

Integration of small business operations as suppliers of the Brazilian automotive industry: an approach of multiple cases¹

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Abstract

The objective of this research is to present the factors that strengthen the integration of suppliers in the supply chain of the automotive sector concerning micro and small business (MSB) and their importance in the activities of the production chain. The preparation of this work was conducted through a qualitative and quantitative approach, applying multivariate statistical techniques and structured interviews, aimed at reducing bias and facilitating understanding for collection and analysis of data. The results confirm and allow the relationship in the supply chain of micro and small companies supplying the automotive industry, the supply of parts and components, building a functional model of the integration of these existing suppliers until the carmaker, regarded this as the client end.

Keywords: supplier integration, collaborative relationship, supply chain, automaker

Introduction

Adaptation and interaction if presents normally, as slight knowledge of thought, that is capable to guarantee bonds between the order, the clutter, and the organization that establish, according to Teixeira (2004). The problems can be minimized mainly with the development of abilities in research and the suppliers, consolidated a partnership in the supply net. One perceives then that, to adapt it changes is a challenge of market, promoted for the constant new features presented in the daily one of the enterprise environments that, in turn, function under this aspect, as a species of creative redoubt of conflicts.

The supply of components for intermediate companies of bigger transport will be satisfactory and the market of parts spare will be taken care of, generating a challenge in the search of competitive advantages of prominence in the market, Eberhardt et. al. (2004). Of this form, where the processes of the logistic chain if establish connection, as form for that the organizations obtain differential that it are satisfactory having for consequence, the increase in the levels of quality of service and product as it offers its customers, as well as, the reduction of the costs of storage and supplies, by means of distribution canals. Searching continuously the

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integration of suppliers and methodologies of purchase leading in consideration as internal constraints, cultural factors and importance in the development of suppliers (Pozo et. al. 2010).

This research comes to contribute for the construction of a theoretical model on the integration of the suppliers of the MSB that compose the supply chain of the Brazilian automotive industry, using given collected of multiple cases, a cluster of companies of the region of Jundiaí - SP. Being thus, this research answers as if it characterizes the integration of the chain of suppliers of automotive parts the Brazilian assembly plants of vehicles, as well as the MSB carry through its purchases of parts and components and that paper the leadership of the purchasers exerts on the integration of the suppliers, indicating the points transports and where it must be observed as being improvement chance, inside of this context this model comes completing the existing gap in the supply chain that previous research had not approached.

The participants whom the database of this research are also the same ones, including it chain of supply, as component of the group of the micron and small business (MSB) of the region of Jundiaí - SP, longing for itself to previously extend the demonstrated concepts, when the such enclosed then since the great companies, until the final consumption, for one more adjusted agreement of the integration of not only a group of suppliers, as well as of more complete chain of supply of automotive parts. According to Bowersox et. al. (1992) it also exists the importance of if organizing a logistic chain of supply and where it has constant exchanges of information on the managing plans of production of transparent form and needs using, in some cases, advanced concepts as *Just in teams* (JIT), *Efficient Responses you the Customers* (ECR), *Warehouse Management System* (WMS) among others.

It was adopted the method and the procedures of research used for the reach of the objectives of this work the quantitative and qualitative boarding, a time that had a considerable level of interaction between researcher and participant. It was a multiple study in case that e, according to Eisenhardt (1989), consists of a strategy of intent research in the perception of the existing dynamic in the context of singular scenes, uniting methods, equal: interviews, documents, questionnaires and considerations.

To inside delimit more specific goals of the work, the described specific objectives had been determined below will lead to the outcome of the general objective, that are: *If the form that the integration of suppliers in the gratings companies is the same ones used in the MSB suppliers for the Brazilian automotive industry; the antecedents for the integration of the suppliers in the great companies of the automotive industry are being used in the MSB that also they supply the same supply chain e if importance the leadership of the purchasers if applies only the great companies or if they extend for all the chain of the suppliers in the Brazilian MPE.*

The gotten results had allowed following inferences on the supplying integration of MSB of the Brazilian automobile industry; the development of abilities in the scope of the suppliers was positive, increase of the confidence in the supply chain, greater interchange of information and greater transparency.

Review of the literature

In Pyke (1992), other qualities are targeted for industrial development of small businesses, as the diversity of products and customer service, level of quality care in a personalized way, with simple structure and dynamic responsiveness to the market.

The approach taken by Porter (1998), on the inter-business relationships and the ability to exploit them, should not be limited to the corporate world of business units. The author believes that ... *the pursuit of interrelationships by some competitors is compelling others to do the same or risk losing its competitive position.*

In Ballou (2006), it meets logistic definition of the enterprise one as being the activities of movement of materials and storage that facilitate to the flow of products since the attainment of the substance cousin until the point of final consumption, adjusted to the customers to a reasonable cost. The author detaches the importance of the transport system, administration of traffic, manuscript and storage of products and information of logistic planning as activities necessary to leave available products and services to the customers at the moment, desired place and form.

The importance of the concept is extended still more when Christopher (1997) includes the question of the value for the customer, therefore, an integrated logistic system propitiates greater trustworthiness in the delivery, adding benefits to the offered product, and the customers perceive such value. Research has demonstrated empirically that the perception of these benefits is high for intangible products, as in the case of services (Bienstock, 2002).

In McDuffie et al. (2001), if it finds the affirmation of that the logistic excellency if has become a powerful source of competitive advantage. Companies had started to see the logistic one in the decades of 1980 and 1990, not more as a simple source of reduction of costs, but also as source of improvement to the products and services offered to the customers, giving beginning the concern of *supply chain management* (SCM) as distinguishing in the cost.

Bowersox and Closs (2006) argue that combine, *postponement* of logistic and *postponement* of production, it is possible to reduce the anticipatory nature of the businesses, however is *necessity* the cooperation and the sharing of information between the constituent members of the supply chain. The two types of delay reduce the risks, but in different way. *Postponement* of production one concentrates in the form of the product, moving unfinished item for front in the logistic system for modification before the delivery.

The quality of service supplied for the assembly plants of auto machine vehicles to the customers has been a variable of performance currently pointed as measure-key of competitiveness of a company, Greenberg (2009). The chain of which it is part, duly structuralized, offers support in the adoption of best the practical ones to not only take care of its demands for the products generated from its process of particular business, but to leave of all excessively originated in the interface with the other associates.

Methodology

The used components of the method in this research are: the boarding, the type of research according to its general objectives and the used strategies.

As Gay and Airasian (2003), can be affirmed that the boarding of research adopted in this research corresponds to quantitative and the qualitative one, a time that had a considerable level of interaction between researcher and participant.

The multiple study in case that, according to Eisenhardt (1989), it consists of a strategy of intent research in the perception of the existing dynamic in the context of singular scenes, uniting methods, equal: interviews, documents, questionnaires and considerations. Voss, Tsiriktsis and Frolich (2002) affirm that such method is used when are intended to study the phenomenon in its

context and when it is longed for to explore variable or phenomena partially understood unknown, taking the answers of questions of the type because, what and as in certain degree of depth.

Moreover, the studies of multiple cases can minimize to little robustness associated with the results of an only study of case, therefore the resultant tests of multiple cases are considered more convincing (Yin, 2001).

To determine the sample size was taken into account the desired confidence level of 90% and a margin of error of $\pm 10\%$ admitted. The formula adopted for determining the sample size was adequate for small populations of Rea and Parker (2000) as follows (equation 1):

$$\text{Tax of answers} = \frac{Z^2 [p(1-p)] N}{Z^2 [p(1-p)] + (N-1) C^2} \quad (1)$$

Where:

C = maximum permissible error or accuracy in terms of proportions (10%)

Z = confidence level in units of standard deviation (1.645)

P = proportion of the universe (50%)

N = number of elements in the population (the total enterprises in the area surveyed are 17)

Resulting in 14 companies surveyed, after a closer work of companies, has been hit the exact amount of 15 respondent companies, thus reaching the minimum required for a confidence level of 90% required for the results.

The research was carried through with the responsible ones for purchases, quality or production of the region of Jundiaí - SP in 15 MSB of the branch of auto parts. The trustworthiness test was applied and obtained an Alpha coefficient Cronbach of 0.8012, for the set of the variable of the proposals. The internal consistency is measured directly by the alpha coefficient of Cronbach. Typically, the questionnaire is considered trustworthy if alpha it will be superior the 0,75.

Analysis and results of the research

The results of correlation of the questionnaire are presented in table 1, to follow, the variable of the proposals present significant correlations between itself. This fact estimates the existence of interaction between the questions, as affirmed in the literature revision. The question of this research, therefore, was answered. That is, it has evidences of that interaction relations exist enter the strategies of the supply chain. For this research it was used as parameters of approval being 0,75.

VARIABLE		
QUESTIONS		α
Q1	The involved ones in the production of the company share of the same in such a way productive information/how much in the supply, preventing shunting lines in the information flow causing deficiency in the productive flow.	0,7983
Q2	The communication is efficient in the supply chain which you is part, since the supplier until the final customer.	0,7878
Q3	The purchases are carried through after competition between suppliers having considered aspects technician and of cost.	0,7952
Q4	Before the acquisition of parts negotiations between the parts are carried through, having aimed at to verify the adequacy technique of the product/service.	0,7812
Q5	The plan of control of risks takes care of to the necessity in the acquisition of material and supply of services.	0,7953

Q6	The company supplies mounted sets (parts mounted between them with a purpose specify to become a product) to its final customer.	0,7871
Q7	The applied processes of improvement to the products are taking care of the requests of the customers.	0,7882
Q8	The concern of the suppliers in together with participating of processes of improvements in the product its company exists.	0,8018
Q9	Constantly company she positively reacts fronts to the challenges of the length the requirements of the customer.	0,7964
Q10	The responsibility of the development of new products is exclusively of the customer.	0,7861
Q11	Before the beginning of the production, the customer shares information techniques on the products to be produced.	0,8036
Q12	Customers share software of control of the production/ supply with its company.	0,8011
Q13	The production requests come followed of information as drawings or norms supplied for the customer.	0,7999
Q14	The primacy between the companies who compose my net of suppliers is the confidence.	0,7957
Q15	I have concern in the development of suppliers for attendance of my customer.	0,7992
Q16	Concern with the integration of the suppliers of the supply net exists which I participate.	0,7974
Q17	A program of management of productive processes efficient in the company exists.	0,7843
Q18	The pointers for the quality give a general vision to me of the production	0,7932
Q19	The customers carry through follow up in my production periodically.	0,7957
Q20	The cost of the production is monitored and constantly reduction works are become fulfilled.	0,7959
Q21	The internal interferences of the procedures of purchases are barriers for the negotiation of products used in the production.	0,7957
Q22	The planning of my purchases is important for the company.	0,7829
Q23	Concern in keeping the product quality and parts supplied my customers exists.	0,7917
Q24	The company if worries about the quality of the suppliers of parts and services of systematic form.	0,7878
Q25	Meetings of strategically alignment with the suppliers are carried through.	0,8184
Q26	I highly consider the competitive company before the pursuing of the market that I participate.	0,7897
Q27	The concern in investing in development exists to take care of the businesses.	0,7974
Q28	Innovative attitudes are considered during the cadaster process of suppliers.	0,8093
Q29	The purchases are carried through by email.	0,8016
Q30	The production of the company is monitored by my customer.	0,7858
Q31	The dependence has the concern in developing alternatives for the suppliers of parts preventing.	0,7969
Q32	The concern in participating of industrial accumulations exists in order to reduce the logistic costs.	0,7914
Q33	The leadership accomplishes of the purchaser is applied in all the negotiations	0,8024
Q34	The decisions on the company are taken aiming at increase of the competitiveness.	0,8131
Q35	It has the concern with high and the decreases of the supply of some components to the customers.	0,8219
Q36	Problems with stated period exist generated by the inefficiency of suppliers.	0,7975
Alpha general coefficient of Cronbach:		0,8012

Table 1 - Coefficients of Alpha of Cronbach for questions

Source: Data raised for the research

Respondents

The names of the companies had not been divulged by request of the respondents, therefore when requested to the same ones that they participated of this research to them it was guaranteed that collected information would be kept in secrecy. In such a way the name of the companies will not consist in figure 1 where the supplied one to the supply chain was described

automotive which is part, the responsible one of the MSB that the questionnaire answered and the city that the company is located.

Identification of the respondent MSB			
Respondents	Supply	Responsible	City
R01	Locks, jambs, rear mirrors and doors handle	Purchases	Valinhos - SP
R02	Reservoirs and covers	Quality	Jundiaí - SP
R03	Constraints of doors	Purchaser	Valinhos - SP
R04	Motor parts replacement	Purchaser	Jundiaí - SP
R05	Belt of security, parts of finishing of the panel.	Quality	Jundiaí - SP
R06	Automotive packings	Logistic/quality	Cabreúva - SP
R07	Superficial treatment using the following processes: KTL, Zinc, Nickel, Hard anodizing, Organometallic, Has covered Alkaline, Chromium, Tins, Phosphating, Oxidation.	Purchaser	Varzea Paulista - SP
R08	Springs tractive, Springs of compression and Springs twist, Metallic Devices (connecting rods, lifter, etc), Printed in general (until 150T).	Purchaser	Campo Limpo Paulista - SP
R09	Thermal services of Metal Treatment	Purchaser	Jundiaí - SP
R10	It would print; Weld and Assembly of sub components	Purchaser	Jundiaí - SP
R11	It would print	Quality	Jundiaí - SP
R12	Painting in plastic (panel, for shocks)	Quality	Jundiaí - SP
R13	Automotive (Plastic Reservoirs)	Purchaser	Jundiaí - SP
R14	Automotive (Layers cushions, blown diaphragms, kitchen-range overhead exhaust, concertinas and Prohibitions for System of injections)	Quality	Jundiaí - SP
R15	Hinges, components for banks Locks and limitors of Doors, components for belts of Security, sets and components for brake system.	Quality	Jundiaí - SP

Figure 1 - Identification of the Respondents.

Source: Data raised for the research

Tests and statistical results of the research.

The boarded tests for analysis of the proposals had been *Shi Square* Kruskal Wallis, and Mann Whitney, called tests distribution free or tests of free distribution that constitute an alternative for this type of problem. The term “free distribution” is vulgarly used to indicate that the methods are applicable independently of the form of the distribution.

The Statistics distribution free it represents a set of tools of more appropriate use in research where one does not know the distribution of the population and its parameters well. The test of *Shi Square* it was applied in the analysis of all the proposals in set in order to verify all the situations, if it statistical occurred significant difference between the groups, that is, $p > 0,05$ in all cases. This test was applied by consequence of the comparison of more than two independent groups not necessarily of the same so great.

The test of Mann-Whitney was used in the analysis of applied the P2 proposal being for the comparison of two independent groups. In this research the group is called with being questions of the used questionnaire as element of collection of data, and the proposal was composed of variable of ordinal measurement.

The test of Kruskal-Wallis was used in the proposals P1, P3 and P4, being applied in three comparison or more independent groups and the variable must be of ordinal measurement.

As Callegari (2003), in the parametric tests, the values of the studied 0 variable must have normal distribution or normal approach. Already the tests distribution free, also called for tests of free distribution, do not have requirements how much to the knowledge of the distribution of the 0 variable in the population. Value 3 of the questionnaire used in this research was supplied in the analyses, therefore it was about a null value, option to the respondents of: without opinion/it is not applied. Of this form the vises had been diminished that could appear during the analysis of the data.

The hypotheses tested in this research had received the name from proposal and had been referenced by letter "P".

With the quarrel above in mind, it is clearly that the integration of the supplier's micron and small entrepreneurs of the automotive sector demands certain set of abilities. This leads, therefore, to describe them in four proposals below indicated:

Proposal 1: The formation of the collaborative abilities has positive impact in the integration of the suppliers. The P1 proposal was composed for four groups divided in 18 questions, with the purpose of clarify if between the analyzed groups some group would exist that would be more significant. After analysis of the data did not occur significant difference between the groups in agreement, that is, $p > 0,05$, see table 2.

Table 2 - P1 result.

Test Statistics^b

	P1
Chi-Square	1,872
Df	3
Asymp. Sig.	,599

Kruskal Wallis Test

b. Variable Grouping: Grupo_P1

Source: Result of the research

Proposal 2: The promptness of contribution of the suppliers extends the level of collaborative ability of the suppliers. The P2 proposal was formed by a composed group of 2 questions. After it analyzes of the data did not occur significant difference between in agreement group, table 3.

Table 3 - P2 result.

Test Statistics^b

	P2
Mann-Whitney U	52,500
Wilcoxon W	130,500
Z	-.953
Asymp. Sig. (2-tailed)	,341
Exact Sig. [2*(1-tailed Sig.)]	,413 ^a

a. Not corrected for ties.

b. Grouping Variable: Grupo_P2

Source: Result of the research

Proposal 3: The effectiveness in the leadership of the purchaser in the development of suppliers has a positive impact in integration of the suppliers. The P3 proposal, composed for two groups with 7 questions and analyzed noticed that in all the situations did not occur significant difference between the groups in agreement, that is, $p > 0,05$, see table 4.

Table 4 - P3 result.

Test Statistics^b

	P3
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Chi-Square	,815
Df	1
Asymp. Sig.	,367

Kruskal Wallis Test

b. Variable Grouping: Grupo_P3

Source: Result of the research

Proposal 4: The internal restrictions and the cultural factors are retarding elements in the process of internal development. The P4 proposal was composed for two groups divided in 9 questions, with the purpose to clarify if between the analyzed groups some group would exist that would be more significant. After analysis of the data noticed that in all the situations did not occur significant difference between the groups in agreement, that is, $p > 0,05$, see table 5.

Table 5 - P4 result.

Test Statistics^b

	P4
Chi-Square	3,196
Df	1
Asymp. Sig.	,074

Kruskal Wallis Test

B variable Grouping: Grupo_P4

Source: Result of the research

The necessity of the proximity of the companies whom they supply to the assembly plants is imminent e, in this research, this concern if it makes gift between the searched ones, creating a trend in participating of industrial accumulations as party to suit of cost reduction.

As consequence, the concept of availability, helpfulness, contribution and the continuous process of development on the part of the supplier factor of great relevance for the supplying MSB of the chain of the Brazilian assembly plants can become. Collectively, the four proposals, after analyzed for software SPSS 17, constitute a picture where we identify rank of the main antecedents to the integration of supplier MSB in the automobile industry. A general vision of the development of this demonstrated conceptual aspect as in tables 6 and 7.

Assertive	Proposals				Total
	1	2	3	4	
1	10	4	4	2	20
2	32	0	18	13	63
4	123	14	57	25	219
5	60	5	41	26	132
Total	225	23	120	66	434

Table 6 - Note of the Data of Research

Source: Result of the research

Proposals	N	Mean Rank
Generality 1	225	211,64
2	23	199,41

3	120	225,73
4	66	228,83
Total	434	

Table 7 - Classification of the Proposals

Source: Result of the research

With the verification of the proposals an analytical model was arrived donates to attributes and variable to it of the integration of the searched chain, figure 3, of as the MSB must be located before the customer and if to develop in order to take care of to the demand of the supply to the national chain of auto parts and which primacies must attempt against in the development of the necessary collaborative abilities the creation of partnerships in the supply to this chain, being intent to the development each bigger time of the collaborative promptness and the leadership of the purchasers, but also, manage the problems of the acceptance before the customers of the development of products and the restrictions interns.

Conclusion

The results petitioned in this research had allowed the construction of an analytical model, based in attributes and variable, for the characterization of the dynamics of the SCM where after it analyzes of the results, answered the question of study of this research: Which are the basic changeable attributes and for the characterization of the integration of suppliers in the MSB?

An analytical model was generated after analysis of the data, has with positive signal (+) the variable that had been considered favorable to the process of integration of the MSB as supplying of the Brazilian automotive industry and important so that this chain of supply if structuralizes each time better and the negative signals (-) the variable that must be managed so that it does not intervene with the contribution and good relationship enters the pertaining members of the supply chain, these indications are demonstrated in figure 2.

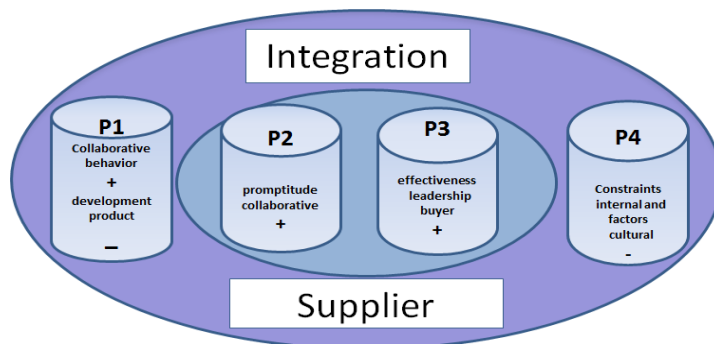


Figure 3 - Analytical model

Source: Result of the research

The attributes raised through the analysis of the results in this research must be considered so that it has the integration of the supplying MSB to the Brazilian automotive industry, taking care of the requested requirements and are appreciated as supplying of the searched chain they are:

- a. The development of abilities in the scope of the suppliers transformed the MSB favorably searched, for intermediary of the reliable increase, generating of partnerships in the chains of values to be

negotiated, this event if it confirms with the results gotten through the answers the P1 proposals: The formation of the collaborative abilities has positive impact in the integration of the suppliers and P2: The promptness of contribution of the suppliers extends the level of collaborative ability of the suppliers, where the strategic alignment in the development of abilities that generate trustworthiness between supplying purchaser/is being evidenced;

- b. Functions as the reactivity and the easiness in the accomplishment of improvement processes had presented distinguishing basic strategies favorable to the MSB, under the aspect of the competitiveness inside of the supply chain and are evidenced in the P3: The effectiveness in the leadership of the purchaser in the development of suppliers has a positive impact in the integration of the suppliers;
- c. The interchange in the information, when effected on the basis of principles of transparency and accessibility, a logistic chain is capable to organize all adequately, however in this research it was guided that the MSB present great difficulty to transpose the barriers generated for the company-customers, fact presented in the P4: The internal restrictions and the cultural factors are retarding elements in the process of internal development, generating delays and stresses unnecessary the MSB.

Integration was looked to understand in this research the antecedents it and to also demonstrate that the process of development of the product (PD), demonstrated in the P1: The formation of the collaborative abilities has positive impact in the integration of the suppliers, is restricted the MSB and must be detached with intention to increase the contribution between purchaser and supplier

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