency theory, the idea is to fit project characteristics to project management approach instead of identifying critical success factors (Sausser et al., 2009).

The “novelty” dimension is related to how new the product is and it is composed of three sub dimensions: derivative, platform and breakthrough. The “technology” refers to how much new technology is used – sub dimension as low-tech, medium tech, high-tech and super high-tech. “Complexity” is related to the extent of the complexity of systems and subsystems used: its sub dimensions are assembly, system and array. Last, “pace” gives an idea of how critical the period is – regular, fast/competitive, time-critical and blitz. These four dimensions of the adaptive model for the management of projects forms the diamond model – the greater the diamond, the greater the potential benefits of the projects and the associated risks. The combination of these characteristics provides a comprehensive set of management practices in order to provide business results to the organization and achieve project success.

2.2. Multinational Enterprises

MNEs are defined by Dunning and Lundan (2008) as an “enterprise that engages in FDI and owns or, in same way, controls value-added activities in more than one country”. In the overcoming decades, MNEs shall face macroeconomics shocks that will establish the way these companies adapt and grow in the next decades – according to Harris et al. (2011), GDP



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– Gross Domestic Product world is estimated to reach USD 90 trillion by 2020, an increase of 40 percent when compared to 2011. These authors say that despite the fact that two thirds of the growth will be generated by advanced economies, the sources of the economic growth will tend to come from developing and emerging economies.

According to an evaluation made by UNCTAD (2013) – United Nations Of Conference on Trade and Development “World Investment Report 2013”, MNEs are estimated to be responsible for 80% of global trade through their networks of affiliates, partners and suppliers. Specifically in developing countries, the trade value added made by MNEs contributes to 30% of GDP. However, participating in this global value chain involves risks for these countries: there may be a potential for them to capture only a small portion of this value added chain, remaining locked to low added value activities. Nevertheless, according to UNCTAD estimates, foreign direct investments may reach USD 1,45 trillion in 2013 and USD 1,8 trillion in 2015. Table 2 indicates the FDI in Brazil from 2005 to 2009, according to Central Bank of Brazil.

Table 2

FDI in Brazil – Evolution (USD billion)

Year	2005	2006	2007	2008	2009
Total	6,4	8,7	12,2	14,0	11,9
Capital Goods	21,5	22,2	33,7	43,9	30,4
% of Capital Goods	29,8%	39,3%	36,1%	31,9%	39,2%

Note: Adapted from Brazil Central Bank, 2014

As said by Dunning and Lundan (2008, p. 116), MNEs engage in FDIs and production in order to increase the value of their assets as perceived by their owners. MNEs activities are defined according to an approach called eclectic paradigm or OLI-Model. In this paradigm, internalization of an organization is determined by the transaction cost theory: in such cases, transactions are made within the organization when the transactions costs of the market are higher than the internal ones. This paradigm offers a general explanation of the extent and pattern of MNEs foreign value added activities of firms. According to this paradigm, the FDI undertaken by a firm is determined by three forces. First, **Ownerships advantages**, i.e., the competitive advantages that an organization of one nationality possesses when compared to organizations of another nationality in supplying a product or service to a particular set of market – for example, economies of scale, production processes, property rights. Second, **Location advantages**: in this case, the organization chooses to add value to its operation / processes by locating its operation in other countries (for example, the existence of raw materials, low wages and incentives). Third, **Internalization advantages** is related to the perceived advantage of producing rather than licensing to an external company or developing a partnership for production purpose (Dunning, 2001). Complementary to this concept, internalization advantages is expected to exploit market failures, like avoiding moral hazards, compensation for the absence of future markets (Dunning & Lundan, 2008).

In order to earn above average returns, organizations define and implement strategies at business and corporate levels. At business level, the concern is to gain a competitive advantage using organization’s core competencies in a specific market. Corporate level strategies are focused on generating competitive advantage by selecting in what markets to compete (product and businesses) and how corporate functions should manage those firms (Hitt et al., 2011). Regardless of strategy level, both have the ultimate objective of adding value to the company. Although there are some questions regarding the extent to which corporate level strategies add more value when compared to isolated value created by



business units, the fact is that companies use corporate level strategies for different reasons as indicated in Table 3.

Table 3

Corporate Strategies	
Strategy	Reasons Underpinning the Strategy
Market penetration – consolidation* <i>*Defense actions to protect its assets</i>	Retaliation from competitors; legal constraints; defending market share; downsizing or divestment.
Product development	Develop new or modified products to existing markets.
Market development	Offering new existing products to new markets.
Diversification	Efficiency gains – economies of scope; deployment of corporate capabilities into new markets; increase of market power; response to market decline; spreading of the risks; fulfillment of power stakeholders expectations.

Note: Adapted from Scholes et al. (2008).

2.3. Capital Goods – CoPS: Complex Products and Systems

As discussed, the capital goods segment plays a fundamental role in the M&A scenario as well as in the FDIs. In 2012, the global economic crises in the Eurozone and the reduction of growing in the emergent economies produced an impact not only on greenfield FDI as well as on M&A projects (UNCTAD, 2013). The capital expenditure on greenfield projects fell by 33% comparing to 2011 reaching USD 612 billion in 2012, and the cross-border M&A declined significant 45% in the same period (total of USD 308 billion in 2012). Even considering the global economic crises, the FDI greenfield projects in capital good segment (manufacturing) reached USD 264 billion in 2012 (43% of total cross-border FDIs). M&A reached USD 308 billion in 2012 as indicated in Table 4.

Table 4

FDI Greenfield and M&A Cross-border investments (USD billions)				
Year	FDI Greenfield		Cross border M&A	
	2012	2011	2012	2011
Services	323	385	124	214
Manufacturing	264	453	137	205
Primary	25	76	47	137
Total	612	914	308	556

Note: Adapted from UNCTAD 2013

A subgroup in this market segment is Complex Products and Systems (CoPS), defined as high technology, high value capital goods. According to Davies and Hobday (2005), the definition englobes high cost products like electricity network control systems, infrastructure and engineering constructions. In general, MNEs provide these services and products through project business. These companies use project management concepts to handle the delivery of major capital projects. The typical hierarchical and management structure does not fit the needs to bring the required knowledge and dynamic environment of this market. A project-oriented organization is more adaptive to these needs and to comply with customer needs in a fast changing condition (Davies & Hobday, 2005). In terms of projects, the provision of CoPS depends fundamentally on project capabilities. According to Davies and Hobday (2005, p. 62), every CoPS is a new project, requiring organizations in this area to develop abilities to



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win bids, learn from previous projects and manage in an efficient and effective way their projects, rather in focusing on cost, scope or economies of scales advantages.

2.4. Managing Complex Projects in Multinational Enterprises

The management of projects is becoming a central concern in most organizations. Its framework and concepts are used to leverage internal resources into process improvements, product development and/or new services (Sausser et al., 2009). Organizations also participate in projects to improve their own innovative capacity, serving as a strategic process to develop new capabilities (Wikström et al., 2010). Not only project-based organizations use projects to manage complex business transactions, but also companies in the construction business, technology-based and service providing organizations. These organizations structure their operational activities in different projects – similarly, large events like Olympic Games organize their business in multiparty projects. The management of these complex projects produces new requirements for proper control by means of portfolio and program management (Wikström et al., 2010).

The need for aligning strategy with project management has received the attention of various scholars (Pinto & Slevin, 1988; Raz et al., 2002; Shenhar, 2001; Shenhar & Dvir, 2007). According to Milosevic and Srivannaboon (2006), project alignment with organizational strategies is an important aspect to avoid the costs of project termination that do not contribute to organization's goals or the resource allocation to ongoing projects not aligned with these goals. Project management may be defined as a specialized form of management, used as a mechanism or process to achieve business goals, tasks in a defined time/cost basis. Its fundamental objective is to support the execution of a specific strategy. As organizations establishes their strategies to achieve their goals, it can be concluded that projects are a mechanism or tool for achieving these goals (Milosevic & Srivannaboon, 2006).

According to Shenhar (2004), the traditional approach to project management focused on “getting the job done” through the control of costs/schedule/scope is not enough to cope with the business current needs. As defined by its conceptual approach, Strategic Project Leadership®, projects are strategic organizational processes developed by organizations to achieve business strategies and goals. These projects should be focused on customer needs, strategy, and success dimensions. A project strategy is required as a form of alignment between business strategy and the project management. In this sense, project strategy is defined as guidelines and definitions on how to achieve competitive advantage from project outcome. The project success depends on factors like efficiency, impact on the customer, impact on the team, direct commercial success and preparation for the future (Shenhar & Dvir, 2007). However, in order to be successful, management has to consider five factors: strategy, spirit, processes, organization and tools. The spirit would be concerned in the promotion of a culture to build a project spirit based on “energy, excitement, and enthusiasm”.

Contemporary projects performed by different organizations are focused on the process of adding value through implementing breakthroughs ideas, improvement of process performance, and creating competitive advantage (Hass, 2009). In order to achieve these benefits, MNEs engage in some form of projects and have to develop project capabilities (Davies & Hobday, 2005). Furthermore, complexity is associated with four dimensions: size, variety, difficulty and change. In terms of size, projects with many components tend to be more complex (Frame, 2002). Variety is associated to the excessive options (and decisions) that project managers have to face (different contractors, employees, solutions, dates, etc.). Difficulty is related to something that is hard to do. The rapidity of change is the last facet of complexity. These factors tends to be present in the implementation of MNEs strategies as



they involve different countries (size of the project), variety / decisions (local or international suppliers), difficulty in managing communications, for instance and rapidity of change of local conditions (market innovation, change in regulatory markets).

The question on how capital goods manufacturing MNEs manage complex projects, particularly in the CoPS, is an important aspect of project management. The way companies handle the complexities related to the business and to the project management needs to be understood and explored in a deeper way. The lessons learned from these organizations can be used by other important market segments. Figure 1 summarizes the model proposed.

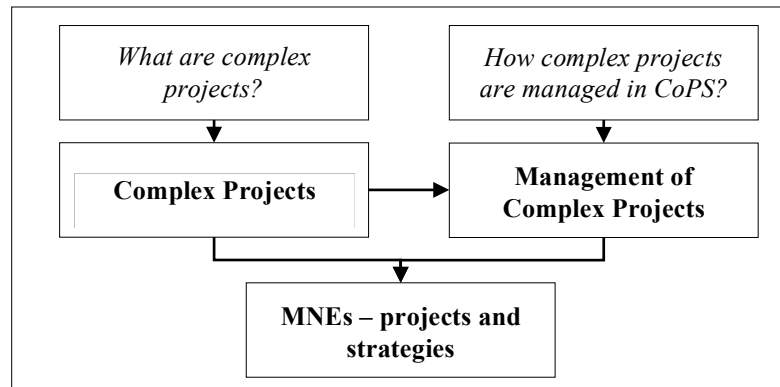


Figure 1: Schematic of the conceptual model used for the case study

3. Methodology

In order to answer the question stated in the beginning of this study – how capital goods manufacturing MNEs **manage complex projects** – a qualitative approach through a descriptive multiple case study was used (two MNEs). According to Yin (2002), a case study should be used when the main objective of the study is to answer “how” and/or “why” questions and the behavior of the participants cannot be controlled. Furthermore, the case study is indicated when it is necessary to evaluate contextual situations that are relevant to the phenomena under evaluation. The nature of this study is descriptive as it is recommend when the objective is to analyze phenomena within its context and an emphasis is placed on the processes involved. A multiple case is justified when the researcher is interested in collecting data from different sources to draw conclusions based on empiric observations (Yin, 2002).

The unit of analysis is the organization. To select the investigated organizations we have used the following criteria: (1) the organization should be a MNE; for this purpose, “MNE – multinational or transnational enterprise – is an enterprise that engages in FDI and owns or, in some way, controls value-added activities in more than one country” as per Dunning and Lundan (2008) definition; (2) the organization (and its business unit) should be part of the capital goods segment, engaged in the manufacturing of CoPS – Complex Products and Systems (high technology and high-value capital goods (Davies & Hobday, 2005); (3) the organization would have to be project-oriented for the provision of its products and services to their customers; and (4) it should be an important unit to the MNE in terms of the Brazilian operation, considering its strategic function within the group.

The first selected organization is an European-based MNE (named here after as ALFA) – its global revenues were greater than USD 40 billion in 2013, with more than 100.000 employees in the world. Its business is comprised of different business units, all of them in the electrical equipment industry. Its products are assembly of electronics, software and system integration, and are tailored suited to the customer requirements. All business



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units are project-oriented – project businesses. Most of their facilities and businesses hold certification based on ISO 9001 – Quality, ISO 14001 – Environmental and OHSAS 18001 – Occupational Health and Safety. The MNE operates in Brazil for more than 50 years. According to its annual report, revenues from Americas increased at a double-digit rate when comparing 2013 to 2012. Brazilian activities have started more than 50 years ago.

The second MNE (BETA) is also an European-based corporation. It also is involved in the manufacturing of electric and electronic CoPS for different market segments, like civil construction and aerospace segment. These pieces of equipment are highly connected to specific software applications. The revenues of the group as a whole are greater than USD 40 billion, with investments in research around 20% of its revenues. It operates in more than 50 countries with 60.000 employees. For BETA, innovation is a driving force for both global and local operations. The Brazilian operation, although not large, plays an important role within the group, being a center of excellence of the entire group in its area of expertise. In Brazil, the business unit is part of the corporate organization for less than 10 years and holds ISO 9001 Quality Management System certification.

Primary and secondary sources of information were used for data collection – as primary source, it was used a semi-structured interview. The interviews, both performed during August, 2014, were based on an script which in turn was prepared considering the research made by Shenhar and Dvir (2007) and the theory review. Although academics Shenhar and Dvir (2007) used a Likert scale for their research, that general approach was used to prepare the script for the interview.

As a result, the questions of the script involved the following areas: (i) characteristics of complex projects, (ii) management of complex projects in CoPS, and (iii) MNEs and their complex projects. Due to the research focus, interview was performed with the manager responsible for the operational excellence of the processes within the business unity (ALFA). His experience includes 20+ years in the company, having supported the establishment of the process of project management, occupying the position of Project Manager for more than five years. In BETA organization, the interviewed was a mathematician, with a specialization in computer network and project management. The interviewed has more than 20 years in the engineering field, being 11 years in project management.

As secondary source of information, analysis were performed both in documents (procedures, records and other general documents) made available during the interview and also, documents obtained in their web sites, like ALFA and BETA annual reports. The interviews were both recorded and transcribed for the purpose of the content analysis. The content of the interviews was analyzed through the concepts of content analysis. According to Krippendorff (2012), content analysis is “a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the context of their use”. The basic steps of this process were based on: (1) prepare the information, (2) unitization of the information, (3) categorization or classification of the unities in categories, (4) description and (5) interpretation (Moraes, 1999).

4. Data analysis and discussion

The analysis has been organized into three different aspects: (i) the characteristics of complex projects, (ii) the management of complex projects in CoPS, and (iii) the MNEs and their complex projects.

4.1. Complex Projects



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Organizations ALFA and BETA are project-oriented businesses – this confirms the theory of organization structure of this market segment (Davies & Hobday, 2005). ALFA's projects are not the same in terms of complexity, although, a general classification can be established using the Diamond approach. In terms of *Novelty*, it usually fits on platform (new generation in an existing line of product) but a disruptive product may be developed locally or at the corporate level. In terms of *Technology*, it is medium to high technology. It has to be addressed that technology seems not to be a concern for organization ALFA. As addressed by the interviewed ALFA's executive, "We are a company of engineers; we always have someone in the group with a proper solution for an existing problem, always".

In terms of *Complexity* dimension, ALFA projects have a system or a matrix (a collection of scattered systems with a common mission) dimension. In terms of *Pace*, it is usually time critical. Their products are usually huge investments in capital goods made by their clients to increase their manufacturing capacity. For ALFA, this is one of the critical aspects of their business. First, because it is a common client complaint revealed by their customer satisfaction survey. Second, some of the delays are out of their control – to some extent, delays are caused by the client itself. As informed by the interviewed ALFA's executive, "sometimes delays or anticipations are requested by the client due to the price of the commodity, for example, energy and/or gasoline". Other external factor is the myriad of customer specific manufacturing standards for the product – what may be accepted in Europe as best practice, Brazilian customer demands a more stringent technical solution even to a higher cost. According to ALFA's executive, the third factor for delays is: "Brazilians are too optimistic...our planning is not real...we easily forget what happened in the past". Regarding complexity, ALFA does not identify or establish a difference between complex and complicated projects, although both factors are addressed by ALFA through different ways of managing complex projects (see item 4.2. Management of Complex Projects).

Differently from ALFA's set of projects, BETA performs projects that have a very similar level of complexity. Using the Diamond model, these projects can be classified as follows: (1) *Novelty*, platform; (2) *Technology*, high technology; (3) Complexity: always a system and (4) *Pace*, Regular. In terms of project control, a different series of meetings is locally held (monthly basis), and at corporate level (four month basis).

BETA makes distinction between complex and complicatedness. Although this separation seems to be more due to the background of the interviewed, it is worth mentioning. All BETA projects are complicated – for instance, purchasing has more interfaces in terms of legal aspects than a normal business operation (due to the product reasons). The complexity comes from the process within the Engineering function. For BETA, the specific characteristics of their engineering fits within the general definition of complexity made by scholars (Baccarini, 1996; Whitty & Maylor, 2009).

4.2. Management of Complex Projects

ALFA MNE has to follow a corporate guideline on how projects have to be conducted. These guidelines are the corporate directive on projects – it has to be locally adapted but this local procedure must be in line with the general intent of the corporate directive. For instance, a control of the cost has to be done, but the system used to collect actual numbers may vary across countries. As informed by the interviewed, "It is basically an "ALFA PMBoK, but including stronger considerations to safety and environmental aspects".

ALFA has a system to classify projects according to their complexity and complicatedness altogether (project complexity factor). Some of the factors involved in this classification are: country of the client, involvement of state companies, the value of the



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project, existence of a joint venture even between ALFA units in different countries, level of product innovation and others. This set of aspects is rated and the result is a number: depending on the number, a more skilled project manager is designated for the specific project. ALFA has a formal program to certify their project managers according to a 4-level scale and evaluate their performance through a career planning process.

Other aspect of the complexity of projects considered by ALFA is the project review process. As the factor of complexity mentioned above is higher, a different group of people makes the project review. According to the interviewed ALFA's executive, "the idea is simple: the more complex the project is, a higher level of functions are required to perform the project review".

On the execution side of the projects in ALFA, there is an operations manager. Once a sale is closed, the operations manager designates a project manager responsible for the project development. His/her responsibility is to make sure the project is delivered according not only to the classic iron triangle (cost, scope, time) but also to interface with clients in order to keep its needs under control. The project manager also participates in the commissioning of the equipment in order to understand the potential problems due to project management.

The process used by ALFA to manage their projects does not follow the Diamond model in its full extent. However, it does have many of the concerns regarding the four dimensions of Shenhar and Dvir (2007) approach. Factors of *Novelty*, *Technology*, *Complexity* and *Pace* can be seen in their system for project complexity evaluation. On the other hand, despite the fact that technology is an important factor for complexity in the Diamond approach, it is not an organization concern. The reason for that is some competitive advantages the company has somewhere in their affiliates.

In BETA, the complicatedness of a project is managed through the basic concepts of PMBoK. Once a proposal is accepted, a project manager is designated and a project team is established. Team members are more functional rather than someone specifically designated to the project. For instance, there is no specific member responsible for the procurement process. In project review meetings, someone from purchasing participates to inform about the status of the processes. As said by the interviewed BETA's executive, "resources do not belong to project manager". In opposition to ALFA, there is no a general project manager.

In Engineering, BETA uses some specific tools for addressing the complexities of this set of activities – for instance, statistical and more probabilistic tools are used (GERT: Graphic Evaluation and Review Technique, Monte Carlo Simulation, etc.). As per the opinion expressed by the interviewed, "the current project managers do not have knowledge regarding PERT and other tools to analyze the complexities involved in projects and the interdependence of activities".

Based on the observation made, some conclusions may be drawn. Despite the fact that both organizations deal with complexity to some extent, they have the same basic level as per the Diamond approach. The way both deal with complexity is different since they use distinct approaches to address this factor. Interesting to pointing out that, although both ALFA and BETA do not fully follow the diamond approach in terms of managing complex projects, both agree with the underline concept of "one size does not fit all" (Shenhar & Dvir, 2007).

Organization ALFA used to have a system to financially reward the best projects. If the profit margin of the project was higher than planned, part of the additional margin was distributed between team members and the project manager. The reasons for ALFA to cease this financial reward were: first, in some projects, an increase in the profit margin was an easy task, most of the times this was not directly related to the internal capabilities of project team members. Second, the increase of margin was related to external factors. As stated by the interviewed, "The better margin achieved was related to mistakes from client rather than a



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good management of the project”. Third, when projects were sold with known low margins, there was a tendency of the project manager to refuse to manage this project. On the other hand, ALFA has implemented a system to promote the best projects. Every year, all countries may indicate one successful project for each business unit to be evaluated by the corporate committee. Based on aspects like cost, scope, time, etc., one project is selected and awarded. According to the interviewed, “It is a reward, a statue; it is an ALFA Oscar”. It has to be highlighted that client perception plays a fundamental role in this process.

There is no financial award, but project manager goes to the European headquarter and can take his wife with him and other interesting features like a formal ceremony, etc. The indication itself grants a status of an excellent project manager and can leverage their career. Finally, locally, ALFA uses a small holographic statue with the project name in order to promote the project and reinforce its importance to the group. This set of promotion of value and intent to enhance the meaning to the project is in line with the concepts of strategic leadership by Shenhar (2004).

In BETA, the company was founded and initiated by engineers doing projects. In this sense, the interviewed has a perception that the employees have a great sense of self-motivation. The way that company performs businesses, lead team members to an adequate level of motivation. As per the interviewed, “Project Management is our DNA”.

4.3. Multinational Enterprises and Their Complex Projects

Both organizations, ALFA and BETA, have corporate offices in Europe. The FDI investments of these companies, according to their annual report, follow the concept of the OLI paradigm (Dunning & Lundan, 2008). The strongest force seems to be the internalization and location advantages. It is clear from their annual report that investments in local operation explore these advantages. It has to be addressed as well that for organization BETA, due to their line of products, the internalization seems to be a sole option.

Organization ALFA is focused on technology innovation and business integration in order to capitalize the synergies between new companies and existing business unities. This strategy intends to increase its penetration in a market segment and develop new markets through acquisitions of other companies and product development (product innovation and improvement). This general corporate strategy does follow the concepts of the OLI paradigm of Dunning (2001), Dunning and Lundan (2008) and the Ansoff Matrix (Scholes et al., 2008).

In ALFA, the alignment between projects is made not only with the corporate strategy but also with existing quality, health, safety and environmental policy. The deployment of the strategy is made through a matrix organizational model. In this case, there is a manager responsible for the deployment of strategies into the business: the business unit manager, who evaluates the market trends. As informed by the interviewed “the business unit manager is responsible to get the businesses”.

It has to be highlighted that the organizational structure in ALFA has changed over the years, from matrix to functional and vice-versa. According to the interviewed, the matrix works better when there is a good personnel synergy between the operations manager and business unit manager. The alignment between projects and corporate strategies is also deployed when there is a need to develop equipment and solutions to local clients. In this case, when a decision is made to enter a new market, or to offer the same product to an existing market, ALFA sends their personnel to a center of excellence, for instance, in China, in order to acquire the competencies required for the business. This market strategy is in line with Ansoff matrix as market penetration and also product development (Scholes et al., 2008).



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In BETA, a weaker organizational function matrix is in place. The KAM: Key Account Manager is responsible for the deployment of corporate strategies in terms of market penetration and product development. However, to some extent, the KAM has more autonomy to identify a local opportunity and develop it locally when compared to that of ALFA. In any case, this new business or line of business has to be within the portfolio of products and services of the corporation, and considering potential risks to the business. Other aspect related to the alignment between projects and strategies is the request made by the Corporate Company to establish an area for the bidding process.

This area is responsible to make sure that not only all aspects of the bidding process have been dully considerate (profit margin, costs, cash flow, time, procurement, etc.), but also there is a proper alignment between sales proposal and corporate strategies. The initial analysis includes risk evaluation (e.g. country sensitivity), financial analysis (e.g. change fluctuation), accounting (taxes) and last, the required expertise for developing the solution to the client. This process happens before a commitment for selling is made.

Organization ALFA seems to be more mature in terms of organizational structures having more time of lessons learned. BETA is still in the process of changing some local practices – for instance, BETA is a fully project-oriented organization. According to the interviewed, “At corporate level, PM has complete authority”.

The management of complex projects by the two companies reveals a similar approach. First, the idea of “one size does not fit all” is an underlying concept used by them to deal with the complexities of their projects and products. For ALFA, the management of complex projects is based on a corporate guideline – in this sense, complex and complicatedness are considered in the “project complexity factor”. It also has stronger matrix organizational structure, which seems to be a consequence of a longer time under the corporate “umbrella”. In BETA, the complex and complicatedness of their projects are managed separately; an interesting approach for differentiating both the concepts and the implications of this differentiation. Complexity is dealt within the engineering function and complicatedness is managed through the traditional concepts of project management like work breakdown structure (division of the “complicatedness” into small blocks for better control).

4.4. ALFA and BETA organization comparison

The comparison between the two investigated companies is done in order to identify similarities and fundamental differences. Table 5 summarizes the main aspects identified.

Table 5

ALFA and BETA Comparison

Similarities		Differences
Complex Projects	Project oriented organizations. Both develop complex projects.	In ALFA, complex and complicatedness are dealt altogether. In BETA, complexity is within Engineering function and complicatedness relate to the project as a hole.
The management of complex projects	Project control – reviews are made in different levels.	ALFA has a more restrictive approach do project management – guideline from Corporate Headquarters. It uses a system for project classification BETA does not follow a specific guideline for project management. Project activities within Engineering considered complex. Some



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ALFA and BETA Comparison

	Similarities	Differences
		probabilistic tools used for project control and analysis.
Multinational Enterprises	Both corporate offices deploy the FDI investments based on strategy of internalization and location advantage. As project oriented organizations, deployment of corporate strategies is done by a specific function.	ALFA has a strong matrix organizational structure. Alignment between strategies and projects are a responsibility of BU Manager. In BETA, alignment between strategies and projects rests with KAM and the bidding process.

5. Final Remarks

The main objective of this empiric study was to answer the question on how capital goods manufacturing MNEs **manage complex projects**, specifically within the market segment of CoPS – Complex Products and Systems. In order to properly answer this question, a descriptive case study was performed in two MNEs of the capital goods market segment, both considered representative within the objectives of the study. In this context, three different aspects were highlighted in this study: (i) the characteristics of complex projects, (ii) the management of complex projects in CoPS, and (iii) the MNEs and their complex projects.

ALFA and BETA MNEs consider the complexity in their projects in different ways: under the Diamond approach. In such a way, both MNEs have adaptive systems to manage their projects (Shenhar & Dvir, 2007). ALFA uses a complex factor calculator as the basis for managing their projects. Due to the similarities of their projects in terms of complexity, BETA uses different probabilistic tools for controlling their projects in engineering department. In common, both MNEs consider that “one size does not fit all”.

In terms of project management, the way ALFA and BETA consider the complexities in projects reveals some interesting aspects: first, the concepts of complexity and complicatedness seems not to have a clear consequence in the way ALFA manage their projects. As the projects have different levels of complexities (as revealed by their complex factor), the complex and complicatedness of the projects are considered altogether. In BETA, the complexity of the projects is the same, i.e., all projects have the same level of complexity. ALFA approach is more adaptive while BETA has a more informal way of realizing their projects. This indicates another area for further research: in a company of the CoPS market, having very similar projects, how the dimensions of the Diamond approach could be better understood. As a result, a more specific guideline on how to address these dimensions could be established. This could have not only an academic interest but also practical implications to be used by organizations in this market segment.

In terms of a system to pursue success within project management, ALFA seems to be more proactive. Our analysis reveals that this mature view is possible due to its older project experience in Brazil. ALFA operates in Brazil for more than 50 years and seems to have lessons learnt regarding project motivation. BETA, however, has less than 10 years as part of the corporation and, therefore, the European culture of the project management has not yet been fully absorbed by the local company. Nevertheless, it is interesting to see that there is a real concern regarding the success of projects in both organizations. The way companies address this aspect is different, but still a concern is present.

Our analysis demonstrate that both organizations, at corporate level, develop FDI based mainly due to the internalization force (the OLI paradigm), confirming the theory defined by



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Dunning and Lundan (2008). For BETA, the strongest force is clearly the internalization due to their specific characteristics of products and client demands.

Considering how both MNEs manage their complex projects, we concluded that similar approaches exist between ALFA and BETA. Both companies are project-oriented – in terms of project deployment, ALFA uses a stronger matrix organizational structure in order to cope with the different objectives of each of the function involved: operations and business unit manager. In BETA, alignment is achieved by the KAM: Key Account Manager and a system for bidding where no proposals are made if not aligned with corporate strategies and or requirements. Although ALFA has a stronger matrix organizational structure, their approaches to the deployment of corporate strategies through a business unit manager (ALFA) and KAM (BETA) are very similar.

The empiric observation shows that the alignment between corporate strategies and projects, for both companies, seems to be a natural consequence of how these companies perform their business. As both companies operate with CoPS business, investments made in research at the corporate level are deployed at local market depending on its local conditions. Therefore, this alignment is much more relevant at corporate level rather locally. An interesting area for academic research is how corporate strategies are deployed into projects of innovation involving different branches in different countries in terms of project management.

Although limited in the number of MNEs studied, this paper contributes in practical and academic senses. It encourages the professionals of the organizations involved in the CoPS business as well as other business market segment to apply the concepts largely used in managing complex projects in order to avoid the typical pitfalls in “one size fits all”. We believe this paper contributes to spark interest amongst scholars in such an important area of project management. The limitations are clear: first, the number of the MNEs involved in the study has to be considered when extending the conclusions and recommendations. Second, the number of interviewed persons is also limited. These factors, rather than being seem only in a restrictive perspective, should be an incentive for other scholars to expand its concept in order to support theory development regarding project complexity in MNEs.

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