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## **A REDE DE VALOR, O MODELO DELTA E A INDÚSTRIA AERONÁUTICA**

## **THE VALUE NET, THE DELTA MODEL, AND THE AERONAUTICS INDUSTRY**

## **LA RED DEL VALOR, EL MODELO DELTA Y LA INDUSTRIA AERONÁUTIC**

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## A REDE DE VALOR, O MODELO DELTA E A INDÚSTRIA AERONÁUTICA

### RESUMO

Este artigo pretende analisar as possibilidades de aplicação de estratégias baseadas na rede de valores na indústria aeronáutica. Para este fim, usamos as dimensões sugeridas no Modelo Delta, visto que este tipo de estratégia não considera apenas a companhia, os clientes e fornecedores, mas também seus complementadores. Por meio de um estudo de caso único, porém altamente representativo na indústria aeronáutica global (Embraer), verificou-se que estratégias baseadas na rede de valores sustentam fortemente o modelo de negócios da companhia pesquisada. Essas estratégias são os meios pelos quais a organização estudada obtém e sustenta vantagens competitivas. As estratégias baseadas na rede de valores parecem se adequar ao modelo de negócios de compartilhamento de riscos adotado pela Embraer. O gerenciamento efetivo da rede de valores simultaneamente permite que cada participante aproveite o sistema ao máximo e contribui incisivamente para incrementar o desempenho do sistema. Além de trazerem aos participantes retorno econômico acima da média, tais estratégias fortalecem a ligação entre eles enquanto mantêm fora os competidores.

**Palavras-chave:** Estratégia; Rede de Valores; Competitividade; Aeronáutica; Embraer.

## THE VALUE NET, THE DELTA MODEL, AND THE AERONAUTICS INDUSTRY

### ABSTRACT

This article intends to analyze the possibilities of applying strategies based upon the value net to the aeronautics industry. To do so, we have employed the dimensions suggested by the Delta Model since this typology of strategy considers not only the company, its customers and suppliers, but also its complementors. By studying a single although highly representative case in the global aeronautics industry, we have found out that strategies focused on the value net strongly support the business model of the company under investigation. Moreover, these strategies are the means by which the organization studied obtains and sustains competitive advantages. Strategies focused on the value net seem to fit well into the risk-sharing business model employed by Embraer, and the effective management of the value net simultaneously allows each participant to get the most out of the system and strongly contribute to increase system performance. Besides providing all participants with above average economic returns, strategies based upon the value net strengthen the bonding among them while locking them in and competitors out.

**Keywords:** Strategy; Value Net; Competitiveness; Aeronautics; Embraer.

## LA RED DEL VALOR, EL MODELO DELTA Y LA INDUSTRIA AERONÁUTICA

### RESUMEN

Este artículo tiene como objetivo analizar las posibilidades de implementar estrategias basadas en la red de valor en la industria aeronáutica. Para ello, utilizamos las dimensiones sugeridas en el Modelo Delta, ya que este tipo de estrategia tiene en cuenta no sólo la empresa, clientes y proveedores, sino también sus complementarias. A través de un estudio de caso único, pero muy representativa de la industria mundial de la aviación (Embraer), se encontró que las estrategias basadas en los valores de red, apoyamos firmemente el modelo de negocio de la empresa investigada. Estas estrategias son el medio por el cual la organización estudiada obtiene y mantiene una ventaja competitiva. Las estrategias basadas en los valores de la red parecen encajar en el modelo de negocio de distribución de riesgos adoptada por Embraer. La gestión eficaz de la red de valores al mismo tiempo permite que cada participante al máximo disfrutar del sistema y contribuye decisivamente a aumentar el rendimiento del sistema. Además de llevar a los participantes sobre el rendimiento económico promedio, estas estrategias fortalecer el vínculo entre ellos, manteniendo a sus competidores.

**Palabras-clave:** Estrategia; Valor Neto; Competitividad; Aeronáutica; Embraer.

## 1 INTRODUCTION

The competition takes very complex forms and achieves high levels of intensity requiring companies to develop strategic positioning that allow them to pursue performance superior to that of their main competitors. Beyond achieving superior performance, it is obviously crucial to meet customers' needs, although taking this for granted might be the root of the biggest problems companies usually face. Customer behavior is becoming somewhat ambiguous given that the customer nowadays simultaneously values attributes such as quality, support, and price. Thus, the combination of these value attributes will lead industry players to develop the solutions that deliver more and cost less. Therefore, companies find themselves embedded in competitive environments characterized by strong rivalry among competitors and customers demanding fully customized offers to meet their specific needs.

To cope with the threats of this challenging business landscape, companies need to formulate strategies that not only foster competitive advantages but also support them in sustaining these advantages. The well-known generic competitive strategies proposed by Porter (1980) were very effective in days of linear competition because they relied on the cost and differentiation dimensions. Although they do not seem to be sufficient to compete in today's complex environment since it is essential to exceed by far the notion of making 'trade-offs' and thereby employ more than a single strategic choice.

We highlight the need for exploring new dimensions rather than only addressing those of cost and differentiation or the combination of both. This requires a deep understanding of the role played by all parties involved in planning and delivering solutions to target customers. Hence, it is very important to consider the possibility of changing not only the focus but also the scope of the competitive analysis, which may include the migration from the value chain (Porter, 1985) to the value net (Brandenburger & Nalebuff, 1996; Kotler & Keller, 2006). To make it happen, the company may admit the chance of competing with some players while cooperating with others, what has been called cooptation (Brandenburger & Nalebuff, 1996; Dowling et al., 1996; Lado, Boyd, & Hanlon, 1997).

We suggest that formulating and implementing unconventional strategic choices involves different perceptions of the competitive environment, especially regarding the parties constituting it and the role each of them plays. It seems to us that there is an open empirical question concerning the participants of the value net and their roles in aggregating value to the system as a whole. Then, this article aims to analyze the ways in which strategies focused upon the value net contribute to strengthen organizational competitiveness in the aeronautics industry, since the increased rivalry in

this industry urges players to adopt unusual competitive strategies so as to attain above average performance.

In addition to the present section, this article comprises another five. The next section explains how strategies based upon the value net work. The third section outlines the methodological procedures employed in this article. The manuscript then moves to presenting the aeronautics industry and the company studied. The section is followed by a critical discussion on how strategies based upon the value net fit into the aeronautics industry by analyzing several specific dimensions that characterize and support the adoption of these strategies. The article finishes with a debate on how strategies based upon the value net may contribute to a more consistent strategic positioning that copes with both industry evolution and market changes. The last section also presents how strategies anchored in the value net shed light on new perspectives for approaching the competitive environment, and as result, bring new insights to the field of strategic management and the aeronautics industry.

## **2 THEORY REVIEW**

### **2.1 FROM THE VALUE CHAIN TO THE VALUE NET**

The concepts of value chain and value net seem to be very close to each other, although some significant differences exist. The value chain is a tool employed to analyze all the activities a firm carries out and how they work together (Porter, 1985). The value net illustrates the kinds of players (customers, suppliers, competitors, and complementors) a company interacts with, by demonstrating their roles and the reciprocities among them (Brandenburger & Nalebuff, 1996). Then, the value network is “a system of partnerships and alliances that a firm creates to source, augment, and deliver its offerings” (Kotler & Keller, 2006: 471). To support and sustain the value net, the role of the complementors is of immense importance. Complementors can be understood as parties who provide complementary offers, or in a more specific way, complementors are firms who provide products or services that make each other’s offers more attractive to customers (Brandenburger & Nalebuff, 1996; Grove, 1996; Hax & Wilde II, 2001; Yoffie & Kwak, 2006). Then, complementors are an essential party for the value creation process and their presence is indispensable to turn the value chain into the value net.

To shed light on the issue of value migration between the value chain and the value net, this article gets back to inside-out and outside-in analyses. The inside-out approach seeks to



comprehend how company's operations may influence business environment while the outside-in approach aims to understand how changes in business environment may affect company's operations. Building on Porter and Kramer (2006), the value chain provides the basis for the inside-out analysis once each value chain activity can potentially produce effects in the business environment. In contrast, the value net offers a supplementary view of the elements that integrate the business environment by considering complementors. Additionally, the foremost feature of the value net is that it provides players with the required sensitivity to deal simultaneously with competition and cooperation, the so-called coopetition.

Coopetition has been subject of investigation of a number of scholars in the field of strategic management such as Gimeno (2004), Silverman and Baum (2002), Gnyawali and Madhavan (2001), Lado, Boyd, and Hanlon (1997), and Jorde and Teece (1990). They have investigated different aspects related to coopetition in many industries and their findings explain why some industries have grown more than others and why some industries have evolved in different ways. Especially regarding coopetition within knowledge-based industries, we mention studies carried out within the field of information technology (Carayannis & Alexander, 2001), biotechnology (Quintana-Garcia & Benavides-Velasco, 2003), and smart card (M'Chirgui, 2005).

Hence, to figure out where value comes from and where it moves to, it is critical to go beyond the value chain, which means formulate strategies based upon the value net rather than those based upon the value chain.

## 2.2 THE DELTA MODEL

In this topic, we aim at understanding the Delta Model, and to do so, we explain what it is and how it works. Besides comprehending the Delta Model, we try to identify which characteristics would help companies formulating and executing their strategies. Then, we discuss how the Delta Model complements the dimensions previously considered and explore those neglected by other scholars and practitioners. By suggesting an alternative approach to looking at the relationship among customers, suppliers, and complementors, the Delta Model intends to provide companies with an adaptive management process that allows them to cope with the changing business environment. The Delta Model consists of a systemic approach to business strategy formulation in networked economies and was built to face the economic forces that influence the competitive environment, since the traditional methodologies that are strongly based upon the competition have not demonstrated appropriateness to establish a sustainable strategic positioning (Hax & Wilde II, 2001).

Different from the industry organization view and the resource-based view, that call attention to the product itself, the Delta Model highlights the importance of building relationships with the customer. By doing so, the company increases the knowledge about its customers by better understanding their operations and needs. These connections with customers can be done directly by the firm or through its complementors, who can make the offer more attractive. Consequently, as per Hax and Wilde II (2001), bonding becomes the foremost element in shaping business strategy and complementors are the core of the strategy, being the Delta Model the spirit of how the company must compete and serve its customers through three distinct strategic options such as ‘best product’, ‘total customer solutions’, and ‘system lock-in’.

### 2.3 BEST PRODUCT STRATEGIC OPTION

The *Best Product* strategic option consists of the traditional means by which the company pursues competitive advantage by outperforming its competitors on the cost or differentiation dimensions, which is in line with Porter’s (1980) generic competitive strategies. By competing on the cost dimension, the organization makes low-cost offers with the purpose of meeting needs of price-sensitive customers. By competing on the differentiation dimension, the company makes special offers, which provide unique benefits for customers that accept to pay a premium price. A company employing this type of strategy attracts customers because of the characteristics of the product itself, which means that they will leave this company as soon as they find a superior product in the market (Hax & Wilde II, 2001).

The *Best Product* strategic option is consistent with the ‘total low cost leadership strategy’ (Porter, 1980), the ‘differentiation strategy’ (Porter, 1980), the ‘operational excellence strategy’ (Treacy & Wieserma, 1995), and the ‘product leadership strategy’ (Treacy & Wieserma, 1995). The *Best Product* strategic option seems to be good enough to serve customers who are only interested in the transaction, which means getting the desired product without facing problems. Therefore, the main goal of a company pursuing this strategy is to improve its own efficiency by manufacturing and delivering standardized products through mass distribution channels (Hax & Wilde II, 2001). Through the intensive distribution, the manufacturer places its products in several outlets (Kotler & Keller, 2006). By adopting these channels, the company aims to reduce cost through the optimization of distribution activities rather than customer satisfaction and loyalty. In doing so, the company seeks to increase its market share by strengthening its brands without prioritizing the customer relationship.



The role of innovation in the *Best Product* strategic option is renewing the product line (Hax & Wilde II, 2001), and by carrying out incremental innovations, the firm gains efficiency (Hollander, 1965). Having a common product platform, the company may try to reach the market before its competitors (Hax & Wilde II, 2001) and establish a dominant design (Utterback, 1994), which seems to be difficult due to the internal orientation of product development.

Taking together the main aspects featuring the *Best Product* strategic option, we notice that this positioning is very static and does not seem to be strong enough to cope with the dynamics of the competitive environment. In addition, this strategic choice makes the organization vulnerable to new entrants because competitive advantages are not sustainable, since they are strongly based on the product rather on the customer.

## 2.4 TOTAL CUSTOMER SOLUTIONS STRATEGIC OPTIONS

The *Total Customer Solution* strategic option is based upon the customer, and the company employing this strategy aims to establish bonds with its customers, what entails an appropriate segmentation and a deep knowledge on how they operate (Hax & Wilde II, 2001). Then, this strategy essentially focuses on the customer rather than on the product, and players adopting this position seek to understand what their customers need with the purpose of making customized offers. The *Total Customer Solution* strategy is in line with the ‘customer intimacy’ strategy by Treacy and Wiserna (1995) and is about providing the customer with a full package, instead of isolated products or services that usually represent pieces of solution.

Besides developing customized offers to meet customers’ needs, the *Total Customer Solution* player serves them through specialized distribution channels (Hax & Wilde II, 2001). The selective distribution allows the company to obtain the appropriate market coverage by enjoying more control and costing less than the intensive distribution strategy (Kotler & Keller, 2006). By doing so, the company expects to strengthen its relationships with customers in an attempt to increase their loyalty. Customers compare products from one company with those from competitors, and by setting up a hierarchy of values, references, and previous experiences, they make purchasing decisions (McKenna, 1991).

Instead of pursuing internal efficiency, the company employing the *Total Customer Solution* strategy intends to combine its own supply chain with those of its clients and suppliers in order to reinforce the connections with them (Hax & Wilde II, 2001). Through collaboration, supply chain partners can structure and execute the required processes to turn raw materials into finish goods in

the most efficient way (Poirier, 1999). This allows supply chain partners to achieve the appropriate time to market, which is a prerequisite for exploiting business opportunities and reaching the competitive edge.

Innovation goes beyond renewing extant products and aspires to develop new products with customer participation (Hax & Wilde II, 2001). Due to the cost and the inaccuracy of the process of understanding customers' needs, some companies have given up of trying to find out what precisely their customers desire, and have provided them with tools intended to assist them in designing and developing their own products (Thomke & von Hippel, 2002). As a result of involving customers in product development activities, the company may be able to create architectural products. Architectural innovation consists of recombining existing components of a system by linking them in a different way (Henderson & Clark, 1990). In doing so, the firm can serve either new markets or applications, although it has to deal with the issue of identifying or creating new market segments (Tidd, Bessant, & Pavitt, 2001).

By learning about customers' needs and preferences and by making them familiar with its products and services, the *Total Customer Solution* player fosters a mutual learning that leads to bonding, and as a result, competitors cannot simply benchmark it (Hax & Wilde II, 2001). This allows a degree of customer bonding that is greater than that of usually obtained by companies adopting the *Best Product* position. To achieve the *Total Customer Solution*, the company must select a way among Redefining Customer Experience, Horizontal Breadth, and Customer Integration.

*Redefining Customer Experience* is about changing the relationships the customer previously had with the company, starting from buying through the total life cycle of ownership (Hax & Wilde II, 2001). Traditional marketing has been replaced by experiential marketing, since the latter takes into account relevant aspects such as customer experience, focus on consumption, eclectic methods and customers who are taken as rational and emotional animals (Schmitt, 1999). Although exceeding customers' expectations increases the probability of retaining them, it is of great importance to point out that constantly exceeding their expectations will become more difficult and even more costly for the company (Kotler, 1999).

*Horizontal Breadth* consists of providing customers with an integrated and customized broad set of related products and services that will improve their economics (Hax & Wilde II, 2001). By offering a bundle of products and services that meets most of the customers' needs, the firm keeps them close to its domain, and as result, increases the probability of building strong relationships with them. Hence, these relationships facilitate the bonding creating process between

the company and its customers, which may lead to competitive advantages because competitors cannot easily replicate this process.

*Customer Integration* regards the situations in which the company performs some activities previously carried out by customers due to its higher efficiency or effectiveness to enrich customers' economics (Hax & Wilde II, 2001). Even though customers may spend more money in the short run, their total costs will be lower in the long run (Kotler, 1999). Therefore, the customer integration generates strong bonding between the company and its customers, and creates high switching costs. In addition, the *Customer Integration* approach may lead to competitive advantages due to the high commitment and common interests that emerge between the involved parties.

## 2.5 SYSTEM LOCK-IN STRATEGIC OPTION

This strategic option broadens the scope of the business previously considered by the *Best Product* and the *Total Customer Solution* positions, and corresponds to the most robust mode of bonding because the firm deals with the total architecture of the system which includes the firm itself, its customers, its suppliers, and its complementors (Hax & Wilde II, 2001). The *System Lock-In* position finds support in the system theory by Von Bertalanffy (1969) since the firm is seen as an element or a subsystem of a greater system, and in accordance with this argument, each element has a specific role to perform if the system as whole is to survive and prosper.

Brandenburger and Nalebuff (1996) refer to the previously mentioned system as the value net, which encompasses the firm, its customers, its suppliers, and its complementors. Besides recognizing which parties integrate the system, it is of great importance to understand the nature of the connections built among them and the motivations to do so. Based upon the resource dependence perspective (Pfeffer & Salancik, 1978), we argue that the firm seeks to establish coalitions with its customers, its suppliers, and its complementors with the purpose of obtaining the required external resources and reducing its dependence on them. In doing so, the *System Lock-In* player increases its power over other elements of the value net and inhibits the competition that might result from backward or forward integration. Therefore, the system becomes more valuable as its elements intensify their participation and commitment, which drives them to an economic zone of greater returns followed by growth (Hax & Wilde II, 2001).

By taking the extended business as a system in which the complementors play an essential role, the firm integrates them into its supply chain, its distribution channels, and its innovation process. This represents an important set of changes, especially from a closed and linear architecture to an open and complex one. This new kind of enterprise can be characterized as a

boundaryless organization, which, in accordance with Ashkenas, Ulrich, Jick and Kerr (2002), is the one whose boundaries are highly permeable and flexible. Consequently, the company must develop the appropriate skills to structure the value net and make it work properly mainly through the complementors.

The *System Lock-In* player aims at improving its supply chain by going beyond the traditional relationships with its customers and suppliers; and to make this process effectively work, the company uses its complementors. Since the constellation approach is viewed as a networked structure idealized to bring new products to market, the main goal of the value chain constellation is to create solutions that synchronize the network activities to satisfy customer's needs (Poirier, 1999). Therefore, complementors are the means by which a company improves the system performance. In other words, the more the company attracts, satisfies, and retains complementors, the more it will attract, satisfy, and retain customers (Hax & Wilde II, 2001).

The innovation focus of the company pursuing the *System Lock-In* strategic option is the open architecture and complementors play a key role (Hax & Wilde II, 2001). This is in line with the fifth generation R&D, in which systems act collaboratively rather than in competitive or cooperative ways, and encompass several parties such as suppliers, customers, partners, distributors and other stakeholders (Rogers, 1996). Additionally, the fifth generation can be understood as the process by which companies seek to strengthen the integration and networking with external agencies to cope with the growing complexity and pace of industrial technological change (Rothwell, 1994). Therefore, ideas can be generated internally or externally to the organization and can head the market from inside or outside the organization, which constitutes the open innovation paradigm (Chesbrough, 2003).

As stated by Hax and Wilde II (2001), the *System Lock-In* strategic option can be achieved through three distinct ways: proprietary standard, dominant exchange, and restricted access. A *Proprietary Standard* certainly is the most desirable strategic position due to its strong potential to allow the company to achieve high margins, large market share, and long-term sustainability (Hax & Wilde II, 2001). Therefore, the establishment of a *Proprietary Standard* leads the company to vast competitive advantages; however, it is not applicable to every product or service because it depends upon rare opportunities that emerge from specific parts of the industry architecture (Hax & Wilde II, 2001).

Through the adoption of the *Proprietary Standard*, a number of organizations have created enormous value such as Microsoft, Intel, and Cisco. Even though these examples refer to companies who have succeeded by positioning themselves as proprietary standards, it is worth to note that



nonproprietary standards also represent a powerful way to obtain competitive advantages, as for the case of JVC who introduced the VHS format.

The *Dominant Exchange* is another means by which a company can pursue the *System Lock-In* strategic option. By applying the *Dominant Exchange* choice, the company establishes an interface between parties who are interested in exchanging any kind of information or good, especially buyers and sellers; and the greater the number of people who participate in this process the higher the value of the business that is positioned as the interface (Hax & Wilde II, 2001). This growth allows the emergence of a virtuous cycle in which the *Dominant Exchange* player governs the flow of information and goods, and as a result prevails over its competitors and becomes hard to be beaten. Moreover, it is very important to highlight that to employ the *Dominant Exchange* approach the company must precisely define which segment it will focus on. Yellow Pages, Visa, MasterCard, eBay, and Amazon, among others, are good examples of successful employment of the *Dominant Exchange* approach. These companies have created and grown powerful interfaces between sellers and buyers and nowadays enjoy the foremost position in their industry. Besides the *Proprietary Standard* and the *Dominant Exchange*, the *Restricted Access* is another approach to attain the *System Lock-In* strategic choice. Different from the first two that attempt to create bonding by simultaneously locking customer in and locking competitors out, the *Restricted Access* player seeks to exploit the constraints resulting from distribution and supply chain activities (Hax & Wilde II, 2001). These restrictions impose high barriers to competitors and prevent them from accessing customers especially because their distribution channels cannot effectively deal with multiple vendor parties (Hax & Wilde II, 2001).

### 3 METHODOLOGY

To accomplish the objective of analyzing the possibilities to apply the strategies based upon the value net to the aeronautics industry we have opted for the exploratory method. By employing this research method, we understand we can increase our knowledge about the phenomenon under investigation and turn it into variables and hypotheses to be tested later (Goode & Hatt, 1979). Relying on Sampson (1996), we understand that the case study is the most appropriate approach for this research because it is predominantly exploratory, considers a small number of respondents, does not require a scientific sampling even though the selection of cases is significant, and does not try to quantify results. Therefore, we have decided to adopt the case study which in accordance with Yin (2003: 13) “is an empirical inquiry that investigates a contemporary phenomenon within its

real-life context, especially when the boundaries between phenomenon and context are not clearly evident.”

Considering the case selection is relevant for building theory from case study as is the population definition for sampling in researches that test hypotheses (Eisenhardt, 1989), we placed emphasis on the process of selecting the suitable case. We have utilized the convenience criterion to opt for the case because it allows time and money savings (Miles & Huberman, 1994). Moreover, we argue that this case is a typical case since it stands for a number of cases in which a wider phenomenon occurs (Gerring, 2007). We understand that the chosen company, Embraer, is a representative organization of the global aeronautics industry because of some reasons. First, it is a technology-based company who operates worldwide to design and manufacture aircrafts for the civil and military aviation industry. Second, it is a company who belongs to a system composed of suppliers, customers, complementors, and competitors. Third, it is a successful company who is highly competitive and has been employing strategies considered to be based upon the value net.

We have raised data from both primary and secondary sources. The latter involved public and private data available in annual reports published by several companies, industry reports written by federal agencies such as Federal Aviation Administration – FAA (USA), National Civil Aviation Agency – ANAC (Brazil), European Aviation Safety Agency – EASA (European Union), periodicals on the civil aviation sector, and audiovisual materials. To obtain primary data, we conducted in-depth interviews with current and former Embraer’s employees and collaborators encompassing managers, executives, and business partners. We prepared a semi-structured questionnaire to help us get the most out of these interviews, which were carried out through personal meetings, telephone calls, and electronic messages from January to June/2009.

We have employed the analytical process suggested by Marshall and Rossman (2006) which comprised the following phases: data organization, data immersion, categories and themes generation, data coding, data interpretation, alternative understandings, and report writing. To interpret the means by which Embraer formulates and executes strategies based upon the value net we have analyzed the dimensions proposed by Hax and Wilde II (2001) which include strategic focus, relevant benchmarking, customer value proposition, product offerings, relevant supply chain, relevant channels, impact on brands, innovation focus, information technology role, and degree of customer bonding.



#### 4 THE AERONAUTICS INDUSTRY AND THE EMBRAER

The aeronautics industry mostly consists of companies who design, develop, manufacture, commercialize and support aircrafts for civil and military markets, what makes it of great importance for the economic growth of both developed and emerging countries. The world's largest aircraft manufacturers are Boeing (United States), European Aeronautic Defence and Space Company – EADS / Airbus (The Netherlands), Lockheed Martin (United States), Bombardier (Canada), Textron (United States), Gulfstream (United States), Embraer (Brazil), Dassault (France), and Finmeccanica (Italy) (Aboulafia, 2007a), and including the BAE Systems, they account for over 85% of this industry revenues (Aboulafia, 2007b).

According to ICAF (2007 *apud* Metcalf, 2007), large commercial aircraft fall into the categories very large aircraft (over 400 seats), twin-aisle aircraft (between 230 and 399 seats), single-aisle aircraft (between 126 and 200 or more seats), and small single-aisle aircraft (nearly 100 seats), and those with capacity below 100 seats are considered to be either regional jet or very light jet aircraft. While Airbus and Boeing focus their efforts to develop over 100 seats aircraft, Bombardier and Embraer compete for the regional and very light jet aircraft segments.

Embraer (Aeronautical Brazilian Company) is an aircraft manufacturer created in 1969 under the president of the Republic Arthur da Costa e Silva's administration with the main purpose of serving the Brazilian Air Force (FAB). Working predominantly for the Brazilian government until 1990, Embraer faced a strong crisis and has been privatized in 1994. After its privatization, the company has been restructured to attend the regional commercial aviation market and has undergone a technological advance which has immensely contributed to its growth in the 2000s (Embraer, 2008a). Employing more than 16,000 people, listed on the São Paulo Stock Exchange (Bovespa) and the New York Stock Exchange (NYSE), Embraer accomplished good outcomes in 2009 as follows: (i) R\$10.8 billion net sales, 8% less than 2008's, (ii) R\$895 million net profit against US\$429 million in 2008, (iii) US\$4 billion market value, 60% more than 2008's, and (iv) 244 aircraft delivered (122 to the commercial aircraft segment, 115 to the executive aircraft segment, and 7 to the defense and government segment) and approved by the ANAC, FAA, and EASA (Embraer, 2010a).

As per Aboulafia (2007a), in 2007 the civil aircraft production market was valued at US\$83.5 billion with potential to achieve US\$110.1 billion in 2016 while the military market was valued at US\$31.0 billion with potential to reach US\$36.6. Embraer (2008c) expects the world air traffic demand to increase 4.9% per year over the 2008-2027 period and Airbus (2007) forecasts

24,262 new passenger and freighter aircraft deliveries from 2007 to 2026. Additionally, for the 2007-2027 period, Boeing (2008a) foresees annual market growth rates of 3.2% for the world economy, 3.2% for the number of airplanes in service, 4.0% for the number of airline passengers and 5.8% for the cargo traffic. From 2008 to 2027, the 30 to 120-seat segment is predicted to worth US\$235 billion and globally demand 7,540 jets (Embraer, 2008c). Considering that the worldwide business jet fleet was estimated to be nearly 12,800 (excluding very light jet segment) at the end of 2007 and its yearly retirement rate ranges from 0.5% to 1.0%, the forecasted revenues (US\$300 billion) and theirs deliveries (13,200 units) over the 2008-2017 period may raise the fleet to 24,800 aircrafts, thereby creating opportunities for pilot training, maintenance facilities, and aviation infrastructure (Bombardier, 2008).

## **5 DISCUSSION**

This section is intended to discuss the dimensions that support the strategies based upon the value net. Therefore, we outline each of them by connecting them to the case of Embraer. In doing so, we expect to explain what strategies based upon the value net are and how they work. The following analysis is essential to the understanding of these strategies' dynamics and shows how the selected company has overcome its competitors.

### **5.1 STRATEGIC FOCUS**

Considering Embraer as an extended enterprise embracing the company itself, its customers, its suppliers, and its complementors, we emphasize the alignment between its business model and its strategic focus. According to Embraer's business model, the company is responsible for designing, integrating, and assembling the aircraft while its suppliers and complementors are in charge of the detailed design and manufacturing of components and parts of the aircraft. Moreover, this connection goes by far beyond a contracting agreement and is characterized as a risk-sharing relationship (Ghemawat, Herrero, & Monteiro, 2000) that requires high level of commitment. Taking the organization as an extended enterprise and following the thinking of Sull and Spinoza (2005), we argue that the value net must be viewed as a nexus of commitments in order to assure its effectiveness. By employing this approach, the company has been successful in serving the regional commercial segment through the families ERJ 145 and EMB 170/190, and as per Embraer (2008d), together they accounted for 46% of market share on the 30 to 120-seat jets segments.

To cope with industry dynamics and take advantages of emergent opportunities, Embraer has widened its strategic focus to increase its participation in all segments of business jets market and in the single-aisle segment of the large commercial aircraft market. Embraer foresees 11,880 business jets deliveries over the 2009-2018 period, which are estimated at US\$204 billion, thereby motivating the company to pursue the leading position in the business aviation market by offering innovative and differentiated products and service solutions (Affonso, 2008). Due to the need for adjusting their operations in the increasing mid-density markets, airlines need to replace their old and inefficient aircraft what will generate nearly 6,750 deliveries in the 30 to 120-seat segment from 2009 to 2028 (Kern, 2008). This may foster the competition in the overlapping area comprising the higher end of the capacity range attended by Embraer and Bombardier and the lower end served by Boeing and Airbus. Boeing (2008b) acknowledges and expects this competition to be significant and therefore calls for attention regarding real potential competitors from Brazil, Canada, China, Japan and Russia.

## 5.2 RELEVANT BENCHMARKING

The relevant benchmarking employed by Embraer put emphasis on complementors rather than competitors or customers. Since the risk-sharing relationship is mandatory for Embraer's largest suppliers (Ghemawat et al., 2000), we refer to them as complementors due to the key role they play in the system. As the project involves a number of phases such as market analysis, conception/ante project, partners and suppliers selection, project, prototype production, roll-out, simulation, certification, series production, start-up teams, fleet monitoring, Embraer's complementors are geographically dispersed all over the world.

According to market information, global partnerships are established to develop and manufacture radome (Saint Gobain, USA), wing stub and control surfaces (Kawasaki, Japan), engine nacelles (GEAE, USA), electrical system and air management system (Hamilton Sundstrand, USA), avionics, lights and wingtips (Honeywell/Grimes, USA), center fuselage slats (Sonaca, Belgium), center fuselage doors (Latecoere, France), empennages and rear fuselage (Gamesa, Spain), tail cone and APU (Hamilton Sundstrand, USA), fuel system, flight control system and hydraulic system (Parker, USA), interior (C&D, USA) and landing gear (Liebher, Germany). Hence, by building a knowledgeable and powerful value net, Embraer relies its benchmarking on its partners and the more they are committed to strengthen the value net the higher the project performance and the greater the profits of all involved parties. To make it happen, Embraer must carefully assess its partners in order to select those who fit into the value net. Considering

complementors as the relevant benchmarking puts Embraer one step ahead from its competitors and provides the company with significant knowledge on what is going on in the marketplace. This gives the organization the ability to act proactively towards meeting customers' needs and making profits while competitors just respond to market demands since their relevant benchmarking emphasize other competitors and customers.

### 5.3 THE CUSTOMER VALUE PROPOSITION

The risk-sharing relationship endorses Embraers' systemic vision and exceeds the product and customer economics since its foremost goal is to achieve a position that benefits all elements of the system, which constitutes the system economics. Accordingly, the customer value proposition emanates from the synergy between complementors. This means that the total solution is greater than the sum of the parts each partner delivers, and by successfully managing the value net Embraer obtains competitive advantages over its competitors.

Since the implementation of the hub and spoke model, the market for regional jets has been increasing and changing the dynamics of the aeronautics industry. The ERJ 145 family has totally been successful and widely contributed to Embraer's growth and consolidation. Actually, the ERJ 145 family helped Embraer returning to the profitability zone in 1998, after 11 consecutive years of losses (Goldstein, 2002). Due to its strong customer value proposition, Embraer has gained 47% market share of world's 30-60 seat segment (Chiessi, 2008) and met airlines' needs for cost effective aircrafts. As per ICAF (2007), regional jets supply the demand for aircrafts with fewer seats than the traditional Boeing 737 by allowing airlines to schedule flights with flexibility and reduce operational costs.

Embraer believes in the potential for 70 to 120-seat aircrafts especially because their wide business application including regional aviation, network, low cost and charter (Embraer, 2008c). Compared to older jets (717, F100, 737-500, 737-300, DC-9-30, MD-87), EMB 190/195 allows up to US\$2.7 million fuel savings and up to US\$1.2 million maintenance cost savings yearly (Kern, 2008). 53% of E-jets operations address right-sizing of narrowbody services while 26% represent natural growth, 15% focus on new markets, and 6% deal with direct replacement (Chiessi, 2008). In addition to helping airlines operating effectively, E-Jets provide passengers with more comfort by using a single aisle configuration with 4 seats per row.

## 5.4 PRODUCT OFFERINGS

Embraer organizes its product offerings into categories such as commercial aviation, executive aviation, defense and government, and aviation services (Embraer, 2008b). The company assembles the aircrafts although it relies on its complementors to develop the products that shape its portfolio. By employing the risk-sharing model, Embraer successfully served the commercial aviation market with the ERJ 135, ERJ 140, ERJ 145, and ERJ 145 XR aircrafts. Up to December/2010, Embraer has delivered 108 ERJ 135, 74 ERJ 140, and 706 ERJ 145, besides holding a backlog of 2 ERJ 145 (Embraer, 2011). Using the same approach, the company introduced the EMB 170, 175, 190, and 195 aircrafts. Up to December/2010, Embraer has delivered 181 EMB 170, 133 EMB 175, 321 EMB 190, and 64 EMB 195 and has accumulated a backlog of 10 EMB 170, 40 EMB 175, 157 EMB 190, and 41 EMB 195 (Embraer, 2011).

To enjoy the emergent opportunities in the executive aviation market, Embraer has developed and released the Lineage 1000, Legacy 600, Phenom 300, and Phenom 100 and has been developing the Legacy 450 e 500. Over the 2009-2018 period, Embraer forecasts 11,880 deliveries and US\$204 billion revenues for the executive market, not including the demand for new business models, estimated around 1,800 to 2,800 units (Affonso, 2008). Therefore, Embraer expects to be one of the world's most important players in the executive aviation market by 2015 (Embraer, 2008b). Embraer's product offerings to defense and government market focus on the intelligence, surveillance and reconnaissance, training, combat, transport, and systems & services (Aguilar, 2008). To serve different segments within the defense and government market, Embraer has created the Super Tucano (for training and light attack), AMX (for ground attack), EMB 145 AEW&C (for airborne early warning and control), EMB 145 RS/AGS (for remote sensing, air-to-ground surveillance), P-99 (for maritime patrol and anti-submarine warfare), and E-Jets, ERJ 145, Legacy and Phenom (for VIP transportation) (Embraer, 2008b).

Another category of product offering is the aviation services, which includes maintenance services, material solutions and customer training, and whose net revenues achieved US\$528 million in 2007 (Embraer, 2008b). Besides its manufacturing units in Brazil (ELEB, Embraer São José dos Campos, Embraer Eugênio de Melo, Embraer Gavião Peixoto e Embraer Botucatu) (Embraer, 2008a), Embraer also has service centers in Brazil (Gavião Peixoto Plant), Portugal (OGMA – Indústria Aeronáutica de Portugal), United States (Embraer Aircraft Maintenance Services – EAMS) plus one in Europe and three in the United States under implementation (Embraer, 2008b).



## 5.5 RELEVANT SUPPLY CHAIN

Embraer's relevant supply chain can be seen as a system supply chain encompassing the firm itself, its suppliers, its customers, and its complementors. Since the technology is an important driver for Embraer's business, the system supply chain reinforces the risk-sharing relationship among partners and allows the company to develop simultaneously products to serve the commercial, executive, and defense markets. By effectively managing its supply chain, in 2009, Embraer increased its production and delivery volume setting new aircraft delivery record for the third consecutive year, achieving its delivery goal (242 aircrafts) (Embraer, 2010a). Likewise, Embraer delivered 246 aircrafts in 2010 (Embraer, 2011).

Embraer has extensively been applying the lean philosophy to its operations ranging from components manufacturing to final aircraft assembly (Coutinho, 2008). Through the Embraer Enterprise Excellence Program, the company has increased productivity and production cycle gains by 20% at the key production bottlenecks (Embraer, 2008b). As a result, Embraer has increased its operational efficiency and attained its manufacturing objectives.

Embraer's competences to manage strategically the system supply chain have allowed the company to identify windows of opportunities and serve different market segments earlier than its competitors have started doing so. Since Embraer's complementors are geographically dispersed around the world, its effectiveness to manage the value net is key not only to project performance but also to accomplish delivery goals.

## 5.6 RELEVANT CHANNELS

Embraer has clients all over the world and has been serving the commercial, executive and defense markets through its own distribution channels. With headquarters in Brazil, the company has internationally expanded and established offices, subsidiaries and customer service units in China, France, Portugal, Singapore and United States (Embraer, 2008a). Although all its industrial units are based in Brazil, Embraer is strongly committed with foreign markets, which account for nearly 96% of its total revenues. To advertise its aircrafts to its potential clients, Embraer uses its foreign regional offices (United States, France, China and Singapore) and participates in several promotional events such as the Singapore Air Show (Singapore), the Regional Airlines Association (United States of America), the Farnborough Air Show (United Kingdom), and the Paris Air Show (France), among others. In doing so, the company has sold E-Jets to 52 airlines in 35 countries (Kern, 2008). By the end of 2007, Embraer sustained its leadership in the world's up-to-120-seat



segment with 47% market share and a backlog of 476 aircrafts of the ERJ 145 and EMB 170/190 families (Embraer, 2008a).

Through its own distribution channels to customers and complementors, Embraer grew the E-Jets number of orders from 60 (in 1999) to 1,752 (in December 2009), which was worldwide distributed as follows: 23% for North America, 32% for Europe, 21% for Latin America, 11% for Asia Pacific, 7% for Brazil and 6% for other regions (Embraer, 2010a). For 2010, Embraer's net revenues were estimated at US\$5.25 billion (Embraer, 2010b). Another approach to customers Embraer has employed was the e-marketplace. Along with ATR, a leading turboprop manufacturer, Embraer has created the Aerochain, an electronic commerce portal aimed to facilitate the relationship with their suppliers and customers (Embraer, 2008a).

## **5.7 IMPACT ON BRANDS**

The EMBRAER brand is worldwide recognized and respected, thereby associated with reliable products and advanced technologies (Embraer, 2008a). With the increasing success of the E-Jets, the company has focused the corporate branding on the EMB 170/190 family. As a result of that, each participant of the value net enjoys the reputation of the EMB brand while simultaneously conveys credibility and trust to the system as a whole. Due to the large number of partners and suppliers involved in the development and manufacturing of an aircraft family, the company must effectively harmonize its brand around the value net in order to benefit all elements of the system. In doing so, each of them adds value to its own brand while contributes to strengthening the EMBRAER brand.

Although companies from emerging economies usually face the challenge of overcoming the difficulties resulting from poor image, especially associated with political and economic instability, social and cultural differences, and technological delays, Embraer has been able to manage these barriers and has built strong reputation throughout the world. In 2007, Embraer invested nearly R\$12 million in social programs in communities close by its headquarters, through the Embraer Education and Research Institute, whose main project was the Engenheiro Juarez Wanderley High School that has approved 93% of its graduates in universities around the Brazilian territory (Embraer, 2008b). Embraer's view on sustainability involves the pursuit of excellence in the economic, social, and environmental aspects (Embraer, 2010a). Hence, the company has been investing in technologies that allow reduced gases emission and level of noise besides other technological research programs.

## 5.8 INNOVATION FOCUS

The innovation focus considers the open architecture including the firm itself, its suppliers, its customers, and its complementors. Even though all of them are essential to make the system work, we emphasize the relevance of the complementors since they foster the innovation process in order to benefit the whole value net. This is in line with the risk-sharing business model and explains how Embraer outperforms its competitors. The product development process has evolved from sequential development to simultaneous engineering to integrated product development and product objectives are set based upon market needs (Matsuo, 2008). Aiming to improve the development phase of aircrafts, Embraer has created in 2000 the Virtual Reality Center (VRC), an electronic tool that assists engineers in visualizing aircraft's structure and systems throughout the development phase (Embraer, 2008a).

By involving different parties in the development process and effectively managing them, Embraer gets the most out of them and simultaneously allows them to get the most out of the value net. Although it seems to be a very open architecture, Embraer has certain control over the system in order to keep the innovation process aligned with its main organizational objectives. This appears to be in accordance with the elite circle model of collaboration proposed by Pisano and Verganti (2008: 81), "in which one company selects the participants, defines the problem, and chooses the solutions". Therefore, the innovation focus is one of the Embraer's strengths and supports the company in carrying out integrated developing projects, thereby increasing its productivity and fostering their performance. By going beyond the traditional ways in which its competitors used to involve customers and suppliers in product development activities, Embraer has built a successful model of innovation.

## 5.9 INFORMATION TECHNOLOGY ROLE

The role of information technology farther exceeds the support to internal operations, customers and suppliers. Actually, the information technology fully supports the network activities by providing the means by which the elements of the value net interact with one another. Rather than facilitating the communication among the parties involved in project planning and execution, information technologies comprise those tools utilized to manage the project in every single phase of its life cycle. These tools allow the company to carry out the integrated product development, which as per Matsuo (2008) involves initial definitions, joint definition, detailed design and certification, series production and phase out.

Due to the high importance of technology to Embraer's business model, technological tools play a significant role in assisting the company to manage its development projects. Using the digital factory, Embraer integrates the two product development environments: engineering (digital mockup) and manufacturing (assembly simulations and 3D work instructions) (Matsuo, 2008). Since the ERJ family, projects have been developed with the use of CAD (computer aided design), CAE (computer aided engineering), and CAM (computer aided manufacturing), what allowed Embraer to effectively manage a large volume of knowledge and complexity activities. The use of these tools has also helped Embraer to increase sharply its employees' productivity and to attain project schedule and budget, what has been critical to its improvement and growth.

### **5.10 DEGREE OF CUSTOMER BONDING**

Embraer's degree of customer bonding is greater than that of its main competitors because they strongly rely on product features. Differently, Embraer focuses on building relationships with customers by involving those complementors who facilitate system operations. Data show that aviation services accounted for 11% of Embraer's total revenues in 2009 (Embraer, 2010a). In addition, in 2007, the fleet of Embraer aircraft represented 4% of world's maintenance services, which corresponded to nearly a US\$4 billion market (Embraer, 2008a).

To keep tight bonding with its clients, Embraer not only sells aircrafts to them but also assist them in getting the most out of these products. For instance, in 2007, Embraer celebrated a partnership with the Canadian CAE with the purpose of training pilots and maintenance staff for the executive jets (Phenom 100 and Phenom 300) (Embraer, 2008b). Another initiative was the EMB 170/190 flight simulator established in Singapore, which has been set up to receive annually up to 400 pilots (Embraer, 2008a).

Because of Embraer's business model, which emphasizes risk-sharing and profit-sharing relationships, the degree of customer bonding grows with the increasing use of Embraer's products and services. This gives Embraer a competitive advantage over its competitors since its aircrafts are essential to support airlines' business, as for the case of ERJ 145 and EMB 170/190 families. This creates a virtual cycle in which the more customers use Embraer's products and services through Embraer own channels and its complementors, the stronger the degree of customer bonding resulting from the effectiveness of the value net management.

## 6 FINAL REMARKS

This article aimed to analyze the possibilities of applying strategies focused upon the value net to the aeronautics industry. To do so, we have explored the missing link between the industrial organization and the resource-based view. We have done that by studying the dimensions that foster the performance of the system as a whole rather than only focusing on product features or customer needs. By applying the dimensions suggested by the Delta Model (Hax & Wilde II, 2001) to a single case in the aeronautics industry, we have found out that strategies based upon the value net are the most appropriate to technology-based companies.

By addressing the value net, this manuscript tried to overcome the cost versus differentiation dilemma through the exploration of dimensions previously ignored or not deeply analyzed. Our findings show that by considering these dimensions, the organization can pursue strategic positioning alternative to those suggested by scholars supporting either the industrial organization or the resource-based view, thereby achieving the required flexibility to compete successfully in today's business world. Due to its ability to employ an adaptive management system, Embraer has established a strategic positioning that competitors cannot easily replicate. Besides sharing risks with its partners, Embraer gets their commitment to increase its productivity and bottom-line. Embraer's financial results have demonstrated how effective its competitive strategy has been and how much companies all over the world have used their aircrafts. Therefore, it can be seen that the strategic focus has migrated from the value chain to the value net.

Besides providing customers with reliable and useful products, Embraer has been able to obtain above average economic returns. Together, these conditions allow the company to achieve sustainable growth over time, which is crucial to attract investor's money and trust. Therefore, the company attracts, satisfies, and retains customers by attracting, satisfying, and retaining complementors, which are mainly represented by its risk-partners. The Embraer case illustrates how a global company can simultaneously focus on products, customers, and the whole system and keep all involved parties in the profitability zone. Embraer's competences to make it happen rely on its knowledge on the aeronautics industry and its orientation to technology and market.

This article presents contributions to scholars and practitioners of the field of strategic management regarding global competitiveness and strategies focused on the value net applied to technology-based companies. Concerning the contributions to the academia, this manuscript presents an alternative view of strategic positioning that may be able to shed light on the cost versus differentiation dilemma. With regard to contributions to practitioners, findings show that strategies based upon the value net may represent a complementary approach to explain why companies

perform differently within the same industry and how they can use complementors to outperform their competitors. Some limitations must be considered regarding the paper we have written. First, we have studied a single case in the aeronautics industry. Even though the selected case is a representative case within the industry analyzed, findings may vary across players in the same industry. Another limitation involves the dimensions we have employed to discuss how strategies based upon the value net work. We have adopted those dimensions proposed by the Delta Model (Hax and Wilde II, 2001) although additional dimensions or a different set of dimensions may be utilized and lead to different findings.

We highlight some possibilities for future research efforts regarding strategies based upon the value net and the aeronautics industry. On the one hand, this study could be replicated to analyze other players in the aeronautics industry. In doing so, we believe one could raise important data that could be useful in planning a quantitative study in the aeronautics industry. On the other hand, one could employ and test different dimensions in order to come up with a new set of dimensions to be used to analyze strategies based upon the value net. Other possibilities would involve comparative investigations and/or cross-industry analyses. These investigations would help us understand how the adoption of strategies based upon the value net varies across industries and under which market conditions they would be recommended.

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