The Use Of Load Matching Services In The Internet

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Abstract

With the advance of the Internet, the possibility of providing load matching services in the web has become an interesting alternative. However, little is known about its use in activities related to logistics. Thus, this study intended to classify shippers and carriers, based on their preferences towards load matching services that operate in the Internet. Initially, the factor analysis was used in order to reduce the number of variables in representative factors and then, the cluster analysis was utilized to organize the users of loading matching services into homogenous groups. Results have shown that different types of users place distinct importance on the services offered.

Introduction

Several authors try to demonstrate the advantages that might be obtained with the use of the Internet (e.g., Lincke, 1998 and Bakos, 1997). According to Rao (1999), the big potential of Internet is the increase of the communication speed between suppliers and their clients, improving the quality of the service, and reducing the logistic costs. Rebouças (2000) adds that the transport sector has been using the Internet mainly to offer idle spaces in vehicles, and freights on a fixed route. Soares (2001) emphasizes that the logistic web sites try to facilitate the transactions between shippers and carriers, gathering in only one place all people involved in the supply chain. Therefore, users obtain more information about the freight market, doing business in a shorter time and at a lower cost.

Another important benefit imputed to the load matching services is the possibility of a better use of back-hauling freights, considered as a very relevant alternative to reduce freight costs. According to Marden (1999), this type of freight has a relatively low opportunity cost, once the truck has to return anyway, and the back-hauling freight represents an opportunity for extra gains.

Besides the load matching services, the transportation companies, through the Internet, can make use of several other types of specific services for the sector. The Business Trucking Magazine (2000) and Lancioni et al. (2000) list, among others: the use of managerial software; exchange of information among suppliers, customers and shippers; rental of services, specialized equipment and vehicles; schedules of goods' delivery; booking of warehouses etc.

Even showing all advantages and profit possibilities, several services that are springing up on the Internet have not been able to satisfactorily meet the customers needs (Selz and Schubert, 2000). For Ishman et al. (2001), the success of an information system depends on the involvement/participation of the user and even on cultural factors. According to Teo et al. (1999), variables such as perceived usefulness, perceived enjoyment and perceived ease of use are relevant to explain the acceptance of information systems in general. Therefore, for the case of Internet, one common observation is that new users are often fascinated by the capabilities of the Internet in giving them access to almost an infinite number of information resources. However, continued usage without any specific purpose or usefulness may decline over time when the novelty effect of the Internet wears off.

Thus, this study intends to classify shippers and carriers, based on their preferences towards load matching services that operate in the Internet. In this way, it is expected to obtain a better understanding of the needs of the users that may help the development of the new services to be offered in the Internet. It is also

expected the evaluation of the following hypothesis: different users have distinct needs and perceptions of the services offered by load matching web sites.

To attain these goals, it was decided for the use of cluster analysis, which permits to group issues and cases in relatively homogenous groups, based on a certain number of variables. According to Malhotra (2001), the cluster analysis can be construed as an exploratory technique, being used whenever there is no prior information about the group formation to be studied, as it is the case of the group of users to be investigated in this current study. Thus, the groups or clusters should be suggested based on the characteristics of the obtained results. Each cluster, following Sharma (1996), has to be homogeneous regarding some characteristics, that is, its perceptions, on the same features, are to be quite similar within that group.

Load Matching Services

Overall, load matching services are made to assist either the carriers as well as the shippers that are involved with the trade of cargoes. This way, a carrier can either search for a load to be transported or announce the availability of its vehicles, and shippers can either announce a load or search for a means of transport that meets its transporting needs. Most of these systems only provide information, allowing the parts to handle the financial, legal and operational aspects.

The access to those load matching services can be free, for instance, as in the web site www.fretenet.com.br, or by paying a fixed fee, for a certain period of time (www.agfreight.com) or through each contracted cargo, which can also correspond to percentages of the freight values (www.iatn.net).

The freight prices can be: fixed, with values established by shippers; public, with all carriers being informed of the offers from each other company; confidential, in which only the shippers know the offers, and sealed when the offers are disclosed at a specific date. The On Line Procurement central (www.onlineprocurement.com) displays on its site a detailed explanation about how freight prices are figured out.

Some load matching services work like traders, outsourcing load transport, such as J.B.Hunt (www.jbhunt.com). These systems have been developed mainly for companies which sell logistics and transportation services and that make use of the load matching services aiming to hire carriers. There are also load matching services that focus only on one transportation mode or on specific vehicles (www.eflatbed.com) or on specific loads (www.bullwagons.com).

Although the main goal of the sites – freight contracting – has been kept, the Internet has made possible an increase of services, augmenting their speed and changing their ways of reaching users.

In Brazil, the first load matching service started in the beginning of 2000 (www.edeliver.com.br), and by the end of 2001, altogether, there were as many as 12 load matching services in operation. This offer for services has followed the increase of Internet users in Brazil which, according to Soares (2001), could reach 10 million of users, corresponding to more or less the half of the number of Internet users in Latin America.

The sites characterize themselves by offering several types of services, focused on the transportation sector, apart from load contracting. Among them are newsletters about the sector, load and vehicle tracking, e-procurement services, routing software and management of productive chains. One of the sites also offers the use of marketplaces focused on the sugar and ethanol market (www.bolsa1.com.br). The services are mainly focused on the relation shippers / carriers; however, some sites also focus on autonomous carriers. In this case, these sites have invested in the ATM (Automatic Teller Machines) installation as a way to attract independent carriers that do not have access to the Internet. Those types of services have been developed by Brazilian groups related to national transportation and computer sectors, being also important the participation of some foreign investors.

Methodology

A questionnaire has been applied, through the telephone, to a group of companies which use or not the load matching services, during the first semester of 2001. The group of respondents was made up by the answers from 100 companies (44 declared themselves as part of the industry sector, 26 from the transportation sector, 24 from the logistics sector and 6 from the distribution sector), which is considered a satisfactory number of observations for the analysis techniques to be used.

In order to prepare the questionnaire, interviews with the people in charge of four load matching web sites already existing in Brazil was carried out. According to Parasuraman (1991), an interview with experts of the sector can be very helpful in a situation where the survey problems are not well defined, helping not only the preparation of the survey itself but also providing better understanding of the problem to be investigated. In view of that, a list of the main topics to be explored was initially stated, without a pre-determined order (to be decided along the course of the interview), which permitted more flexibility in obtaining the desired results.

Thus, this procedure permitted, besides discussing the effectiveness of the criteria available in the literature, that new criteria - considered important in the interviews - were identified and tested through the questionnaire, and also helped in determining the types of groups to be interviewed. Based on those interviews, a number of statements and questions arouse, as it follows:

- The development of the sites is focused on the carriers' views.
- Very little is known about the profile of the web sites' users and about the reasons that make companies do not to use those systems.
- Can the fact that shippers work with different products lead them to look for distinguished services and characteristics on the web sites?
- Distinguished services are considered important to different load matching services; however, the importance of these services is still unknown.

The questionnaire was divided into three parts. In order to identify the profile of the responding companies, questions were developed about the kind of product the company trades or produces, the volume imported in a year, the type of company, the transport expenses and the frequency and criteria for contracting carriers. The second part is related to the Internet use by the respondent. In this case, it was expected to verify whether or not the company got support for its logistics activities through the Internet.

In the third part it was requested to the companies to mention the importance placed on the services offered by the load matching services, according to some features that were identified through studies carried out about the Internet and through the interviews with the experts. For this evaluation, a scale ranging from 1 ("*not important*") to 4 ("*very important*") was used.

However, the diversity of services offered by the load matching services demands the choice of a method of analysis that can reduce the number of these variables, as a means of facilitating its comprehension. At first, some variables that are correlated can be grouped, forming groups of variables that permit, later, a simpler characterization of the object in study. This way, the factor analysis technique will be used, which aims to group and summarize the variables – which in the current study correspond to each type of service offered by the load matching web sites.

According to Hair et al. (1998), a factor analysis allows a better comprehension of the relations among the variables, or respondents, and of the impact each one has on the data analysis, turning it into a complementary methodology to other multivariate analysis. Thus, in the factor analysis process, each of the variables can be defined as linear combination of common factors that will explain the parcel of the variance of each variable, plus a deviation that summarizes the parcel of the total variance not explained through these factors. The parcel explained through these common factors is named as communality, and the parcel not explained is named specificity. The communality can vary from 0 to 1, with values close to zero showing that the common factors do not explain the variance and values close to 1 showing that all variances are explained through the common factors. An application of factor analysis techniques for the separation of key-variables in adopting information technologies by different companies may be seen in Martinez and Redondo (2001).

In this current study, the factor analysis will be used to reduce the number of variables in representative factors and, next, based on the generated factors, the cluster analysis will be used, aiming to group companies according to their evaluations on the services offered by the load matching services. According to Sharma (1996), each cluster formed is homogeneous concerning certain characteristics, which means that its observations are similar among themselves and different from other clusters in relation to the same characteristics.

Thus, it can be possible to identify if the services requested by the companies can be correlated to their characteristics.

Results of the factor analysis

The results obtained through the evaluation of services and characteristics of load matching services were used in the factor analysis, supported by the software SPSS 10.0. The method used was the one of main components, once the objective of this analysis is to determine the number of factors that accounts for the maximum data variance, aiming to the subsequent use of the cluster analysis.

According to Hair et al. (1998) and Malhotra (1999), after the choice of the method for the factor analysis, it is necessary to determine the number of factors. The initial factor solution did not reveal a simple structure of perceptions regarding the analyzed criteria. Therefore, 5 variables that showed little relevance were excluded, carrying out the factor analysis on the 21 remaining variables. The variables excluded were "*Trust on the quotation process and freight management*" (3); "*Quality of staff assistance and Help Desk*" (13); "*Carrier or buyer evaluation*" (17); "*Delivery notifying and problems warnings*" (19) and "*Formatted reports*" (26).

The number of factors was determined based on the values of characteristic roots. Six factors were then generated, which presented characteristic roots higher than 1 and that explained 60.62% of the total variance of the answers to the questions raised. The remaining factors, with characteristic roots lower than 1, were not taken into consideration in the analysis. Next, the factors were rotated, to facilitate their comprehension, because each of the new factors generated, after the rotation, should reveal a relatively strong correlation with one or more variables and a weaker one with the others. The method used was the VARIMAX, which tries to minimize the number of variables with high factor load. The correlation coefficients between each rotated factor and each of the variables, that is, the factor loads, are shown in Table 1. The factor loads refer to the correlation that exists between each factor and each of the variables, that is, they show the importance of each factor in the explanation of each of the variables. Thus, it is observed, for example, that the correlation between factor 2 and variable 2 is 0.673. Each variable will be associated to the factor with which it has the highest factor load. This way, for example, factor 1 will be formed of variables 12, 16, 18, 20 and 21. The factor loads that express the best association between the remaining factors and each of the variables are emphasized, in bold, in Table 1.

Table 2 shows, for each variable, the obtained communality. Thus, for example, for variable 1, the value of 0.758 for communality means that the common factors explain 75.8% of the total variance. The percentile difference not explained is the specificity. The closer to the unit they are, the better the model adjustment is. By the same token, it can be said that the smaller the specificity is, the better the model is.

The main characteristics of the 6 generated factors are described in the following sections.

Table 1 - Factor loads of 6 factors generated in the factor analysis, related to the evaluation of the importance of services of load matching web sites.

	Generated factors					
	1	**2**	**3**	**4**	**5**	**6**
VAR 01	0.079	0.223	0.143	0.072	0.203	**0.682**
VAR 02	0.093	**0.673**	–0.002	0.171	0.135	–0.152
VAR 04	0.042	**0.735**	0.105	0.142	0.126	0.009
VAR 05	0.012	0.041	0.336	**–0.591**	0.412	0.271
VAR 06	0.064	0.255	0.171	0.092	0.157	**0.750**
VAR 07	0.317	0.016	–0.172	0.264	**0.570**	0.283
VAR 08	0.473	0.126	–0.039	–0.120	**0.485**	0.028
VAR 09	0.402	**0.458**	–0.040	0.318	0.007	–0.060
VAR 10	0.186	0.267	0.112	**0.482**	–0.034	0.293
VAR 11	0.291	**0.643**	0.012	0.017	–0.052	0.322
VAR 12	**0.535**	0.298	0.162	0.415	0.126	0.171
VAR 14	0.033	–0.007	0.171	–0.070	**0.712**	–0.151
VAR 15	0.144	**0.586**	0.262	–0.082	–0.133	0.043
VAR 16	**0.734**	0.162	0.202	0.113	0.130	–0.029
VAR 18	**0.742**	–0.051	0.235	0.174	0.016	0.013
VAR 20	**0.607**	0.299	0.377	0.028	0.037	0.038
VAR 21	**0.415**	0.409	0.377	0.026	0.073	0.248
VAR 22	0.257	0.090	**0.813**	0.188	0.069	–0.027
VAR 23	0.301	0.136	**0.823**	0.038	0.060	–0.270
VAR 24	0.041	0.089	0.434	**0.596**	0.345	–0.048
VAR 25	0.452	0.160	0.311	**0.606**	0.049	–0.027

Note: The factor loads in **bold** express the best association between each factor and each of the variables.
Source: Research data.

Table 2 - The communality values for the variables related to the evaluation of the importance of services and characteristics of load matching web sites.

Variables	**Communality**	**Variables**	**Communality**
VAR 01	0.758	VAR 14	0.647
VAR 02	0.698	VAR 15	0.536
VAR 04	0.685	VAR 16	0.635
VAR 05	0.816	VAR 18	0.740
VAR 06	0.725	VAR 20	0.731
VAR 07	0.639	VAR 21	0.825
VAR 08	0.519	VAR 22	0.772
VAR 09	0.643	VAR 23	0.799
VAR 10	0.728	VAR 24	0.780
VAR 11	0.688	VAR 25	0.739
VAR 12	0.624		

Source: Research data

FACTOR 1 – Services offered

The first factor explains 28.26% of the common variance and can be related to 5 variables that represent the services offered on the sites, being this way labeled as "**services offered**". The associated variables to this factor are: "*Relevance of content: news, toll information, maps*" (12); "*Load follow-up*" (16); "*Presentation of companies in a clearer way*" (18); "*Information booths chain about loads and vehicles*" (20) and " *Chain of* a*utonomous services hiring* " (21). It can be considered that the larger the range of services and relevance of contents, the higher the interest of companies to use the site. Authors like Selz and Schubert (2000) emphasize that, in order to establish virtual communities of users for certain types of products, the companies should provide additional services to those users, making them available to other companies on their respective sites or creating generic services which can be useful for their customers. Values over 3 ("*important*") were given to all the services listed in this factor, except for "*Chain of* a*utonomous services hiring* " (21), which showed an average value of 2.88.

FACTOR 2 – Security and users community size

The second factor, which explains 8.03% of the common variance, has the smallest number of significant factor loads, if compared to factor 1. This factor is associated to 5 variables: *"Data security*" (2); "*Negotiation with parts identification*" (4); "*Facility to use: screen clearness, intuitive navigation, clear and self-explaining screens*" (9); "*Size and community dimension of shippers and carriers*" (11) and "*Capability to find new suppliers or buyers*" (15), which are also correlated to the possible increase in the number and speed of the businesses.

FACTOR 3 – Additional services

Factor 3, "**Additional services"**, presents two variables that identify more complex services, which cannot be offered through the web site: "*Insurance supply*" (22) and "*Payment collecting services*" (23). The two services received values close to 2 ("*without importance*") in the evaluation from the companies. However, the standard deviation of the answers was higher than 1, which can show different evaluations on the users' part. This factor explains 7.11% of the common variance.

FACTOR 4 – Participants pre-selection and scope of services

Factor 4 can be labeled as "**Participants pre-selection and scope of services**" and includes variables: "*Negotiation without parts identification*" (5); "*Participants pre-selection*" (24); "*Scope of services: quotation, evaluation, market averages and news*" (10) and "*Information through fax or E-mail about available loads*" (25). The first two variables are related to the users' necessity in knowing the other participants in the transaction, which could increase, in that manner, their trust on the process. The "*Participants pre-selection*" (24), besides guaranteeing the partners in the system, is also an additional service offered by the load matching services. The negative sign of the variable "*Negotiation without parts identification*" (5) allows its interpretation as a demonstration of the importance, for the users, in knowing their partners in the consolidated transactions. This factor explains 6.28% of the common variance.

FACTOR 5 – Integration and form of negotiation

Factor 5, labeled as "**Integration and form of negotiation"**, which explains 6.10% of the common variance, gathers three variables: "*Negotiation through open or closed auctions without parts identification*" (7); "*Negotiation through the system of purchase order and later negotiation between the parts, with the quotations disclosed in the incognito mode on a scoreboard"* (8) and "*Integration with the systems and processes already existing in the companies*" (14).

FACTOR 6 – Site impartiality

Factor 6, labeled as "**Site impartiality",** is related to the impartiality the site and to the disclosing of values negotiated. The variables correlated to this factor are: "*Site impartiality"* (1) and "*Disclosure of values negotiated to community members*"(6). This factor explains 4.80% of the common variance.

The main goal of the factor analysis, in this current study, is the reduction of the number of variables in order to use cluster analysis. However, some inferences can be made based on the results of this analysis. Examining the criteria for the development of services on the *Web* (see, for example Selz and Schubert, 2000 and Huizingh, 2000), it can be noticed that security, contents, interface, contact with users, are normally presented as important criteria in the development of these services. In the results found in the factor analysis, these criteria are contemplated principally in factors 1 and 2, which together represent 36.30% of the total data variance. Factor 1, named **Services offered,** includes 5 variables that refer to the site content, having average values ranging from 2.88 to 3.38, that is, the group of companies considered them "*important*". Factor 2, **Security and size of users community**, shows variables related to security, content and interface, having average values ranging from 3.11 to 3.63, being therefore, between "*important*" (3) and "*very important"* (4). Compared to the results described by Keeny (1999), the respondent companies act according to groups of companies and users already studied by that author.

The other four factors are also related to at least one of the criteria of security, content, interface and contact with users. Factor 3 is directly related to the site content. Factor 4, besides the range of services, which is related to the site content, has variables related to participants pre-selection. In factor 5, the variable considered "*important*", "*Integration with the systems and processes already existing in the company*" (14), could be related to the system interface. The variables in factor 6, "*Site impartiality*", represent a form of contact between the head office and their customers, as well as an indication of security for the information provided by the users.

However, it should be considered, according to Gontijo and Aguirre (1998), that the factor analysis generates a selection of the most important relations and helps to interpret the relations that come along with each factor, individually. As each choice and each interpretation are, in higher or lower degree, very subjective, it cannot be certified that the relations established are the only true ones. In spite of that, the factor analysis is a very important tool to identify the mutual relations among the studied variables.

Considering that the factors replace, in a satisfactory way, the original variables, it can be obtained an aggregation of companies, considering the factor scores figured out for each one of them. This way, the results found were used for the cluster analysis, through which it can be obtained groups of companies with similar characteristics and approaches.

Results of the cluster analysis

From the factor scores figured out for each company, in the factor analysis, it was possible to carry out the cluster analysis, with the support of the software SPSS 10.0. Following Hair et al. (1998), the distance measurement used was the Euclidean one - the square root of the result of adding the squares of the difference of values for each variable - which is the most commonly used. Table 3 shows the scores given by the companies, of each cluster, to the services and characteristics of load matching services. The method chosen to obtain the clusters was the non-hierarchic one (*k-means*) and the decision about the final number of clusters was made based on the relative cluster sizes as proposed by Malhotra (1999). Three clusters were obtained, being the first formed by 36, the second by 42, and the third by 22 companies. Table 4 lists the predominant characteristics of the three clusters.

Table 3 – Scores* given by the companies researched to the services offered by the load matching services, according to groups formed in the cluster analysis.

Services / Variables	**Clusters (Averages)**		
	1	2	3
(1) Impartiality	3.09	3.29	2.91
(2) Data security	3.83	3.86	2.91
(3) Trust on the quotation process and freight management	3.58	3.71	3.23
(4) Negotiation with parts identification	3.69	3.66	2.64
(5) Negotiation without parts identification	1.26	2.33	1.50
(6) Disclosure of values of negotiation to community members	2.20	2.64	1.50
(7) Negotiation through open or closed auctions without parts identification	1.47	2.19	1.59
(8) Negotiation through the purchase order system and later negotiation between the parts, with the disclosure of quotations in the incognito mode on a scoreboard	1.61	2.50	1.68
(9) Facility of use: screen clearness, intuitive navigation, clear and self-explaining screens	3.53	3.55	2.95
(10) Scope of services: quotation, follow-up, evaluation, market averages and news	3.36	3.40	2.95
(11) Size and range of shippers and carriers communities	3.50	3.21	2.27
(12) Relevance of content (news, tolls information, maps)	3.06	3.33	2.55
(13) Quality of staff assistance and Help Desk	3.14	3.32	2.82
(14) Integration with the systems and processes already existing in the company	2.67	3.49	3.05
(15) Capability of finding new suppliers or buyers	3.77	3.55	2.82
(16) Load follow-up	3.22	3.74	2.95
(17) Carrier and buyer evaluation	3.08	3.26	3.05
(18) Company's presentation in a clearer way	2.91	3.43	3.05
(19) Delivery notifying and problems warnings	3.42	3.79	3.00
(20) Information booths chain about loads and vehicles	3.03	3.50	2.41
(21) Chain of autonomous workers hiring	3.03	3.21	2.00
(22) Insurance supply	2.42	3.52	2.36
(23) Payment collecting services	2.08	3.21	1.91
(24) Participants pre-selection	2.31	2.98	2.41
(25) Information through fax or e-mail about available loads	2.97	3.38	2.68
(26) Formatted reports	2.86	3.29	2.55

*1 = "*without importance*"; 2 = "*little important*"; 3 = "*important*" and 4 = "*very important*"
Source: Research data

Table 4 – Predominant characteristics in the three clusters.

	Clusters		
	1	**2**	**3**
Types of companies	Shippers and carriers	Carriers	Shippers
Types of loads	General load	General load	General load and agricultural cargoes
Internet use in logistics	Non-users	Non-users	Users
Areas where it is used or to which there are plans for Internet use	Management and freight hiring	Management and freight hiring, load follow-up and data exchange	Management and freight hiring
Reason for not using	Not necessary	Internet does not meet the company needs, there is no trust in information systems and lack of knowledge in this area	-

Source: Research data

CLUSTER 1 – Shippers and carriers group

The first group is formed mainly by companies that are classified as manufacturers (38.9%) and logistic operators (30.6%), being the remaining classified as carriers (19.4%) and distributors (11.1%). Thus, it can be referred to as "*Shippers and carriers*". The logistic operators and carriers work, in most of the cases, with general loads and agricultural cargoes – which correspond, respectively, to 38.9% and 33.3% of the products transported/produced by this group. The manufacturers deal mainly with agricultural products and cement.

In this group, the companies have contracts for transportation on fixed prices and periodical prices adjustments or, whenever this does not happen, they operate with fixed carriers. They do not show, therefore, the need to, frequently, search for new partners in the market.

The group is divided into companies that use or not the Internet in logistic activities, with a small predominance of the second case. The main cause pointed for the non-use of the Internet is the fact that the Internet is not necessary in the activity. The main areas where these companies use the Internet are management and freight hiring.

Analyzing the information concerning to this cluster, related to services and characteristics offered by the load matching services (see Table 3), it is noticed that the variables "*Negotiation without parts identification*" (5); "*Disclosure of values of negotiation to community members*" (6); "*Negotiation through open or closed auctions without parts identification*" (7) and "*Negotiation through purchase order system and later negotiation between the parts, with disclosure of quotations in the incognito mode on a scoreboard*" (8) were considered less important than the other characteristics and services, following the approach of the majority of the respondent companies. Other variables, such as "*Participants pre-selection*" (24), also received lower scores than the others. These results can be related to the fact that the companies from the cluster deal with contracts already defined and with preferential suppliers, which would not justify the use of such services.

CLUSTER 2 – Carriers group

The second cluster was formed by 42 companies, being that logistic operators and carriers correspond to 56.1% of the total, with the highest number of companies dealing with load transport, reason for which it is labeled as "*Carriers*". The manufacturers correspond to 41.5% of the sample. The companies deal mainly with general loads (39.4%) and agricultural cargoes (14.6%), while the remaining companies deal with other 12 different types of products. Regarding the criteria for hiring freights, the companies, which are classified as manufacturers, assume contracts on a fixed price, with periodical adjustments, or deal with well-defined and preferential suppliers.

Around 60% of the companies of the group assume they are not using the Internet in logistic activities and the main reasons appointed for that are related to the fact that the Internet does not meet the needs of the companies or that they do not trust the systems and lack knowledge in this area. From the total of users, 34% assumed that they are having plans for using the Internet in logistic activities, especially for hiring freights and in the management area. The fact that the users of this group have plans for using the Internet makes a difference from the users of group 1 who, in general terms, assume that the Internet is not important in their activities.

As for the areas where the Internet is used, this cluster has shown a higher number of options, with small difference of answers, when compared to the other clusters: freight hiring, management, load follow-up and exchange of information.

Cluster 2 has placed, in general terms, more importance to the proposed variables, when compared to the other two groups (see Table 3). On average, the variables received scores greater than 3, being considered "*important*", except for the cases of the variables "*Negotiation without parts identification*" (5), "*Disclosure of values of the negotiation to the community members*" (6), "*Negotiation through open and closed auctions*

without parts identification" (7),"*Negotiation through purchase order system and later negotiation between the parts, with the disclosure of the quotations in the incognito mode on a scoreboard*" (8). Thus, when compared to cluster 1, where non-users also predominate, the companies from cluster 2 tend to consider the services offered by the head office as important ones. The group also shows a higher number of companies which assume to have plans to use the Internet, which can indicate a higher knowledge or values of the services offered. It has to be pointed out that this group is composed by a higher number of carriers and logistic operators that, for having load transportation as their core business, could have higher influence on the actual freight negotiation.

CLUSTER 3 - Shippers group

Cluster 3 is formed by 22 companies, 54.5% manufacturers and 27.3% carriers, being labeled as the "*Shippers*" group. This cluster is characterized for being the most homogenous among the three groups. The group presents the same number of companies dealing with agricultural cargoes and general loads (22.7%). The companies have transportation contracts on fixed prices with periodical adjustments or, whenever this does not occur, they operate with well-defined suppliers. Distributors, carriers and logistic operators, whenever they do not make use of their own transport, use the same criteria for hiring freights as the shippers do.

In this cluster, 59.1% of the companies assume they are using the Internet, especially in the management area and also for hiring freights being, therefore, the only group where Internet users predominate. The companies that do not use the Internet state that this technology is not necessary in their activities. Cluster 3 gives lower scores to the studied variables in comparison to the other two groups (see Table 3).

The variables "*Negotiation without parts identification*" (5); "*Disclosure of values of the negotiation to the community members*"(6), "*Negotiation through open and closed auctions without parts identification*" (7); "*Negotiation through purchase order system and later negotiation between the parts, with the disclosure of the quotations in the incognito mode on a scoreboard*" (8) were again considered from "*little*" to "*no importance*", showing the same kind of approach observed in the other two clusters. This way, for the group of the companies studied, knowing the partner in business is considered an important factor.

The results of the three clusters show that carriers and shippers have different needs and perceptions towards the services offered by the load matching web sites. Carriers place higher importance on the services offered by the head office, maybe because of the fact that they are more directly involved in the activity, when compared to shippers. This result is evident when it is compared to cluster 2, formed mainly by carriers, and cluster 3, formed by shippers. Cluster 3 gives lower scores to the services evaluated, considering them less important when compared to cluster 2. Besides, the results shown in Table 4 reveal that among the three clusters, cluster 3 was the one that gave the lowest scores to 20 of the 26 services offered.

Conclusions

The present research aimed at classifying carrier and shipper companies according to their preferences concerning services and characteristics of the load matching services that operate in the Internet. Based on the results found, it is not rejected the initially formulated hypothesis that different companies, in the case shippers and carriers, place a distinct importance on the services offered by the load matching web sites. Cluster 3, formed mainly by shippers, places a higher importance to the services offered by the load matching web sites, when compared to cluster 2, formed by carriers. However, it has to be noticed that the shippers consist the majority of Internet users.

It is expected the development of new types of services to assist especially the shippers. Taking into account the increase of load offers, it is also predictable that carriers naturally start to use more frequently such systems, which should be more easily implemented by the existing load matching services.

The group of companies researched showed that it is important that the load matching web sites consider, in their development, security criteria, content, interface and contact with users, being the

knowledge about the partners in business one of the most important characteristics for the consolidation of a commercial transaction.

The clusters formed do not show a relevant distinction among the types of loads which the companies studied work with. However, in countries with a higher number of load matching services, it is possible to notice the increase of load matching services focused on companies that work with a specific type of vehicles or products. These new load matching services intend to, in that manner, meet specific needs of the freight market and differ their services from the others. Thus, new groups of different services and characteristics in the load matching services are started up, which could lead to the formation of new clusters of companies. This way, future studies can be developed aiming at identifying these changes.

The size of the sample researched not only allowed to observe characteristics of a relevant group of companies, but also guaranteed a number of satisfactory observations for the used analysis techniques. However, it is important to remind that the results found are valid only for those companies, and cannot be generalized to other companies that were not studied. In future studies, the increase in the sample size could contribute even better for the comprehension of the Internet use in logistic activities.

It must also be considered the contribution from the use of multivariate analysis techniques may give to studies of this nature, where the aim is to classify groups of objects (companies) based on the behavior of a group of variables. The formation of groups with similar characteristics facilitates the use of other methods of study to improve the understanding of the characteristics and needs of well-defined groups.

Finally, it is worth remembering that e-businesses are at an initial phase of worldwide adoption and their technological developments, either in terms of standards as well as in their types of applications, as shown by this study, are occurring at a high speed. Nevertheless, the results obtained are related to the reality of a given period, demanding a follow-up of its development along next times.

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