

# Electronic Data Interchange (EDI): An Interorganizational System Applied in the Auto Parts Industry Supply Chain

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**Abstract**— One of the main advantages offered by Information and Communication Technologies (ICTs) is the exchange of data between organizations, from simple e-mail to the most sophisticated information systems such as Efficient Consumer Response (ECR), Supply Chain Management (SCM) (CPFL), Business-to-business Commerce (B2B) and Electronic Data Interchange (EDI). Complexity increases when we extrapolate the boundaries of companies and integrate the information of several organizations in a shared way, as each company has its own culture. The research work proposed here aims to carry out an exploratory study, which seeks to analyze the implementation of an interorganizational system like EDI in the automobile industry, based on the information and opinions of the managers of small and medium enterprises of the auto parts sector. In order to achieve the objective of this work, a survey was carried out with suppliers of auto parts for the Automobile Industry assemblers, using the EDI. In general, the research indicated that the use of EDI (or interorganizational systems) by auto parts companies is still at a very early stage. As positive aspects associated with the use of EDI by small and medium-sized auto parts suppliers, respondents pointed basically to the operational and / or transactional benefits, and as negative aspects, they pointed mainly to the penalties or demerits applied by the automakers. In general, the research indicated that the use of EDI (or interorganizational systems) by auto parts companies is still at a very early stage.

**Keywords**— EDI, Electronic Data Interchange, Interorganizational system

## 1. Introduction

The choice or deployment of a technology becomes necessary, in some cases mandatory, due to the opportunities or business needs that the market offers. A good example is the need to integrate computer systems between organizations. One of the clear manifestations of this trend is the use of expressions such as: Efficient Consumer Response

(ECR), Supply Chain Management (SCM), Collaborative Planning, Forecasting and Logistics (CPFL), Business-to-business Commerce (B2B), often in the literature. To maintain competitive conditions, organizations adhere to these technological developments, without which they would tend to disappear [1].

Electronic Data Interchange (EDI) is of fundamental importance as it allows computers from different organizations to exchange information automatically, a function that is indispensable for the integration of any automated systems [1]. Electronic data interchange (EDI) performs an important part in improving organizational communication among the industry supply chain [2].

Complexity increases when we extrapolate the boundaries of companies and integrate the information of several organizations in a shared way, as each company has its own culture. The culture of the organization is one of the most cited factors among those influencing results, being linked to all the aspects that depend on people's actions, such as the relationship with the partners [1][3].

Subramani [4] conducted a study that investigates "How do suppliers benefit from the use of Information Technology in supply chain relationships?". The author states that "most of the existing studies analyze the benefits gained by network leaders, with little attention being paid to analyzing the benefits obtained by the supplier companies."

Thus, this study seeks to contribute to the analysis of EDI implementation, focusing on small and medium sized auto parts companies in Brazil.

This study arose from the author's interest in researching how organizations have implemented Interorganizational Systems (IOS) and what the perception of those involved in this process is.

The need to implement EDI involves costs, such as: dedicated lines or VAN (Value-added Networks); hiring of specialized companies that provide the communication infrastructure, such as IBM and Embratel; computer equipment; and integration with existing systems. That is, the deployment of this technology represents a significant burden, especially for small and medium-sized companies.

The research work proposed here aims to carry out an exploratory study, which seeks to analyze the implementation of interorganizational system like EDI in the automobile industry, based on the information and opinions of the managers of small and medium enterprises of the auto parts sector.

## 2. Background

### 2.1 Electronic Data Interchange (EDI)

The term EDI in English can be translated as "Electronic Data Interchange" in its simplest form. It was developed to meet the needs of efficient communication between commercial partners, enjoying the advantages offered by modern Information Technology. In the business world, traditional communication occurs in two forms: unstructured (messages, memos and letters) and structured (purchase order, dispatch advice, invoices and payments) [5].

EDI covers the exchange of structured messages, while electronic mail applications deal with unstructured communications. In a structured message, such as a purchase order, the data is formatted following a pre-established pattern, facilitating electronic transfer between computer systems. As defined by Colcher and Valle [5].

On the one hand, Albertin [6] defines EDI, in technical terms, as a well-known example of exchanging structured documents, which allows data, in the form of document content, to be exchanged between software applications that are working together to process a business transaction. It should be emphasized that EDI only specifies a format for business information, and that the actual transmission of information is performed by other transport mechanisms, such as e-mail or peer-to-peer connection.

On the other hand, Albertin [6] considers that because of the different approaches in the

development and implementation of EDI, there is no consensus in its definition. Some of them are:

Transmission, in a standardized syntax, of business information or unambiguous strategic meanings between computers of independent organizations (The Accredited Standards Committee for EDI of the American National Standards Institute).

Standard data exchange formatted between business partner computer application systems with minimal manual intervention (UN / EDIFACT Training Guide).

Computer-to-computer electronic transfer of business and administrative data, using an agreed standard to structure an EDI message (Article 2.1 of the European Model EDI Agreement).

Electronic transfer from one computer to another of computer-readable data using an agreed standard for structuring the data (International Data Exchange Association, EDI handbook: trading in the 1990s).

Like IOS, EDI is also defined by several other authors:

"EDI is an Interorganizational System, which, as a system, encompasses technical processes, procedures, administration, integration, IT infrastructure and services to operationally achieve its objectives" [7].

For Droge and Germain [8], EDI is "an Interorganizational System based on Information Technology, which integrates members of the supply chain, with the aim of facilitating the flow of a product or service through a distribution channel."

Tuunainen [9] defines the use of EDI as "systems used for exchange, computer-to-computer, information-based, standards-based, business documents and business-to-business information."

Bueno [1] defines the term EDI as a broad concept of electronic data interchange between organizations, no matter the medium through which data is transferred. In this work, there will be no distinction between EDI and EDI over the Internet.

Electronic data interchange (EDI) is a form of inter-organizational electronic commerce where one trading partner (a buyer or a seller) establishes individual links with one or more trading partners through a computer-to-computer electronic communication method [10].

EDI is a strategy of cooperation between suppliers, distributors and retailers so that they can respond to consumer demand more rapidly and thus the use of EDI can result in increased sales, reduced stocks and improved profits [11].

According to Lou et al. [2], Electronic Data Interchange (EDI) is a technology which transmits

business documents between the enterprises in a standard format with electronic methods. It is not only an information technology, but an effective tool for promoting competitive capability in a dynamic environment.

Since EDI is an interorganizational system, its adoption would also be extended beyond the organizational boundaries [12]

### 2.1.1 *Benefits of EDI*

According to Johnston and Vitale [13], it is not entirely clear whether EDI provides the best opportunities for strategic use of information systems, or whether the public nature of these systems has simply made them better known. What is clear is that an EDI can bring significant competitive advantages, including: low costs, closer connection with customers and increased product differentiation. These benefits are sometimes shared among participating industries at various levels. In many cases, however, only the first company to build an EDI in a particular industry was, for a long time, a sustainable advantage.

According to Colcher and Valle [5], EDI brings the following benefits:

- Efficiency Gain: Significant reduction in the volume of paper transactions, with immediate gains in administrative and operational cost.
- Speed: Large volumes of business information can be transported from one computer to another in a few minutes, allowing quick responses, which ensures customer satisfaction.
- Errors: EDI eliminates the inevitable typing errors.
- Improved logistics management and productivity gains: EDI enables companies to better manage and control production using continuous replenishment.

According to Lummus and Duclos [14]:

- The implementation of EDI results in benefits for both supplier and buyer.
- As transactions are processed electronically, data entry errors introduced by the issuer are eliminated. Reducing input errors results in improved quality and consistency and decreased time in audits and error-seeking.
- Customer service can be improved by improving access to information and shortening the connection time. Through EDI, orders can be processed quickly and scheduled deliveries precisely.
- A significant benefit of EDI, for the supplier, is the reduction in the financial cycle or time of the payment process.

- Improved relationships between companies and their suppliers, due to extended data sharing, reduced lead time, and improved communication.

For Albertin [6], the tangible benefits of EDI come from cost and time savings, elimination of retyping, reduction of occurrence of errors, creation of knowledge of receiving data, etc. The economy also comes from the following improvements:

- reduction of paper-based systems;
- problem solving and customer service;
- expansion of the customer base and / or suppliers.

### 2.1.2 *Theoretical models dealing with EDI*

There are many models and approaches to analyze and develop new communication techniques to be used within a business structure. EDI is no exception. Stages of inclusion range from a single-partner business, without integration, to multi-partner business, integrated with existing systems. Models and tools can help organizations visualize and implement EDI and other technologies across a variety of industries.

As main references to characterize the processes of implantation and use of EDI, the following models were used in this work:

#### A) Tuunainem

Tuunainem [9] considers that the use of EDI is a way of strengthening the relationship between buyer and seller. Information sharing can affect the relative bargaining power of both parties, as well as the competitive position of the buyer and the supplier with respect to its rivals in the industry.

Tuunainem [9] adds that when companies use coercive power over partners, for adoption, they become less powerful and more vulnerable partners. On the other hand, when the EDI adoption event is seen as an opportunity for building and strengthening trust between companies, the relationship is able to support organizational change.

The greatest benefits can be obtained by companies that have their EDIs integrated with internal systems, according to Tuunainem [9].

Tuunainem [9] considers that the Interorganizational Systems can be classified according to two dimensions, as shown in Figure 1:

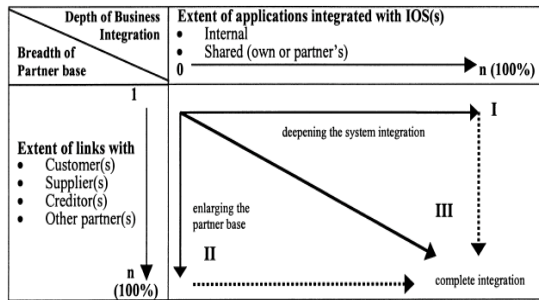


Figure 1 - Depth x Amplitude - Source: Tuunainen [9]

According to the author, the three levels for the dimension "extension of the integrated applications" are:

1. Use without integration to any database or internal application.
2. EDI is integrated with internal processes, applications and databases.
3. EDI partners share other partner's processes and databases and extend integration to include external resources.

And for the "breadth of partner base" dimension, the levels are:

1. Establish a connection with a customer, in a particular industry, and with other possible customers, in the same industry.
2. Then, increase the base of partners, including suppliers of the auto parts company.
3. Finally, establish connections with customers in other industries (vertical and horizontal) and also other businesses of possible partners.

#### B) Subramani

Subramani [4] believes that network leaders can use their bargaining power to have process benefits across firms, such as cost savings.

Subramani [4] proposes a way of categorizing EDI appropriation patterns in organizations, considering that there are two main patterns: "Exploitation" or "Exploration". Exploitation is the extension or elaboration of certainties; the term was translated as "exploitation". It is the class of actions in which the goal is to improve operational efficiencies. Exploration is the purchase of new possibilities, translated as "holding". It is the class of activities whose goal is to learn about the environment and discover new ways of creating values or solving old problems.

Figure 2 shows that according to the standard adopted by the company, for the use of IT, exploration or exploitation, it obtains, as a primary result, the operational or strategic benefits and, as second-order benefits, the competitive performance. Considering the relationships represented by the arrows, the research carried out

by Subramani [4], did not confirm, only, the link between operational benefits and competitive performance.

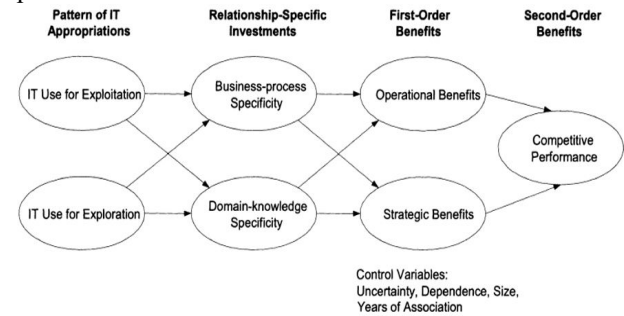


Figure 2 - Use of IT, Specific Investments in Supplier Relationships and Benefits - Source: Subramani [4]

Subramani [4] presents two types of specificity of intangible resources:

- Specificity of the business process - is the degree to which a supplier's key business processes, such as operational processes (administrative and quality control) are particular to the company's focal relationship requirement. The author considers that the specificity of the business process is an important factor linked to performance in the inter-firm relationship.
- Knowledge domain specificity - is the degree to which critical vendor expertise, such as the formulation of competitive analysis and strategy, and the development of a new product are particular to the firm's local relationship requirement. Knowledge domain specificity is perceived in the examples of firms that rely on vendors for innovations and for critical decisions.

#### C) Lummus and Duclos

Lummus and Duclos [14] identified six stages of EDI implementation and defined stage inclusion parameters:

- Stage 1 - EDI is used for small number of transactions with a partner. Some business documents are handled electronically, while all others are handled manually. Electronic documents are entered manually into the systems.
- Stage 2 - EDI is used with two or more customers for a small number of transactions. The size of the implementation reports the turnover using EDI.
- Stage 3 - EDI technology is integrated with company systems to update transactions without additional data entry.
- Stage 4 - EDI is used to conduct business with suppliers and customers.
- Stage 5 - EDI is integrated with customers

to enable each company to query information, such as inventory status and deliverables, in the customer's database.

- Stage 6 - EDI is integrated across the enterprise. EDI transactions are found in all business organization functions (quality control, engineering, factory, marketing and accounting).

For the authors, the identification of the stages of implementation of EDI is relevant due to the relationship between the progress of implementation and the benefits received. To examine this relationship, the stages of implementation were grouped into three levels:

- Level 1 - Level of Transaction - The company is using EDI with few customers, for a limited number of transactions (stages 1 and 2).

- Level 2 - Liaison Level - The company has EDI integrated into the systems and is using EDI with its suppliers (stages 3 and 4).

- Level 3 - Integrated Level - EDI transactions are events driven: data is shared between the customer and the vendor; EDI transactions are integrated throughout the company (stages 5 and 6).

The benefit groups associated with the implementation stages are:

- Group 1 - Transaction benefits - Reduction in paper, reduction in time spent ordering and filling documents, reduction in incoming errors, improved payment cycle, faster response time, standardized information.

- Group 2 - Benefits for sharing information - Reduction in inventory, reduction in lead time, improvement in customer relationship.

- Group 3 - Competitive benefits - Economy in reducing people and efficient business operations, effective use of people related to new tasks, improvement in time based on competition.

At the implementation transaction level, companies can expect only benefits that result from the improvement in the transaction process.

At the link level, companies can expect improved lead time, reduced inventory, and other benefits from open sharing of information with their customers and suppliers.

At the integrated level, companies can expect cost benefits due to reduced people and improved operations.

Companies that have implemented only at the transaction level can expect to receive the minimum of benefits.

Companies that have reached the second level of implementation have their systems connected to customers and suppliers through EDI.

Companies that have reached the third level of implementation are, openly, sharing information among their customers and suppliers.

| Levels of EDI     | Benefits of EDI |                     |             |
|-------------------|-----------------|---------------------|-------------|
|                   | Transaction     | Information Sharing | Integration |
| Transaction Level | XXX             |                     |             |
| Linked Level      | XXX             | XXX                 |             |
| Integrated Level  | XXX             | XXX                 | XXX         |

Figure 3 - Implementation Level vs Benefits of EDI - Source: Lummus and Duclos [14]

#### D) Bensaou and Venkatraman

Bensaou and Venkatraman [15] developed a conceptual model of interorganizational relations, based on the adjustment between the need and the capacity of information processing (figure 4).

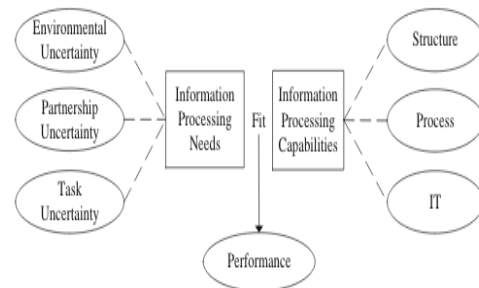


Figure 4 - Conceptual Model of Interorganizational Relationships - Source: Bensaou and Venkatraman [15]

Bensaou and Venkatraman [15] depart from the basic premise that the need for information processing stems from uncertainties.

For them, the higher the level of uncertainties, the greater the need for information processing in the interorganizational relationship. The authors identify three types of uncertainties:

1. Environmental Uncertainty - It arises due to general environmental conditions, in which the interorganizational relationship is inserted.

Bensaou and Venkatraman [15] identify three dimensions for environmental uncertainty:

- Capacity - How much the environment supports growth.

- Complexity - Heterogeneity and variation of an organization's activities.

- Dynamism (change in product) - The need for the design of the organization to respond to environmental dynamism.

One can consider the aspects presented in the model created by Bensaou and Venkatraman [15] to analyze interorganizational relationships. In the case of this work, will be studied in companies of the auto parts sector. Considering the "capacity" dimension, it is observed that the sector currently has significant growth capacity. With respect to the

"complexity" dimension, it can vary according to the observed company, being an issue to be included in the interview script. For the "dynamism" dimension, it can also be considered as high, in general, in this sector.

2. Partnership Uncertainty - It is the uncertainty that the focal company perceives in relation to the type of relationship with a business partner. The authors point to three sources of partnership uncertainty:

- Specificity of the assets of the focal company - How much the focal company made investments specifically for the relationship with this partner.
- Vendor asset specificity - How much the production of the component (s) requires capabilities and unique abilities for this supplier.
- Level of mutual trust within the relationship - Degree of mutual trust between two companies. The authors use a scale ranging from extremely weak to extremely strong.

These dimensions will be analyzed in this paper, considering the auto parts industries. Specific investment levels for the implementation of EDI (both the focal company and the supplier) and the level of trust between the companies implementing the EDI will be observed.

3. Task Uncertainty - It is related to the specific set of tasks performed by the organizational agent responsible for the interorganizational relationship. The authors identify task uncertainty as a three-dimensional function:

- Analyzability - Refers to the extent to which there is a known procedure that specifies the sequence of steps to be followed to perform a task.
- Variety - Refers to the number of exceptions or the frequency of unanticipated events, which require different methods or procedures to perform a job.
- Interdependence - Refers to the extent to which individual units are dependent, one on the other, to perform their individual tasks Bensaou and Venkatraman [15]. They use the question: "How much of the total work must be done with this supplier?" To evaluate this aspect (they do the measurement by means of percentage values).

In this case, it will be analyzed how the tasks related to the partner, through EDI, are performed. The concepts "Analyzability", "variety" and "interdependence" will be included in the interview script.

The capacity to process information is derived from the number of mechanisms for interorganizational coordination. Bensaou and Venkatraman [15] classify as:

1. Structural mechanisms - hierarchy of mechanisms that aim at adjustment, adaptation or

adequacy, with respect to the relative capacity of companies to reduce uncertainties - rules and procedures, direct contacts, task forces and teams. According to Bensaou and Venkatraman [15], relationships will differ, in their combinations, according to the use of these mechanisms.

The authors differentiate them into three dimensions:

- Multiplicity of information channels between two companies: Degree in which the business functions of both companies work together. The authors use a 4 x 4 matrix, in which each cell contains the degree that the vendor's A function works with the manufacturer's B function. The scale is three points: high, medium and low. Four functions form the columns and lines: sales / purchases; product engineering; manufacturing and quality.
- Frequency of information exchange: Frequency of mutual visits. The authors use as an indicator for this dimension the sum of 6 intervals of 6-point scales, separately, and 3 scales measure the frequency of visits made last year by the supplier's engineers, engineering departments, purchasing departments and lines manufacturer's assembly

E) Massetti and Zmud

It has been found to be vitally important for an organization to know its current position in relation to its stage of EDI implementation. However, being able to monitor its development can provide crucial information for a continuous emerging strategic approach.

Massetti and Zmud [16] developed an approximation for EDI measures, which have four dimensions: volume, diversity, amplitude and depth.

- Volume - The extent to which company document exchanges are manipulated through EDI (characterized by file-to-file connections) is determined by dividing the total number of documents by the total of function documents or transactions.
- Diversity - Number of different types of company documents handled through EDI (characterized by connections, application for application).
- Amplitude - The extent to which a company has established EDI connections with each of its partners (characterized by the connection of the work environments).
- Depth - Refers to the degree of electronic consolidation established between the business processes of two or more partners.

Table 1 results provide a strategy for EDI measures:

| Facet     | Measurement Level | Measures  | Interpretations  |
|-----------|-------------------|---|--|
| Volume    | Functional        | % of function's documents exchanged via EDI                               | Intensity of EDI activity within the function                                  |
|           | Organizational    | % of organization's documents exchanged via EDI                           | Intensity of EDI activity within the organization                              |
| Diversity | Functional        | % of function's trading partners linked via EDI                           | Function's openness to EDI relationships with partners                         |
|           | Organizational    | % of organization's trading partners linked via EDI                       | Organization's openness to EDI relationships with partners                     |
| Breadth   | Functional        | Number of document types exchanged via EDI; Specific standards used       | Extent of electronic document integration and exchange within the function     |
|           | Organizational    | Number of functions using EDI; Number of document types exchanged via EDI | Extent of electronic document integration and exchange within the organization |
| Depth     | Functional        | % of EDI linkages at each depth level                                     | Nature of the electronic relationship with partners                            |
|           | Organizational    | % of EDI linkages at each depth level                                     | Permeability of an organization's boundaries                                   |

Table 1 - Measures of volume, diversity, amplitude and depth of EDI - Source: Massetti and Zmud [16]

According to the authors, the scheme is a consistent and effective way to document and track the nature of EDI and enable the development of more robust and effective EDI applications. This measurement tool uses percentage variation to monitor levels of functional and organizational activities. It provides quantitative assistance for the development of an emerging strategy, which can fully exploit, and direct an EDI initiative in the organization.

### 3 Methodology

#### 3.1 Search type

In order to achieve the objective of this work, a survey was carried out with suppliers of auto parts for the Automobile Industry assemblers, using the EDI. In order to collect the information necessary for the analysis of the EDI implementation process by the auto parts supplier industries, we opted for the use of exploratory research of a qualitative nature.

It is justified the adoption of the exploratory research, since there are few studies aimed at obtaining the point of view of small and medium-sized companies in the process of EDI implementation.

For Gil [17], the exploratory research aims to provide greater familiarity with the problem, with a view to making it more explicit.

Already Zikmund et al. [18] considers that exploratory studies are conducted to clarify ambiguous problems, so that research is necessary to gain a better understanding of the dimensions of problems.

The qualitative approach presents a reality that cannot be quantified or measured and involves subjective items to the research reality. It is possible to work with the data without due statistical treatment, because the search for the reality is sought [19].

#### 3.2 Sample and Research Subjects

The interviewees were: managers and technicians of five companies that supply auto parts, located in Brazil.

The subjects of the research are:

- Managers of small and medium-sized companies;
- EDI users and IT professionals from small and medium enterprises;
- IT Suppliers.

The companies surveyed provide for one or more automakers, and the EDI process, with each automaker, is different.

#### 3.3 Research Instrument

The interview, for Gil [20], "(...) is the technique in which the investigator presents himself to the investigated one and asks him questions, in order to obtain the data that interests the investigation."

The research instrument of this work is composed of a script of interviews, semi-structured, with open questions. Respondents were asked to answer the questions for each automaker.

The interview script consists of questions extracted from the theoretical models presented in the previous chapter. The roadmap is geared towards corporate managers. For the specialists there were adaptations. In several situations, it was necessary to explain the concepts to the interviewees

Some of the answers, to the questions elaborated, were directed by the interviewer in the form of performance notes, which aim to detect the degree of importance, according to the intensity of perception for that question.

### 3.4 Data Collection and Research Preparation Procedures

The data collection was done through semi-structured interviews, with:

- Managers of small and medium-sized companies;
- EDI users and IT professionals from small and medium enterprises;
- IT Suppliers;

Data collection was helpful in assessing how EDI is being deployed in companies and the positive and negative aspects of their deployment.

The stages of the work were as follows:

- theoretical review (literature review);
- field research (data collection);
- analysis of the data collection and final writing of the research.

## 4 Results and Analysis

The analysis of the results was oriented to evaluate the answers and other sources. This is an exploratory study that seeks to capture, in an initial research, how the implementation of EDI has occurred, from the point of view of small and medium-sized companies.

Table 02 – Results

|   | <b>AUTOMOBILE COMPANIES</b>                 | <b>Experts</b>             |
|---|---|----------------------------|
| EDI Implementation Stage                        | 60% - stage 3 and 40% Stage 2               | Stage 2                    |
| Benefits obtained                               | Transaction benefits and Shared information | Transaction benefits       |
| Amplitude and Depth of Integration              |   |                            |
| Relationship with partner base                  | Car manufacturers                           | Car manufacturers          |
| Extension of integrated applications            | EDI is integrated                           | EDI is integrated          |
| Coercive power for adoption of EDI              | Exist                                       | Exist                      |
| Bargaining power between assembler and supplier | Does not exist                              | Does not exist             |
| <b>EDI appropriation patterns</b>               |   |                            |
| Exploitation X Exploration                      | Exploitation                                | Exploitation               |
| <b>Measures for EDI</b>                         |   |                            |
| Diversity of transactions - Number of documents | 7   | 7                          |
| Diversity of transactions - Standards used      | RND and EDIFACT                             | RND and EDIFACT            |
| Depth of data exchange                          | File for files                              | File for files             |
| <b>Interorganizational Relations</b>            |   |                            |
| Environmental Uncertainty                       |   |                            |
| Capacity  | Big   | Big                        |
| Complexity                                      | Big   | Big                        |
| Dynamism  | Big   | Big                        |
| Uncertainty of Partnership                      |   |                            |
| Specificity of the assets of the focal company  | Low   | Low                        |
| Specificity of the supplier's assets            | Big   | Big                        |
| Level of mutual trust within the relationship   | Big   | Big                        |
| Uncertainty of Tasks                            |   |                            |
| Analyzability                                   | High  | High                       |
| Variety   | Little                                      | Little                     |
| Interdependence                                 | High  | High                       |
| Structural Mechanisms                           |   |                            |
| Multiplicity of information channels            | Limited                                     | Limited                    |
| Frequency of information exchange               | None  | None                       |
| Formalization of information exchange           | Used for control                            | Used for control           |
| Process Mechanisms                              |   |                            |
| Conflict resolution                             | Collaborative                               | Collaborative              |
| Joint actions                                   | Only with some Departments                  | Only with some Departments |
| Commitment                                      | The supplier assumes the risks              | Risks are shared           |



Respondents were questioned regarding aspects of EDI, and the answers were entrusted to the interviewees' perceptions:

- Positive aspects of EDI - All respondents reported that EDI has positive aspects. The managers of the company Alfa and Beta presented as the main aspects the agility of the process and the reduction of errors. The company manager Gama reported the implementation of EDI improved the control of inventory and production processes. Respondents from the Delta and Epsilon companies noted the positive aspect of continuing to provide for automakers. Other positive point is that the uses of electronic data interchange (EDI) have a significant influence on the coordination [21].

- Negative Aspects of EDI - Respondents were unanimous in stating that the negative aspect is the existence of penalties and demerits. Here is the answer from the company manager Alfa: "There is a problem of applying a penalty if there is an error in the procedure between the Supplier and the assembler, for example, delivery delay, lack of ASN and so on. These penalties are applied only to suppliers by automakers as demerit".

Beta, Delta and Epsilon managers said there are no plans to upgrade EDI. Alfa and Gama managers commented that there are no EDI upgrade plans, but there are plans to improve interfaces with existing systems

## 5 Conclusion

As positive aspects associated with the use of EDI by small and medium-sized auto parts suppliers, respondents pointed basically to the operational and / or transactional benefits, and as negative aspects, they pointed mainly to the penalties or demerits applied by the automakers.

In general, the research indicated that the use of EDI (or interorganizational systems) by auto parts companies is still at a very early stage. When comparing the aspects presented in the theoretical models selected in the literature with the reality of these companies, it is seen that those concepts are, for the most part, far from becoming reality. At the same time, it can be said that the characteristics and benefits obtained from the use of EDI systems are very small, compared with the models presented.

The analysis was based on the opinions of company managers and others involved in the process. The study included five companies in the auto parts industry, involving 7 respondents, among managers and IT specialists from these companies.

The study focuses on the verification of the aspects presented in five theoretical models considered relevant, identified in the literature on

interorganizational systems [22]. These models provided the main elements for the elaboration of the script that was used in the interviews. We sought to obtain the opinion of the managers regarding the application of the concepts presented in these models, experienced by the auto parts companies in the EDI implementation process, and the opinion of the interviewees about the concepts presented in the models in general - how much they reflect the current reality.

Based on the exploratory study, it was possible to elaborate the elaboration of propositions about the studied subject.

The first model analyzed was that of Lummus & Duclos [14] and based on this analysis the following proposition was formulated:

P1. The implementation of EDI applications in small and medium enterprises are between stages 2 (transaction) and 3 (transaction and shared information). This scenario would be related to obtaining benefits basically at the transaction level.

P2. The integration depth (internal and external) of small and medium EDI applications is low.

P3. The breadth of the customer base connected via EDI, of small and medium-sized enterprises is small.

P4. Carrying companies tend to exercise their coercive power over small and medium-sized enterprises.

It was verified that the main reason for the adoption of the EDI by the researched companies is the attendance to the needs and requirements of the automakers. One of the interviewees defined this power through the phrase one of the automakers used: "In EDI. No Business, No EDI. No Business".

The analysis based on the model of Subramani [4] led to the formulation of the following proposition:

P5. "The standard of use of IOS implanted among automakers and small and medium suppliers, among those proposed by Subramani [4], is the use - which means improving operational efficiencies"

P6. The largest volume of EDI use is made by the sales area, the diversity of standardized documents is restricted to 7, the main standard used is the RND, the range of EDI transactions occur only with the automakers, If the exchange of file to file.

P7. There is a low level of specific assets of both automakers and suppliers of auto parts, in the relationship between them, and also in the use of EDI.

P8. The companies that supply auto parts have significant confidence in the auto-makers.

P9. The interdependence between the units to perform the tasks is high.

P10. The greater the formalization of the exchange, the less the information processing capacity of the companies surveyed.

P11. The information processing capacity tends to increase with increasing conflict resolution, union actions and commitment.

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