PRODUÇÃO

A study of the competitiveness of the most important compact automotive vehicles manufactured in Brazil

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Abstract

This article describes the methodology and the results of a qualitative empirical research carried out to identify the determinants of competitiveness of the most important compact automotive vehicles produced by the four major car manufacturers operating in Brazil: Fiat, Ford, General Motors and Volkswagen. The methodology chosen was the one recommended by the fields and weapons of the competition model, because it is both qualitative and quantitative, and also because it very clearly represents the competitive business and operational strategies of companies. The results confirmed the hypothesis that were validated by Popper's deductive method: 1) there is no statistically significant differences between the fields of competition chosen for the more competitive automotive vehicles and those chosen for the less competitive ones, once they all compete primarily on design, quality and price of product; 2) the focus (the mathematical variable that measures the alignment of the weapons of the competition with the fields of the competition selected for each vehicle) explains why a certain automotive vehicle is more competitive compared to the other.

Keywords

1. Introduction

1.1. *The automotive industry in Brazil*

The Brazilian automotive industry holds significant figures. It comprises 25 assemblers and more than 500 parts manufacturers with revenues of US$ 46.9 billion in 2009 – the fifth producer and the eleventh exporter of vehicles in the world. From 1957 to 2009, it has produced 45.6 million automobiles, 8.6 million light commercial vehicles, 3.4 million trucks and 766,000 buses, adding up to 58.4 million units. The installed capacity of its industrial complex can produce 4.3 million vehicles/year and 110,000 agricultural machinery units/year, directly or indirectly employing 1.5 million workers (ASSOCIAÇÃO..., 2010).

Brazil is a country of greater technological capacity, pioneer in the production of more economical and less polluting vehicles (ethanol, biofuels and tetra-fuels). The sector has been developing totally domestic automobiles (from design to production) with global quality standard and it is one of the few to master the entire product cycle. It exports vehicles, components and engineering services to all continents.

In the beginning of the 1990's, the economic opening in the country forced the domestic industry, until then protected by governmental market reserve, to increase its competitiveness. The successive record sales entailed by per capta income increase and the availability of financing for the acquisition of new vehicles attracted (and still does) new automotive assemblers and parts manufacturers that started to

100 | PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

offer safer, more modern and efficient products. This fact increased consumers' demand standards that begin to look for innovative products with lower prices and better quality and assistance of excellence.

The Brazilian automotive industry faces several structural problems such as a heavy tax burden, low productivity, exchange rate policy and bottlenecks in the auto parts sector. It also faces great challenges such as waste elimination, suppliers' integration, intensive use of new materials (aluminum, plastic, recyclable materials), intensification of the use of electronics, greater vehicle safety and reduction of environmental damage.

Competition in the automotive sector is quite complex. Assemblers need to develop and produce high quality vehicles with various attributes; they must have attractive design and performance, be economical, reliable and comfortable and have compatible prices.

1.2. Compact vehicles

The remarkable technological evolution of the so-called 'popular' car, created in 1993, consolidated the choice of consumers. Thanks to the increasing urbanization rates, space limitation in cities, lack of public transportation, economic conditions of the population and available technologies, Brazil has become the third world producer of compact vehicles and their byproducts. Nowadays, about 80% of the sales are concentrated on these vehicles, which are directed to fleet operators and consumers with lower purchasing power or to be the second or third car in the family.

Competition is intense in the compact vehicles segment, proven by the present 10 direct competitors and by the threat of new entrants, mainly from Russia, India, China, East European countries, including Honda and Toyota that still do not have compact car models. In order to become domestically and internationally competitive, the segment needs to develop automotive engineering locally, grow, invest in the increase of productivity and installed capacity, achieve international configuration that integrates several phases of the industrial process and have the tax burden reduced.

These conditions affect the domestic and international competitiveness of compact vehicles. This is not our problem though, for we are not interested in analyzing the segment, but discovering the factors that make a certain vehicle model be more competitive than the others. Even because greater competition has forced companies to devise strategies in order to reach sustainable competitive advantages.

1.3. Purpose, object and contribution of the study and research methodology

The study here reported has the purpose to identify the determining competitive factors of the best-selling Brazilian compact vehicles: Palio, Uno, Fiesta hatch, KA, Celta, Corsa hatch, Gol and Fox, manufactured by the 4 largest automotive firms in Brazil: Fiat, Ford, General Motors and Volkswagen.

The study comprehended the time period between 2003 and 2006, with data from Associação Nacional dos Fabricantes de Veículos Automotores (2003, 2004, 2005, 2006a, 2006b, 2007).

This is an empiric qualitative research. The Popperian deductive method (POPPER, 1968) was used; according to this method, a general statement (proposition, hypothesis) can only exist if it is properly formulated before being tested by systematic methods of observation, which are derived from singular statements (in this case, the ones from the fields and weapons of the competition).

The methodology chosen was the one recommended by the fields and weapons of the competition model, because it is both qualitative and quantitative, and also because it very clearly represents the competitive business and operational strategies of companies, as shown in subsection 5.1.

This article is relevant because it significantly contributes to the study of vehicles competitiveness, since it focuses on the perspective of competition between products and not between companies. The main authors of the Theory of Competitiveness, such as Porter (1980, 1985), Peteraf (1993), Krogh and Ross (1995), Barney (1986a; 1986b; 1991; 2001), Prahalad and Hamel (1994), deal with competition among companies. But Contador (2008, p. 71) emphasizes that "[...] competition generally occurs between products of a certain market and not between companies", because the fields of the competition most often selected by companies are price, product project, product quality, diversity of products or product and brand name image. Their researches demonstrated that, in only 25% of the situations, the fields selected by companies are related to the company: competition in payment conditions, prize and/or promotion and in the macro-fields of assistance, delivery time and image (of a reliable company and in social responsibility).

In the case of auto vehicles, all the 32 fields of competition (Chart 1) are related to the product, what confirms the point of view by Contador: *the product is the protagonist of competition.*

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 101

Chart 1. Fields of the competition and supporting fields.

Models		Fields of the competition and supporting fields			
		1st F. C.	2nd F. C.	1st S. F.	2nd S. F.
More competitive	Gol	Design	Quality	Price	Diversity
	Palio	Design	Quality	Price	Diversity
	Celta	Design	Price	Quality	Diversity
	Uno	Quality	Price	Design	Diversity
Less competitive	Fox	Design	Quality	Diversity	Image
	Fiesta	Design	Quality	Price	Diversity
	Corsa	Design	Quality	Diversity	Price
	KA	Design	Price	Quality	Diversity

Source: elaborated by the authors.

2. Theoretical framework: The fields and weapons of the competition (FWC) model

This section is intended to expose the concepts of the fields and weapons of the competition model (FWC) utilized in the study, excerpted from the book *Fields and Weapons of the Competition* (CONTADOR, 2008). In order to avoid repeating the reference, the citations of this book will be indicated only by the page number.

The FWC model is qualitative and quantitative – because it studies the competitiveness of companies by means of mathematical variables. These two characteristics are its differential over the other Theory of Competition models. It is an analogic model developed to represent the way companies compete (CONTADOR, 2008).

2.1. *Field of the competition and weapon of the competition concepts*

The FWC arose from a simple idea: separate the so-called competitive advantages according to customer interests, distinguishing the ones that interest them from those that do not. The first are related to the fields of the competition (such as product price and quality) and the latter are related to the weapons of the competition (such as advertisement and staff training). Customer interests are what characterize the field of the competition – if there is interest, there will be competition between companies to attain the customers' preferences. The weapons do not interest the customers (CONTADOR, 2008).

As we shall see, this distinction made by the FWC facilitates the formulation of companies' competitive strategies, because the fields of the competition refer to the business competitive strategies, while the weapons of the competition refer to the operational competitive strategies. These are two of the several analogies of this model.

2.2. *Concepts and definition of weapon and weapon of the competition*

Once the previous distinction has been made, it is possible to define weapon and weapon of the competition.

> Weapon is any activity performed or any resource administered by a company's group of employees with homogeneous assignments. Weapon of the competition is any activity performed or any resource administered by a company's group of employees with homogeneous assignments used by the company to attain and/or maintain competitive advantage. (CONTADOR, 2008, p. 78)

In order to assist the management of the weapons, it is necessary to define each weapon as activities and resources under the responsibility of a small group of employees that perform similar activities, such as the workers of a given assembly line (CONTADOR, 2008).

The weapons of a company are counted by the tens. The same weapon is used to compete in more than one field, as well as to compete in a field where several weapons are needed. The origin of competitive advantage is in the weapons of the competition (but not only in them, because there are other constraints to competitiveness, cited in subsection 5.5). It is through its effect on the weapons of the competition that the company offers competitive effectiveness to its products and itself (CONTADOR, 2008).

2.3. *Concepts, definition and configurations of the fields of the competition*

The field of the competition is

> [...] the market imaginary locus of dispute among products or companies for customer preference, where the company seeks to attain and maintain competitive advantage. (CONTADOR, 2008, p. 18)

The fields of the competition represent the attributes of the product and the company that are valued by and interesting to the customer

There are 14 fields of the competition, that is, there are 14 basic ways (besides their countless combinations) that a company can differentiate itself from the others. The configuration of the fields of the competition depicts the 14 fields in 5 combined macro-fields (CONTADOR, 2008):

- Competition in price: 1. in the price itself; 2. in payment conditions; and 3. in prize and/or promotion;

- Competition in product (goods or services): 4. in product design; 5. in product quality; and 6. in product diversity;

- Competition in assistance: 7. in access to assistance; 8. in assistance project; and 9. in assistance quality;

102 | PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

- Competition in delivery time: 10. in product delivery time; and 11. in assistance time;
- Competition in image: 12. in product and brand name; 13. in the company's reliability; and 14. in social responsibility.

2.4. *Supporting field*

The supporting field supplements the company's business competitive strategy. It is an auxiliary field and not a competition one – in this field the company does not compete, but it contributes to attain and maintain the company's competitive advantages (CONTADOR, 2008).

The supporting field is

> [...] the secondary and supplementary imaginary locus of dispute among companies for customer preference for the product and/or the company. (CONTADOR, 2008, p. 62)

Similarly to the field of the competition, the supporting field represents an attribute of the product or the company that is valued by or interesting to the customer and there are the same 14 fields of the competition.

2.5. *Market segmentation and the product/market pair*

In order to apply the FWC model, the company must segment the market, for two reasons: 1) a single product can compete in different fields in each market segment; and 2) the market segment can be different for different products (CONTADOR, 2008).

Before deciding which field to compete in, the company has to decide in which market to operate with a certain product. The FWC model suggests that a compound of fields of the competition and supporting fields shall be chosen for each product/market pair, that is, the company must segment the market, define a product or family of products for each segment and select the fields of the competition and the supporting fields for each product/market pair. In this respect, it is similar to the focus strategy by Porter (1980).

2.6. *The fields and weapons of the competition model thesis*

The FWC model thesis is worded as follows:

> The most relevant condition for the company to be competitive is having high performance only in those few weapons that offer it competitive advantage in the selected fields of the competition for each product/market pair. (CONTADOR, 2008, p. 109)

Clearly specifying where the company needs to have high performance to be more competitive is one of the strong points of the FWC model. This thesis provides a very safe and precise criterion – it can express in just one statement the way the company must track to be more competitive. This proposition was stated as a thesis mainly for the necessity to be validated, as it has really been, demonstrating concern with methodological accuracy (CONTADOR, 2008).

2.7. *The concept of the FWC model on business strategy and operational strategy*

Two of the several analogies of the FWC model were mentioned in section 2.1; they deserve to be better explained.

For the FWC model: 1) the business strategy takes the form of the competitive strategy and it is the one applied by the company or business unit for the positioning of the product or the company itself in the market, whose essence is in the definition of the product/market pair and in the selection of the fields of the competition and the supporting fields for each product/market pair; and 2) the operational strategy takes the form of the competitive operational strategy, whose main objectives are to select the weapons of the competition to be used by the company, determine the intensity of each weapon and to align the weapons of the competition with the fields of the competition and the supporting fields (CONTADOR, 2008).

2.8. *The fields and weapons of the competition model in the typology of strategy*

In order to make the understanding of the FWC model easier to the reader interested in the theme of strategy, it is worth placing the FWC in the typology established by Igor Ansoff, in the four generic strategy approaches proposed by Richard Whittington and in the ten strategy schools presented by Mintzberg, Ahlstrand and Lampel.

According to Igor Ansoff (1988), one of the pioneers of corporate strategy, there are two basic types of strategy: portfolio strategy and competitive strategy. According to this typology, the FWC model fits into the competitive strategy, because "[...] it specifies the special focus that the company will try to use to be successful in each of the business strategic areas." (ANSOFF, 1988, p. 100). Richard Whittington (2001) presents four strategy generic approaches: classical, evolutionary, processual and systemic. The FWC model is associated to the classical

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 103

approach, since it understands strategy as a rational and deliberate process that has the purpose to maximize advantage in the long term. From the ten schools or perspectives for strategic formulation systematized by Mintzberg, Ahlstrand and Lampel (2000), the FWC model belongs to the Positioning School, once it formulates strategies by means of a prescriptive and analytic process.

To a certain extent, the ideas of the FWC model are similar to the ones of the RBV (resource-based view), because it states that the company can create competitive advantages from its resources, becoming more profitable (PETERAF, 1993; KROGH; ROSS, 1995; BARNEY, 1986a; 1986b; 1991; 2001).

The FWC model, apart from being qualitative, is based on mathematical variables, therefore tending to favor quantitative models; tendency observed in the works published in the main international journals specialized in strategy (PRAHALAD; HAMEL, 1994). According to Markides (1999), the core of strategy is the selection of a position that the company is able to hold. The FWC model understands it the same way, separating, however, the positioning in two aspects: product and company.

2.9. *FWC, Porter's, RBV and Balanced Scorecard models*

The FWC model combines two quite distinct concepts that, in general, have been dealt with separately in the specialized literature: the concept that the company's competitiveness comes basically from its market positioning, as thought by Porter (1980), and the concept that the company's competitiveness comes basically from its internal factors, as suggested by the supporters of the Resource-Based View – RBV. Both for the *Balanced Scorecard* – BSC (KAPLAN; NORTON, 1992, 1993, 1996, 1997) and for the FWC models, the alignment of strategies is fundamental for the company's competitive success.

In a very simplified way, the FWC model can be seen as a combination of some concepts from the Porter's generic strategies model with others from the RBV and BSC models. Thus, the external environment, where there is the emphasis of Porter's model, is related to the fields of the competition: 1) formulating the business competitive strategy is to define products for each market and select the fields of the competition of each product in each market; and 2) the positioning of the product and the company itself in the market is defined by the selection of the fields of the competition for each product/market pair. Regarding the internal environment, where there is the emphasis of the

RBV model, there is a connection with the weapons of the competition, because the formulation of the operational competitive strategies corresponds to select the weapons to be utilized in the competition and to define their intensity, demonstrating the company's capacity to execute its operational activities. Finally, the alignment of the weapons with the fields of the competition, which naturally results from the concepts of the model, is equivalent to the central idea of the BSC model concerning the alignment of the operational competitive strategies with the business competitive strategy. Nevertheless, the FWC model has been more efficient than the BSC model for the alignment of company's strategy, because, due to its methodology, the operational strategies are already born aligned with the business strategy, making the alignment effort proposed by the BSC model unnecessary.

3. Competitive analysis methodology

3.1. *Selection of the competitiveness indicator*

The selection of the indicator to obtain the competitiveness ranking is a fundamental phase of the FWC model, because, since the model is quantitative, competitiveness needs to be necessarily measured. For the study reported herein, four different indicators were elaborated. After being calculated for the eight automotive vehicles, the respective rankings were assessed by people connected with the Brazilian automotive sector. These people were asked to analyze each ranking and give their opinion concerning the suitability, feasibility, fidelity and the real competitiveness perception provided by the respective indicator. The indicator calculated through the following formula, where DC is the degree of competitiveness and *pi* is the product *i* (one of the vehicles), was almost unanimously selected.

$$DCpi = \frac{pi \ sales \ (2003 + 2004 + 2005 + 2006)}{market \ sales \ (2003 + 2004 + 2005 + 2006)} \quad (1)$$

This indicator reflects the percentage values of market share of each vehicle in the time period; RENAVAN was the source. Table 1 shows the degree of competitiveness of each automotive vehicle.

3.2. *Questionnaires*

Data were collected through three questionnaires, all responded by three executive staff members of each assembler (Fiat, Ford, General Motors and Volkswagen).

104 | PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

Table 1. Degree of competitiveness of automotive vehicles.

Automotive vehicle model	Degree of competitiveness (% market share)
Gol (Volkswagen)	23.31
Palio (Fiat)	17.27
Celta (GM)	15.51
Uno (Fiat)	13.60
Fox (Volkswagen)	8.44
Fiesta hatch (Ford)	7.95
Corsa hatch (GM)	3.97
KA (Ford)	2.66

Source: elaborated by the authors.

Questionnaire 1 had the purpose to identify the company and the respondent and to know the company's mission.

Questionnaire 2, whose goal was to identify the fields of the competition of each vehicle and which ones were valued by the customers, listed and conceptualized the competition meanings in each of the 14 fields of the competition.

Questionnaire 3 described in detail the intensities 1 and 5 of each of the 53 weapons of the competition that are typical of the automotive industry, determined according to the description in the next section, and requested the intensity identification of each weapon utilized by the company regarding the respective vehicle (the title of the 53 weapons are shown in Table 2).

These questionnaires, which were elaborated according to the concepts of the field of the competition and the weapon of the competition, were submitted to the assessment of several executive staff members of Volkswagen as a preliminary test. Volkswagen was used as a laboratory, once the first author of the questionnaire is a staff member of that company.

4. Determination of the group of weapons of the competition of automotive assemblers

One of the central points of the FWC model is the determination of the weapons of the competition: which activities and resources are just weapons and which are weapons of the competition?

This research followed the procedure suggested by Contador (2008), which comprises four steps: 1) selecting the List of Weapons that is given in the Appendix of Contador's book (2008), all the activities and resources that have the potential to be weapons of the competition of an automotive assembler (realized by the authors); 2) supplementing and validating this list by means of consulting several areas in Volkswagen;

3) describing the contents of the weapons with the help of other areas in that company; 4) identifying, in this list, the weapons with strategic content, which became known as that assembler's weapons of the competition; and 5) validating the list of weapons of the competition through the consultation to several areas in Volkswagen.

The nature, importance and content of an activity or resource are the criteria used to determine whether the activity or resource should be part of the group of the weapons of the competition of the company.

4.1. Identification of the relevant, semi-relevant and irrelevant weapons

In order to facilitate the understanding about the relevance of weapons, the group of weapons of the competition should be understood as the company's armory. In the military field, the weapons for a battle are selected from the armory and the most appropriate weapons are used according to the type of combat. All of them are combat weapons (here named weapons of the competition), but only a few will be used depending on the type of combat.

Similarly, the company withdraws from its armory the weapons that will be used to compete in a given field. The relevance of the weapon for competitiveness (more specifically, for the fields of the competition) is the criterion to identify whether a weapon of the competition should or should not be utilized to compete in a certain field, that is, it is the field of the competition that determines whether a company's weapon of the competition is relevant to compete (CONTADOR, 2008).

By the criterion of relevance, the 53 weapons of the competition of the assembler are classified into *relevant weapons, semi-relevant weapons* and *irrelevant weapons* for each field of the competition. They respectively provide high, moderate or low competitive advantage to the assembler in the fields where it has decided to compete and, consequently, they should have high, moderate or low intensity demanding high, moderate or low investment. (The concept of intensity of the weapon is given in the following section).

This classification is obtained through the priority matrix of the weapons (CONTADOR, 2008), which comprises all the company's weapons of the competition in its lines and columns. A relevance ranking is generated by comparing each weapon of the line to all the weapons of the columns, giving to each matrix cell weights that range from +2 to −2 and then adding up the weights. The Nihans index is used to classify the weapons according to their

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 105

Table 2. Calculation spreadsheet: average intensity of weapons, focus and dispersion.

Nº	Product: GOL Weapon of the competition	Field: product design		Intensity of weapon	Value	
		Relevant	Irrelevant		Focus	Dispersion
1	Administration, information system and sales technical team	0	0	4.4	0.0	0.0
2	Technical assistance	0	1	4.3	0.0	4.3
3	Warranty	0	1	4.2	0.0	4.2
4	Government and fleet operators' assistance	0	1	4.3	0.0	4.3
5	Customer Service	0	1	4.0	0.0	4.0
6	Customer satisfaction monitoring	1	0	4.5	4.5	0.0
7	Influence on prospective customers	0	1	4.1	0.0	4.1
8	Production process project	1	0	4.5	4.5	0.0
9	Innovative and adequate technology and production process automation	1	0	4.2	4.2	0.0
10	Process control and continuous improvement and project of new processes, tools and installations	1	0	4.2	4.2	0.0
11	Cost reduction permanent program in production, products and suppliers	0	1	4.0	0.0	4.0
12	Quality control and evaluation system	0	0	4.0	0.0	0.0
13	Production outsourcing	0	1	4.0	0.0	4.0
14	PPC (production planning and control) system	0	1	3.9	0.0	3.9
15	Materials management	0	0	4.0	0.0	0.0
16	Just-in-time production	0	0	4.1	0.0	0.0
17	Flexibility for exchanging products	0	0	2.9	0.0	0.0
18	Structuring of the logistic network	0	0	3.8	0.0	0.0
19	Integrated system for logistic management	0	0	3.6	0.0	0.0
20	Permanent program for the improvement of internal and external logistics	0	0	3.5	0.0	0.0
21	Spare parts distribution to authorized dealers	0	1	4.1	0.0	4.1
22	Innovative good quality raw materials and components	1	0	4.0	4.0	0.0
23	Selection, evaluation, development and corporative relationship with suppliers	1	0	4.0	4.0	0.0
24	Electronic shopping	0	1	3.4	0.0	3.4
25	Definition of the company's goals	0	1	3.3	0.0	3.3
26	Competitive intelligence system	1	0	3.5	3.5	0.0
27	Monitoring of competitors and identification of opportunities and threats	1	0	4.0	4.0	0.0
28	Business strategy formulation	1	0	3.7	3.7	0.0
29	Operational strategy formulation	0	0	3.5	0.0	0.0
30	Civic and social responsibility and sensibility	0	1	4.6	0.0	4.6
31	Marketing planning and strategy: a. meeting the demands, necessities, preferences, expectations and desire of customers; b. market research	1	0	4.2	4.2	0.0
32	Marketing management and auditing	0	0	4.0	0.0	0.0
33	Participation in the product concept	1	0	4.3	4.3	0.0
34	Marketing and advertising, participation in events and visual communication	1	0	4.6	4.6	0.0
35	Creation and consolidation of the corporative image – Social marketing	0	1	4.7	0.0	4.7
36	Research and development: a. Technology and technological association for product research, development and modification; b. R&D installations; c. Product engineering (goods)	1	0	4.8	4.8	0.0
37	Techniques for the generation of ideas – Creative team	1	0	4.0	4.0	0.0
38	Project quality tools, solution of problems found in the project and frequent revision in product projects	1	0	4.1	4.1	0.0
39	Design	1	0	4.1	4.1	0.0
40	Product safety and functioning	1	0	4.2	4.2	0.0
41	Modularity in project, standardization and nationalization of components	1	0	4.0	4.0	0.0
42	Flexibility to adapt the product to new markets	1	0	4.2	4.2	0.0
43	Quick launching of new products	1	0	3.5	3.5	0.0
44	Management information system and operational and management decision process	0	1	3.6	0.0	3.6
45	Management by process, communication and integration system and integrated management system	0	1	3.1	0.0	3.1
46	Good corporate governance practices	0	1	4.2	0.0	4.2
47	Strategic accounting	0	1	4.1	0.0	4.1
48	Strategic controlling	0	1	4.1	0.0	4.1
49	Staff evaluation system	0	1	3.5	0.0	3.5
50	Wage policy	0	1	3.9	0.0	3.9
51	Establishment of goals for the staff	0	1	4.1	0.0	4.1
52	Talent attraction and retention policy	1	0	4.0	4.0	0.0
53	Staff training	0	0	3.6	0.0	0.0
	Sum	21	21	211.43	86.51	83.58
	Average intensity of the weapons, focus and dispersion			3.99	0.824	0.796

106 | PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

relevance, with the ones greater than the index being more important than the ones smaller than the index, which is calculated through the formula

$$N = \frac{\sum (sw)^2}{\sum (sw)} \qquad (2)$$

where (sw) is the sum of the weights of each line.

In this study, a matrix for each field of the competition pointed in the field research was built, always considering the 53 weapons of the competition.

4.2. Identification of the intensity of the weapons of the competition of each assembler

The qualitative sub-model arose from the finding that one single weapon has several levels of depth and breadth. The planning and control weapon, for example, can be a simple system made up of a few manual procedures supported by spreadsheets developed in Excel, or it can be a quite complex system that integrates several functions, such as the *Manufacturing Resource Planning* - MRP II. Thus, the variable intensity of the weapon appeared.

"Intensity of the weapon is the intensity that each weapon of the competition is used by the company [...]" (CONTADOR, 2008, p. 114), evaluated at five levels. It can also be defined as the power or range of a weapon or as the effectiveness level at the use of the weapon resources. It is a discrete variable ranging from 0 to 5 and it should be evaluated by the company according to the description made in a questionnaire that defines the simplest state of the weapon, corresponding to intensity 1, and the most improved state, corresponding to intensity 5; the respondent should indicate the intensity between 1 and 5, indicating 0 in case it is not used. The description of the intensities 1 to 5 was done with the help of the Volkswagen staff member, who better knows the state of the art of the weapon.

The intensity of each of the 53 weapons was obtained as follows: a) there were three respondents for each assembler; b) each respondent assigned intensity from 0 to 5 for each weapon; c) the final intensity was obtained by the arithmetic mean of the three intensities.

4.3. Calculation of the quantitative variables: average intensity of weapons, focus and dispersion

These three quantitative variables are fundamental for the company's competitive analysis according to the FWC methodology (CONTADOR, 2008).

"The average intensity of weapons (AIW) is the intensity arithmetic mean of all the company's weapons of the competition." (CONTADOR, 2008, p. 118) (relevant, semi-relevant and irrelevant). It measures the improvement effort of all the company's weapons of the competition. It is a continuous variable ranging from 0 to 5. Table 2 shows that the average intensity of weapons regarding the automotive vehicle *Gol* is 3.99 (result of the addition of the third column – 211.43 – divided by the 53 weapons).

> Focus, the same as the focus of the weapons in the field of the competition, measures the application of efforts in the weapons that offer competitive advantage in the field selected to compete. (CONTADOR, 2008, p. 117)

It is the variable that measures the application of efforts in the weapons relevant to the field selected to compete, that is, the weapons needed for business competition in the field selected by the company. Its value is calculated by the quotient between the sum of the *intensity* of the *relevant weapons* and the sum of the maximum possible *intensity* to be obtained in such weapons and it corresponds to the mean intensity of the relevant weapons divided by the maximum value of the intensity of weapons measuring scale. It is a continuous variable ranging from 0 to 1.

> Dispersion, the same as dispersion of the weapons in the field of the competition, measures the application of efforts in the weapons that do not offer competitive advantage in the field selected to compete. (CONTADOR, 2008, p. 117)

In other words, it is the variable that measures the application of efforts in the weapons irrelevant to the field selected to compete, that is, in the weapons useless to business competition in the field of the competition selected by the company. It is, understandably, the opposite of the focus. Like the focus, its value is calculated by the quotient between the sum of the *intensity* of the irrelevant *weapons* and the sum the maximum possible *intensity* obtained in such weapons and it corresponds to the mean intensity of the irrelevant weapons divided by the maximum value of the intensity of weapons measuring scale. It is a continuous variable ranging from 0 to 1.

The calculation method is quite simple and is made even easier through the use of an *Excel* spreadsheet. Table 2 illustrates the calculation method for the focus and dispersion for the product design field of the automotive vehicle *Gol.* All the 53 weapons of the competition identified according to what was exposed in item 3.3 are listed in the two columns on the left.

In the third and fourth columns, titled Relevant and Irrelevant, it is possible to find the relevant, semi-relevant and irrelevant weapons for the competition

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 107

in product design indicated by a pair of numbers, classified according to what was exposed in item 3.4. The (1; 0) pair indicates that the respective weapon is relevant, with 1 meaning that it contributes to the focus and 0 meaning that it does not cause dispersion; the (0; 0) pair indicates that the respective weapon is semi-relevant, demonstrating that it does not contribute either to the focus or to the dispersion; and the (0; 1) pair indicates that the respective weapon is irrelevant, with 1 meaning that it causes dispersion and 0 meaning that it does not contribute to the focus. These two columns are valid for any automotive vehicle that competes in product design.

In the fifth column, the intensity value of each Volkswagen's weapon regarding the *Gol* is marked (it is valid for any field of the competition of the Gol).

The sixth column of Table 2, *Focus,* is obtained through the multiplication of the third column by the fifth column. According to its definition, the value of the focus (0.824) is obtained through the sum of the values in the sixth column (86.51) divided by the product of the sum of the third column (21) by 5.

As the table shows, the focus corresponds to the mean of the relevant weapons divided by 5, which it is, by definition, the maximum value that the intensity can reach.

The value of dispersion is obtained analogously.

The variables average intensity of the weapons, focus and dispersion are other three analogies of the FWC model.

5. Data analysis and field research conclusions

5.1. *Statistical tools*

The three statistical tools utilized for data analysis were the following: the chi-square test for two samples, Pearson's linear correlation (*r*) and the *t* test.

5.2. *More competitive automotive vehicles and less competitive automotive vehicles*

In order to compare the competitive strategies of the assemblers, the eight vehicle models were decreasingly classified by their degree of competitiveness and were combined in two classes: more competitive vehicles

and less competitive vehicles, with four models in each class. The purpose of this classification was to verify whether there were differences between the competitive strategies (business and operational) adopted by the automotive firms for the more competitive vehicles in relation to those adopted for the less competitive vehicles. The *t* test verified the correlation of this classification.

5.3. *Influence of the business competitive strategy on the competitiveness of vehicles*

As afore mentioned, the business competitive strategy is represented by the product/market pair and by the fields of the competition and the supporting fields selected for the automotive vehicles. Chart 1 shows the 1st and 2nd fields of the competition and the 1st and 2nd supporting fields for the more competitive and the less competitive vehicles, and Table 3 shows the selection frequency of the supporting fields and the fields of the competition.

A simple look at the data in Table 3 would be enough to conclude that there is no difference between the more competitive vehicles and the less competitive vehicles either regarding the fields of the competition or with respect to the supporting fields.

However, it is possible to verify this fact statistically through the application of the chi-square test to the figures in Table 3. That done, the values of the chi-square calculated of 0.476 (for the fields of the competition) and 2.000 (for the supporting fields) were obtained. Although the applicability conditions of the chi-square test recommended by Siegel and Castellan Junior (2006) are not fully satisfied, as the size and characteristics of the sample, such as the values charted for the critical chi-square for the significance level of 5% (5.991 and 9.488, for the fields of the competition and the supporting fields, respectively) are a lot greater than the calculated values, it is possible to conclude that there is no statistically significant difference between the more competitive and the less competitive vehicles either in the fields of the competition or in the supporting fields. It is possible to verify, therefore, that the business competitive strategy of the vehicles, in itself, does not explain the difference in competitiveness among them.

Table 3. Selection frequency of the supporting fields and the fields of the competition.

MODELS	Fields of the competition			Supporting fields				
	Design	Quality	Price	Design	Quality	Price	Diversity	Image
More competitive	3	3	2	1	1	2	4	0
Less competitive	4	3	1	0	1	2	4	1

Source: Elaborated by the authors.

108 PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

It is worth noting the fact that none of the assemblers has selected 'price' as the first field of the competition of its vehicles, as seen in Chart 1. This fact contradicts the common sense: as these vehicles are called 'popular', they should compete in price. But this common sense is mistaken, once the first business strategy of the assemblers consists in defining a price range and, within this range, offer a vehicle with characteristics and attributes that meet the demands, necessities, preferences, expectations and desires of customers in a more attractive way than the characteristics and attributes of the competing vehicles regarding appearance, functions, usability, material quality, finishing quality, among others – which means to compete, not in price, but in product design (which was selected as the first field of the competition by seven out of the eight assemblers). The second business strategy of the assemblers consists in offering, within the price range, a vehicle that the customer considers of better quality than the competing products in an array of criteria they valorize, such as performance, usability, quality of materials and finishing, durability, among others – which means to compete in product quality (selected as the second field of the competition by five out of the eight assemblers).

5.4. Comparison between the fields declared by the assemblers and those preferred by the customers

Table 4 combines the fields of the competition declared by the assemblers (A) and those preferred by the customers (C) for each vehicle. The numbers from 1st to 4th show the order of importance in the field of the competition, where 1st is the most important. For the assemblers, the 1st and the 2nd are the fields of the competition, while the 3rd and the 4th are the supporting fields.

The trivial analysis of the data in Table 4 enables the conclusion that there is a relatively high alignment degree between the fields of the competition and the supporting fields declared by the assemblers and those preferred by the customers. The Palio and Fox models, which respectively occupy the second and fifth positions in competitiveness, present total adherence, while the other models present partial adherence. The great exception regards the Gol, which is the most competitive among the eight studied vehicles: there is practically no adherence, concerning the order, between the fields of the competition declared by the assemblers and those preferred by the customers – the customer thinks about price because holds the image, created by Volkswagen, that the Gol is cheap, but

actually values other characteristics, captured by the assembler to offer a vehicle with a good cost/benefit ratio that the customer mistakes for price.

It is also possible to conclude, from the analysis of Table 4, that the alignment between the fields of the competition and the supporting fields selected by the assemblers and those preferred by the customer does not explain the differences among the degree of competitiveness of the vehicles, because, both in the case of the more competitive and in the case of the less competitive, except the Gol, there is a relatively high alignment degree. That is, satisfying the customer desire is not a strong enough condition to guarantee competitive success, because both for the more competitive and the less competitive vehicles, the assemblers try to offer a vehicle that holds the characteristics desired by the customer.

5.5. Initial considerations about the influence of operational competitive strategies on the competitiveness of automotive vehicles

In order to deplete all the possibilities of analysis to uncover the determinant factors of vehicles competitiveness, the variables average intensity of weapons (AIW), focus and dispersion were calculated for ten different situations, expressed by the declared fields of the competition and their combinations, shown in Table 5. After that, 80 spreadsheets similar to Table 2 were processed for each vehicle.

These ten situations present different values for the variables focus and dispersion and, consequently bring different results for the t test (applied to the difference between the means of these two variables) and for Pearson's correlation coefficient (between focus and degree of competitiveness and between dispersion and degree of competitiveness), which are shown in Table 5. Obviously, these ten situations do not affect the value of the average intensity of weapons.

According to Contador (2008), to analyze the operational competitive strategy, it is necessary to know the values of focus and dispersion for the group of fields selected by the company. The reason for that is easy to understand: as a single weapon can be relevant to one field and irrelevant to another, when only one field is analyzed and the company acts in several fields, a high dispersion value is obtained because the weapons are irrelevant to one field, but relevant the other. In order to calculate the focus and dispersion in the group formed by the fields of the competition and the supporting fields, it is necessary to know the combined relevance (CONTADOR, 2008), which was done.

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO   109

Table 4. The fields of the competition declared by the assemblers and those preferred by the customers.

Field of the competition	Classification															
	Palio		Uno		Fiesta		KA		Celta		Corsa		Fox		Gol	
	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Price	3rd	3rd	2nd	1st	3rd	2nd	2nd	1st	2nd	1st	4th	3rd			4th	1st
Design	1st	1st	3rd	3rd	1st	1st	1st	2nd	1st	2nd	1st	1st	1st	1st	1st	3rd
Quality	2nd	2nd	1st	2nd	2nd	3rd	3rd	3rd	3rd	3rd	2nd	2nd	2nd	2nd	2nd	2nd
Diversity	4th	4th	4th		4th		4th		4th	4th	3rd	4th	3rd	3rd	3rd	
Delivery time								4th								
Image				4th		4th							4th	4th		4th
DC = Degree of competitiveness	17.27		13.60		7.95		2.66		15.51		3.97		8.44		23.31	
DC position	2nd		4th		6th		8th		3rd		7th		5th		1st	

Subtitle: A = assembler; C = Customer; DC = Degree of competitiveness. Source: elaborated by the authors.

Table 5. Pearson's linear correlation coefficients and level of significance of the *t* tests for the declared fields and their combinations.

Situation	Pearson's *r* between DC and AWI, focus and dispersion variables for all vehicles			Level of significance (α) of the *t* test for the difference between means		
	AWI	Focus	Dispersion	AWI	Focus	Dispersion
Product design only		0.795	0.563		0.086	0.107
Product quality only		0.759	0.650		0.105	0.064
Product price only		0.843	0.604		0.045	0.136
Product diversity only		0.757	0.576		0.089	0.119
1st declared field	0.789	0.825	0.507	0.065	0.062	0.168
2nd declared field		0.777	0.643		0.084	0.079
3rd declared field		0.746	0.580		0.108	0.139
1st and 2nd declared fields		0.789	0.531		0.088	0.117
1st, 2nd and 3rd declared fields without weight		0.799	0.577		0.083	0.090
1st, 2nd and 3rd declared fields with weight		0.803	0.240		0.077	0.270

Source: elaborated by the authors.

Considering that a relevant weapon for the field of the competition is more important for the competitiveness of a vehicle than a relevant weapon for the supporting field, weights were attributed to the relevance of the weapons. These weights substitute the values *1* of column *Relevant* in Table 2 (CONTADOR, 2008).

5.6. *Analysis of the influence of the average intensity of weapons (AIW) variable*

The hypotheses cited in sections 4.6, 4.7 and 4.8 were formulated according to the results of previous studies conducted by Contador (2008) to validate the fields and weapons of the competition model.

Two hypotheses were formulated to investigate the variable *average intensity of weapons* in the competiveness of automotive vehicles: 1) the mean of the average intensity of weapons regarding the four more competitive vehicles is significantly greater than the mean of the weapons regarding the four less competitive ones, according to the *t* test with 10% significance level; and 2) there is moderate correlation, measured by Pearson's correlation coefficient, between the average intensity of weapons regarding the vehicles and their degree of competitiveness.

The application of the *t* test found that the mean of the average intensity of weapons regarding the four more competitive vehicles (3.890) is significantly greater (at 6.5% significance level) than the mean regarding the four less competitive ones (3.686). Therefore, it is possible to conclude (with 93.5% confidence) that the more competitive vehicles hold more powerful weapons than the less competitive ones, thus accepting the first formulated hypothesis.

Pearson's correlation coefficient calculated by ($r = 0.789$) indicated a moderate positive association ($0.70 < r < 0.79$) between the average intensity of weapons and the degree of competitiveness of the vehicles. Thus, the second hypothesis has been accepted.

To clear any doubts over this result, it is necessary to test the correlation coefficient so that it is possible to know whether there really is a correlation between the average intensity of weapons and the degree of competitiveness at 10% significance level. The result of the correlation coefficient test (COSTA NETO, 1977) was 0.62. As the calculated value of Pearson's linear

110 | PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

correlation coefficient (0.789) is greater than this value, it is possible to state that there is correlation between the variables.

5.7. Analysis of the influence of the focus variable on the fields of the competition

Two hypotheses were formulated to investigate the influence of the variable *focus of the weapons in the fields of the competition,* or simply *focus,* in the competitiveness of automotive vehicles: 1) the mean of the focuses regarding the four more competitive vehicles is significantly greater than the mean of the focuses of the four less competitive ones, according to the *t* test with 10% significance level; and 2) there is strong correlation, measured by Pearson's correlation coefficient, between the focus regarding the vehicles and their degree of competitiveness.

It has already been exposed in section 4.5 that, in order to analyze the operational competitive strategy, it is necessary to know the values of the focus and dispersion for the group of fields selected by the company and it is also recommended to attribute different weights to the weapons that are relevant to the field of the competition and the supporting field. These conditions correspond to the last situation in Table 5 – first, second and third declared fields with weights.

For this situation, the application of the *t* test has found, with 92.3% confidence, that the focus regarding the more competitive automotive vehicles is greater than the focus regarding the less competitive ones.

Pearson's correlation coefficient (*r*) between the degree of competitiveness and the focus in the weapons of the competition of the vehicles of the sample is 0.803, which represents a strong positive association between these variables (0.80 < *r* < 0.89). This result demonstrates that the focus variable explains, for itself, 64% (explanation coefficient $r^2 = 0.803^2 = 0.645$) of the vehicle competitiveness.

Out of the ten situations analyzed, the third and the fifth ones deserve to be commented, since they present the best results of the two statistical tests.

Despite the assemblers having declared the 'price' field as their second or third fields, as shown in Chart 1, the level of significance for the *t* test (0.045) and Pearson's correlation coefficient (0.843) demonstrate that it is fundamental for companies to have a strong alignment of their weapons with the field 'product price' in order to obtain lower costs in development, project, production and commercialization of their automotive vehicles, precisely because they are compact models sold at lower prices. Namely, the correlation between the intensity of the weapons relevant to the

competition in price and the competitiveness of the vehicle are quite high.

The best result, both for Pearson's correlation coefficient and the *t* test, is associated with the first declared field, which it is product design, for all vehicles except the Uno (product quality), as shown in Chart 1. The results of the fifth situation in Table 5 demonstrate that the correlation between the intensity of the relevant weapons for the first field of the competition and the competitiveness of the vehicle is very high.

5.8. Analysis of the influence of the dispersion variable on the fields of the competition

Two hypotheses were formulated to investigate the influence of the variable *dispersion of the weapons in the fields of the competition,* or simply *dispersion,* in the competitiveness of automotive vehicles: 1) the mean of the dispersion values regarding the four more competitive vehicles is not significantly greater than the mean of the dispersion values of the four less competitive ones, according to the *t* test with 10% significance level; and 2) there is no correlation, measured by Pearson's correlation coefficient, between the dispersion regarding the vehicles and their degree of competitiveness.

The results of the *t* test shown in Table 5 enable the acceptance of the first hypothesis in seven situations. The result of Pearson's linear correlation coefficient test was 0.62. As the calculated values of this coefficient (Table 5) are smaller, it can be stated that there is no correlation between the variables dispersion and degree of competitiveness at 10% significance level. This means that the dispersion does not influence the competitiveness of the vehicle.

5.9. Conclusion about the influence of operational competitive strategies on the competitiveness of automotive vehicles

Based on what has been exposed in the last three sections, it is possible to conclude that: 1) the difference in competitiveness among the vehicles is better explained by the *focus* than by the *average intensity of weapons*; 2) the *dispersion* does not influence the competitiveness of automotive vehicles.

Therefore, the results obtained demonstrate that the concentration of efforts in the weapons relevant to the fields of the competition and the supporting fields selected by the company for their vehicle models (or the high intensity of the weapons relevant to the group of fields of the competition and

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 111

Chart 2. Relevant, semi-relevant and irrelevant weapons by field of the competition.

Nº	Weapons of the competition	Fields of the competition			
		Project	Quality	Price	Diversity
1	Administration, information system and sales technical team	S	S	S	I
2	Technical assistance	I	R	S	I
3	Warranty	I	R	I	I
4	Government and fleet operators' assistance	I	I	R	I
5	Customer Service	I	I	I	I
6	Customer satisfaction monitoring	R	R	I	S
7	Influence on prospective customers	I	I	I	I
8	Production process project	R	R	R	R
9	Innovative and adequate technology and production process automation	R	R	R	R
10	Process control and continuous improvement and project of new processes, tools and installations	R	R	R	R
11	Cost reduction permanent program in production, products and suppliers	I	I	R	I
12	Quality control and evaluation system	S	R	S	I
13	Production outsourcing	I	I	R	S
14	PPC (production planning and control) system	I	S	R	R
15	Materials management	S	S	R	R
16	Just-in-time production	S	S	R	R
17	Flexibility for exchanging products	S	I	S	R
18	Structuring of the logistic network	S	S	R	R
19	Integrated system for logistic management	S	S	R	R
20	Permanent program for the improvement of internal and external logistics	S	S	R	R
21	Spare parts distribution to authorized dealers	I	I	I	S
22	Innovative good quality raw materials and components	R	R	S	S
23	Selection, evaluation, development and corporative relationship with suppliers	R	R	R	R
24	Electronic shopping	I	I	R	S
25	Definition of the company's goals	I	I	I	I
26	Competitive intelligence system	R	I	R	R
27	Monitoring of competitors and identification of opportunities and threats	R	S	R	S
28	Business strategy formulation	R	I	S	S
29	Operational strategy formulation	S	R	R	R

Nº	Weapons of the competition	Fields of the competition			
		Project	Quality	Price	Diversity
30	Civic and social responsibility and sensibility	I	I	I	I
31	Marketing planning and strategy: a. meeting the demands, necessities, preferences, expectations and desire of customers; b. market research	R	S	I	R
32	Marketing management and auditing	S	I	I	S
33	Participation in the product concept	R	R	R	R
34	Marketing and advertising, participation in events and visual communication	R	R	I	R
35	Creation and consolidation of the corporative image – Social marketing	I	I	I	I
36	Research and development: a. Technology and technological association for product research, development and modification; b. R&D installations; c. Product engineering (goods)	R	R	R	R
37	Techniques for the generation of ideas – Creative team	R	R	R	R
38	Project quality tools, solution of problems found in the project and frequent revision in product projects	R	R	S	S
39	Design	R	R	R	R
40	Product safety and functioning	R	R	S	I
41	Modularity in project, standardization and nationalization of components	R	R	R	R
42	Flexibility to adapt the product to new markets	R	I	I	R
43	Quick launching of new products	R	I	I	R
44	Management information system and operational and management decision process	I	S	S	S
45	Management by process, communication and integration system and integrated management system	I	I	I	I
46	Good corporate governance practices	I	I	I	I
47	Strategic accounting	I	I	R	I
48	Strategic controlling	I	I	R	I
49	Staff evaluation system	I	I	I	I
50	Wage policy	I	S	R	I
51	Establishment of goals for the staff	I	S	R	I
52	Talent attraction and retention policy	R	I	I	I
53	Staff training	S	R	I	S

Source: elaborated by the authors.

supporting fields) is the necessary condition for the fine competitive performance of the vehicle, exactly as forecasted by the FWC model.

The fact that the mean of the average intensity of weapons regarding the more competitive vehicles be significantly greater than the mean of the weapons regarding the less competitive ones and the fact that there is moderate correlation between the average intensity of weapons regarding the vehicles and their degree of competitiveness, demonstrate that the average intensity of weapons influences the competitiveness of the automotive vehicle. Nevertheless, considering that: a) the variable *average*

intensity of the weapons is the mean of the intensity of the relevant, semi-relevant and irrelevant weapons; b) having high intensity in the irrelevant weapons results in *dispersion*; and c) the dispersion does not influence the competitiveness of the automotive vehicles, it is possible to concluded that: 1) it is not the high intensity of the weapons that provides competitiveness to the vehicle, but the high intensity of the relevant weapons (those that generate the variable *focus* and that are contained in the average intensity of weapons); and 2) increasing the intensity of irrelevant weapons (those that generate the variable *dispersion*) is a waste of resources.

112 PRODUÇÃO

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

The variable *dispersion* is important for two main reasons: 1) the FWC model holds the merit to separate the relevant weapons form the irrelevant ones, what is not so clearly perceived by other models; and 2) the *dispersion* variable serves as counterproof, because, if *dispersion* is of the same nature as *focus* and if there is no correlation between the *dispersion* and competitiveness and if the correlation between *focus* and competitiveness is high, it is possible to confirm that the *focus* variable explains the competitiveness of the automotive vehicles.

6. Conclusions

6.1. *Reasons for the selection of the theoretical framework*

The purpose of this article is report the methodology and the results of a research conducted to identify the determining factors of competitiveness of the main compact automotive vehicles manufactured by the four main automotive assemblers operating in the country: Fiat, Ford, General Motors and Volkswagen.

The methodology suggested by the Fields and Weapons of the Competition (FWC) model was used in this study not only because it is qualitative and quantitative, but also because it can very clearly represent: 1) the business competitive strategy, assigned by the fields of the competition and the supporting fields of each product/market pair; 2) the operational competitive strategies, depicted by the weapons of the competition and their respective intensities; 3) the objective of a weapon of the competition, named target, which is used to direct and orient the efforts of a weapon; 4) the alignment of the relevant weapons with the fields of the competition and the supporting fields, represented by the variable focus; 5) the dealignment of the irrelevant weapons with the fields of the competition and the supporting fields, expressed by the variable dispersion.

In addition, the FWC model structure includes entities, axioms, postulates, thesis, corollaries, performance indicators and seven quantitative variables (CONTADOR, 2008).

6.2. *Summary of the field research conclusions*

The main conclusions of the field research can be summarized as follows:

- The business competitive strategy of automotive vehicles, for itself, does not explain the difference of competitiveness among the vehicles (section 4.3);

- The alignment between the fields of the competition selected by the assembler and those preferred by the customers does not explain the difference between the degree of competitiveness of the vehicles, since both the more competitive vehicles and the less competitive ones, except the Gol, present at least partial alignment (section 4.4);

- Satisfying customer desire is not a strong enough condition to guarantee competitive success (section 4.4);

- The variable average intensity of weapons exercises moderate influence in the competitiveness of vehicles (section 4.6), the variable focus has strong influence (section 4.7) and the variable dispersion does not hold influence (section 4.8);

- It is not the high average intensity of weapons that provides competitiveness to the vehicle, but the high intensity of the relevant weapons (those that generate the variable focus and that are contained in the average intensity of weapons) (section 4.9); and

- Increasing the intensity of the irrelevant weapons (those that generate the variable dispersion), is a waste of resources (section 4.9).

6.3. *Determining factors of the automotive vehicles competitiveness*

The second and the third conclusions confirm the first: the business competitive strategy of automotive vehicles represented by the product and its respective fields of the competition and supporting fields, alone, does not explain the difference in competitiveness of the vehicles.

These conclusions denote that the companies have very similar perception of the fields of the competition valued by the customers and they all try to satisfy them. That is why there are no statistically significant differences between the fields of the competition and the supporting fields of the vehicles, that is, there are no statistically significant differences between the assemblers' business competitive strategies.

The last three conclusions of the previous section demonstrate that is the variable focus that explains why a vehicle is more competitive than the other. This means that, the greater the intensity of the relevant weapons for the selected fields of the competition and the supporting fields the greater the degree of competitiveness of the vehicle.

It is worth noting that these results are coherent with the results of all researches conducted to validate the FWC model, as reported by Contador (2008).

Sanchez, J. H. et al.
A study of ... manufactured in Brazil. Produção, v. 22, n. 1, p. 99-114, jan./fev. 2012

PRODUÇÃO | 113

6.4. *Importance of the fields of the competition and the supporting fields*

The conclusion of the previous section may induce the reader less familiarized with the FWC model to think that the field of the competition is not important. However, the fields of the competition are extremely important, because, together with the product/market pair, they represent the business competitive strategy of the company. If the company is not intelligent enough to define products that are adequate to the destination markets and to select the fields (competition and supporting) valued by their customers (at least for a niche of customers), this company will not survive, because it will not have enough customers to sustain it.

The field of the competition is also important for another reason: it is the guideline for the company to differentiate their products. A product designed to compete in price will be totally different from one designed to compete in quality.

There is a third reason that justifies its importance: it is the field of the competition that defines which weapons are relevant, semi-relevant and irrelevant, which implies the definition of the intensity of each weapon in order to obtain high focus and low dispersion of weapons in the selected fields of the competition and supporting fields.

6.5. *Confirmation of the FWC model thesis and the determinants of competitiveness*

The conclusion of section 4.7 – the focus is the variable that explains the competitiveness of automotive vehicles, since it explains 64% of it – confirms, once again, the FWC thesis:

> For a company to be competitive, the most relevant condition is to have high performance only with those few weapons that give it competitive advantage in the fields of the competition selected for each product/market pair. (CONTADOR, 2008, p. 109)

The conclusions of the studies also confirm the validity of the determinants of competitiveness (CONTADOR, 2008): 1) product adequate to the destination market; 2) appropriate selection of the fields of the competition and the supporting fields for each product/market pair; 3) adequate use of the weapons of the competition, which means to identify relevant, semi-relevant and irrelevant weapons for the fields of the competition and the supporting fields and to define the intensity of the weapons; and 4) the alignment of the weapons with the fields of the competition and the supporting fields.

7. How to increase the competitiveness of an automotive vehicle

Once found in section 4.9 that it is the variable focus that explains the difference of competitiveness among the vehicles in the sample, the rule to increase the competitiveness of a vehicle becomes obvious: in order to make an automotive vehicle more competitive, the company should increase the focus through the deployment of measures that increase the intensity of the relevant weapons. As a corollary of this rule, it must reduce the dispersion, reducing the intensity of the irrelevant weapons, what will reduce its costs and, therefore, it will make it more efficient. Increasing or lowering the intensity of a weapon means to increase or lower the investments and resources applied to it. Chart 2 shows the relevant, semi-relevant and irrelevant weapons for the fields of the competition selected by the assemblers. In order to increase the competitiveness of their automotive vehicles, the assembler should select their fields of the competition and their supporting fields and invest in the increase of the relevant weapons indicated in Chart 2.

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