INDUSTRY LOGISTIC MODEL IMPLEMENTATION BY MULTIPLE OBSERVATION FROM THE SAME SHIPPER

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ABSTRACT

A company has to optimize its production in order to maximize its profit especially in a short time. This means its penetration in a production weaving factory which involves very efficient companies whose products and services highly meet all the customers'needs. Logistics' costs and transport is the most important element because it is a factor of the process since it contributes to optimize it. Choosing the typology of transport to use depending by the shipper-carrier interaction. The parameters which influence the choice of the transport by the shipper are: availability, rapidity, efficiency and security. The attempts to reduce dead times and increase the rapidity of all the processes of the company, are very considerable. Nowadays the margins, to reduce them further, are part of the logistic stream. Among the various signs testifying the will of the companies to pursue such objectives, there is the Just-in-Time philosophy, with its most important member Lever Fabergè of Pozzilli whose strategies will be analyzed according to the choices made using directly specific carriers . As a matter of fact Lever Fabergè, with the drastic reduction of mid-span supplies, made the transport efficiency one of the key elements, in order to set about its products at a national and international level. As a consequence there are more frequent deliveries but in reduced quantity and also the programs complying requested. The importance of a prompt and well-timed delivery gives to the supplier the responsibility of choosing the most reliable transport. But the factor which leads to a reappraisal of the transport role, is the concept of the integrated logistics according to which transport represents one of the main activities of the company logistic system, for the impact it has on the level of service and for the cost it requests. This report shows broken up a logistic models of modal choice which are the most recent and so far they were not taken into account even though very interesting from a theoretical point of view and very useful to evaluate the variety of innovative supply hypotheses. With this model some transport choices regarding the logistic decisions of Lever Fabergeè of Pozzilli, will be simulated. All the information useful for this survey have been possible thanks to Pozzilli factory.

Keywords: Industry, logistic, model, Lever

1. INTRODUCTION

This work is focused on the analysis of the distributive logistic process of a big size company in the home and personal care sector: the Unilever.
Unilever is a multinational group, the most important in the sector of wide consumption. Nowadays Unilever works in 90 Countries with more than 400 brands, employs around 265.000 employees, of which 71.000 in Europe. Its net turnover is estimated to be around 60.000 million €. 40% is concentrated in Europe, 30% in the North America and 30% in other Continents. 67% of the turnover is based on the food sector, 33% on the cleaning and personal hygiene. Each day 150 millions of times in the world one chose products with Unilever brand. It has strong research investments: the base research is focused on the laboratories of Port Sunlight and Colworth (UK) and of Vlaardingen (Oland). The managerial structure is based on two global divisions, one for the food area and the other one for the home and personal care area, with a managerial model based on the concept of business group with expertise for region and goods (Omar K. (1999).
Lever Fabergè Italia is the company of the Unilever group that works in the Italian market in different sectors, such as the personal hygiene, clearance and textures care, dishes and home pavements care. The company is based in Milan and employs around 1350 employees and has got two operative units: Casalpusterlengo (Lodi) and Pozzilli (Isernia). In the block of Casalpusterlengo there are the world innovation centres of the dental hygiene products and for the home clearance. In the block of Pozzilli is focused the production of liquid cleaners. These places, furthermore, are also provided for the market of various countries of the Mediterranean Europe and of the south-east Asiatic (Bowersox D.J., Closs D. J., Helferich O.K. (1986).
Pozzilli is one of the main factory belonging to Lever Fabergè, the cleanser division of Unilever. Products are divided into: FSO (conditioner), GPC (floor products), LAC (abrasive cremes), HDW (dishes cleansers). The actual organizational system makes the company working in a very competitive sector, in which one can underline some aspects particularly relevant such as the difficulty to insert innovative products and the reduction of the supply chain costs (Cunnigham, M.T. and Kettlewood, K. 1975, James P., Womack E .Jones D. T. (1997).
This paper shows broken up a logistic models of modal choice which are the most recent and so far they were not taken into account. Even though they are very interesting from a theoretical point of view and very useful to evaluate supply hypotheses. With this model some transport choices regarding the logistic decisions of Lever Fabergeè-carriers from Pozzilli plant will be simulated. All the information useful for this survey have been possible thanks to Pozzilli factory.

2. SHIPPER BEHAVIOUR AND FREIGHT MODEL FRAMEWORK

2.1. Shipper-carrier behavior modeling

In general freight modal choice model may be defined according to the hypotheses which inform the model itself, that is to say they tend to reproduce the shipper or carrier behaviour choice. They are based only statistic relations from which one wants to describe the studies phenomenon accordingly statistical-descriptive models and probabilistic-behavioural models are identified.

The behaviour of the consume good production firm is validated by a sample analysis of firm or directly from firm data base through the estimation of the attributes of a random utility model based on maximum likelihood method (Quandt R.E. and Baumol W.J., (1966)) .It gives the values of the parameters which maximise the probability to reproduce the firm choices. In the behavioural framework of random utility, different models may be developed in relation to different hypothesis made on the distribution of the residuals of perceived utilities (Oum, T. 1979; Picard, G.and Gaudry, M. 1993, Das C., (1974)).

Carrier sélection mode. Three different studies (Gilmour, P. 1976, Cunningham, M.T. and Kettlewood, K. 1975, McGinnis, M.A. 1979, Gray, R. 1982) examine shipper perceptions of freight modes yielded, speed and reliability, rather than cost are the attributes of modes considered most important to shippers . Others two examples are presented by Boerkamps, J.H.K., Van Bingsbergen, A.J. and and Bovy, P.L. (2000) and Holguin-Veras, J. (2000). The former describes a commodity based freight model that incorporates supply chains the latter estimates freight carriers based on profit maximisation, market equilibrium and user requirements (Evers P.T., Harper D.V. and Needham P.M., (1996).

- ✓ *Shipper and carrier relationship*. Some of the mode choice models analyses the option of using owned vehicle of the possible modes. Min H.(1998) presents a decision support model to assist shippers versus common carrier private fleet . Hall R.V. and Racer M. (1995) describe a decision support system that allocates vehicles in the presence of private fleet and carrier option. On the contrary Crum, B.R. and Allen, B.J.(1990,1991) examined the impact of logistics strategies of JIT systems on shipper-carrier relationships *logistic service providers* (Boyer K.D., 1977) . The question of how companies select providers of third-party logistics service was recently studied (Menon , M.K., McGinnis, M.A. and Ackerman, K.B. 1998).Their results are based on a survey of logistics managers who are less concerned about the prices charged for services. For the specific case of firms providing third party logistics services Hanna J. B. and Maltz A. 1998 found that carriers were providing the services directly.
- ✓ *Shipper and carrier information technology*. Shippers and carriers incorporate information technologies into their operation particularly for port management of container terminal operation and movements i.e., in staking and handling phase. Several studies should be considered (Holguin-Veras, J. and Walton C.M. 1996; Catalani, M.1998 and 2001). Generally all these models are used to examine the logistical performance and impacts of different types of freight distribution or control terminal operation and accessibility improvements. The last kinds of models are very interesting and it is desirable to see more of these in the future.
- ✓ *Shipper and carrier logistic integration management.* Logistics' costs and transport is the most important element because it is a factor of the process since it contributes to optimize it. Choosing the typology of transport to use depending by the shipper-carrier interaction (Baumol W.J. and Vinod H .1970). The unit of load as swap body

or tilt trailed facilitate the logistic supply management. The parameters which influence the choice of the transport by the shipper are: availability, rapidity, efficiency and security by the carrier (Catalani M. and Zamparelli S. 2009). The attempts to reduce dead times and increase the rapidity of all the processes of the company, are very considerable. Nowadays the margins, to reduce them further, are part of the logistic stream.

As regard freight demand modelling several different approaches are present in the literature with their advantages/disadvantages. The models were divided according to the nature of data required and geographica1 scope into aggregate, desegregate, international, interregional and urban (Bayliss, B. 1988 , Friedlaender A.F. and Spady R. (1980). Because in the paper there is an interregional desegregate application, particular attention will be given to the literature at national demand freight model, at consignment desegregation level. Below is reported the main sequence of work in the model interaction field. The behavioral models attempt to explain the freight transportation model as the result of a process of utility maximisation made by a known decision-maker. Early examples may be found in Watson P.L. (1974), Watson, P.L., Hartwig, J.C. and Linton, W.E. (1974). Daughety, A.F. (1979) and Daughety, A.F. and Inaba, F.S. (1981) provide a more extensive but similar modelling framework which is firm1y grounded in the economic theory of the firm. The modelling approach used to estimate freight transportation model within this framework is based on random expected utility maximisation. As formerly seen *two classes of desegregate freight transportation models* are reported in the literature: the so-called "behavioural" and "inventory" models. (Winston, C. 1981, 1983). Behavioral models focus on the mode choice decision made by either the consignee or the shipping firm, whereas, inventory models analyze the demand from the viewpoint of an inventory manager.

Interesting in the desegregate - behavioural contest the work of Abdelwahab, W. and Sargious, M. (1992) and Abdelwahab, W.(1998) tackle the simultaneity of the decisions in the freight market, through a utility maximisation discrete-continuous joint decision model for mode choice and shipment size. The model is a switching simultaneous system of three equations. The first equation determines the mode choice and the others two reflecting the shipment size by truck and rail respectively with vectors of exogenous independent explanatory variables for the shipment sizes by truck and rail respectively.

The special number of Transportation Research (1983) should be recalled, along with the works of Bayliss, B. (1988) and Harker P.T. (1987). However, there are other examples of complete treatment of freight modal choice models with a desegregate behavioural approach; of these, within the logistic approach, it is worth recalling the models set up at the MIT (Freight Transportation Group, 1980; Vieira, L.M. 1993). As regard the consignment approach, modal choice models developed by Daughety, A.F. and Inaba, F.S. (1981) are noteworthy, as well as those obtained within the framework of the PFT2-CNR in Italy, Di Gangi M., Montella B. and Russo F., (1994) and the complete analysis of Regan A. and Garrido M.(2000). A INRETS study estimates a nested logit model of mode choice using desegregate revealed preference data (Jang, F. Johnson, P. and Calzada, C, 1999). This hierarchical , nested under the public transport decision, incorporates a wide array of firm characteristics, goods physical attributes and spatial - flow characteristics of shipments (Garrido R.A. and Mahmassani H.S., (1998- 2000).

In the recent literature, international freights flows have been investigated by many authors but the use of logistics models for intrinsic difficulty to calibrate has not been applied in order to estimate a first magnitude of import/export freight by road or railways or intermodal transport. This paper proposes an analysis of a logistic freight modelling , based on random utility function, of an international company (Lever) exporting products in many European countries (Catalani M., Zamparelli S. 2009). In this comtest Haralambides H. and Veenstra A. 1998 specify the main modelling approaches , based on standard theory of international trade, aggregate cost function and spatial interaction. As they are cross section models they are not adequate for forecasting purposes like demonstrated by Regan AC. and Garrido PA. (2000) . Coto-Millan P., Banos- Pino J, Villaverde Castro J (2005) for example, present a theoretical explicative model and provide empirical evidence to the determinant variables, which explain the behaviour of maritime imports and exports. In the family of input-ouput analysis Zhao Y. and Kockelman KM. (2004) examine the existence and uniqueness of the RUBMRIO, which represents the spatial allocation of productive activities and commodity flows (Moses L., (1955)). Nuzzolo A., Crisalli C. and Comi M. (2008) present a system of models for the estimation of road international import/export freight flow by using a partial share approach.

3 . VOLUMES OF FREIGHT ALLOCATED TO POZZILLI SITE

The planning of the indoor goods flow (row materials) in the plant of Pozzilli is based on Annual Plan that is a plan giving to the company the indications for the entire year (for example 2009), step for step of production, per quarter and per month in terms of quantity to be produced. The establishment is a centre of production that works in strict relation with external bodies named “Local Company”, that follow the purchase of the ended product. The establishment, on the base of the production circle estimated, gives to the local companies its production plans. Euro buyers deal with the purchase contracts on European level, contacting providers and negotiating with them the supply conditions (figure 1). Starting from this plan, and so from these quantities, one determines the request for needs for typology of material in relation to the making (semi worked). Euro buyer, will insert contacts with providers in the system of Pozzilli (Levin R.C., (1978). Contracts that can last a semester, a year or more. Defined the size of contracts, the establishment of Pozzilli arranges weekly the Material Requirement Planning (MRP) that gives the list of needs on medium and large range in function of the type of material and product. In function of the line of production and purchase the plan is uploaded weekly so it is detailed for the production of the next ten days. Defined the plan are transmitted to providers the orders for the purchase of raw material, taking into account the conditions of supply, the features of the components, its status, its availability at warehouse and the presence in the warehouse of space for the storage of materials (Lewis K. and Widup D.P., (1984)).

Figure 1 Pozzilli plant in the Unilever activity in Europe

The establishment of Pozzilli each week on the basis of the Annual Plan, taking into account the clients requests, can plan the production line and transfer to providers its needs. The provider is however uploaded for all the period that include the contract stipulated with Euro buyer and so it knows that in two years, for example, it will provide same million pieces divided per weeks according to the establishment needs.

The entire supplying cycle is constantly monitored: the incoming materials flow, the efficiency of providers according to the delivery times, local companies in terms of ended product. By the output reliability index, (O.R.I) and outlines the progress of the production cycle. The final logistic to obtain a good O.R.I. is to respect the planning ouput. However the index has a related importance respect to the productivity and to the economical progress of the company. The index has just an effect on the imagine of the company taking into account the progress of the other establishments of the Unilever group. The table 1 above gives an idea of some providers, of the kind of provided material, of the used mean of transport, of the quantity and the frequency of dispatch.

Table 1 Management of suppliers

Type of product:

N°	Ingredients	Supplier	Origin Country	Transport	Quantity	Frequency
1	Les	Lever Fabergè	Casale Monferrato	intermodal.	27 tons	2 times a day
2	Betaina	Eigenmann& Veronelli	Rho (MI)	road	28tons	3 a week
3	Betaina	Sasol Italia	Milano	road	28tons	2 a week
4	Sulphate magnesium	Romana Chimici	Anagni	road	26tons	1 a week
5	Citric acid	Jung Bunz Lauer	Switzerland	railways	24tons	2 each 3 weeks
6	Perfum	Firmenich	Ginevra	road	2550Kg	1 a week
7	Preservant	Romana Chimici	Anagni	road	5tons	1 a week
8	Colouring	Sensient Colors	England	road "groupage"	250Kg	1 each 6

						weeks
9	Colouring	Fiorio Colori	Gessate	road "groupage"	250Kg	1 time a month
10	Lemon juice	F.lli Di Bartolo	Calatabiano (CT)	road	4000Kg	1 time a month
11	Demineral water	Water	Pozzilli	/	/	/

Often the inefficiency is linked to disconnected logistic processes among the various junctions of the supplier and distribution chain. To realize an “integrate logistic” that allow to optimize the products flow, is very important that this is supported and controller by an operative system able to manage all the information. In real time it will be possible to verify the quantities contained in the storage silos through the level of raw material and semi worked. At last all raw materials necessary to the packaging of the product will be storage in the so-called “*Dressing warehouse*”. It has got a great automotive level. The great part of goods is moved on standard pallets and a small part on elevator trolleys. It is managed by three operators among which, in function of the machine cargo weekly established plan quantity of raw material necessary for the production.

5. LEAN PRODUCTION AND WAREHOUSE AUTOMATIC MANAGEMENT

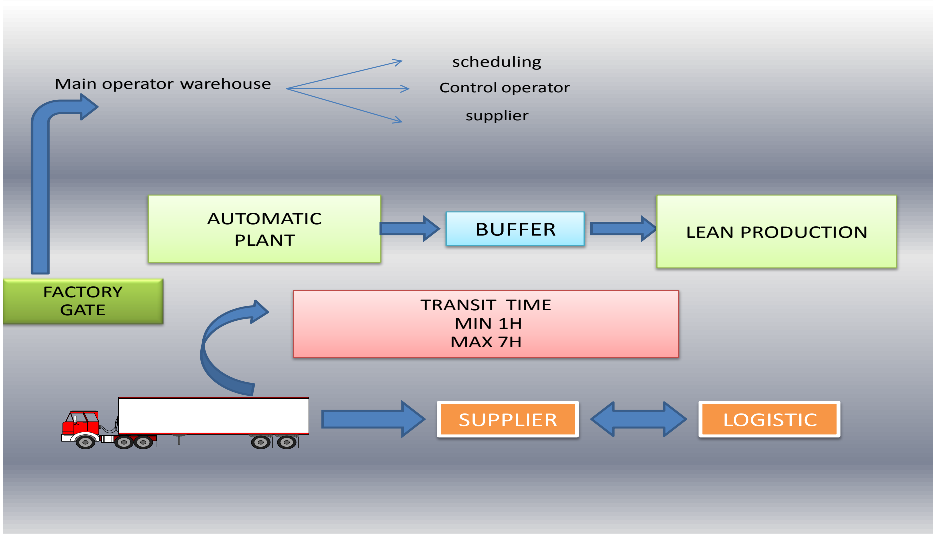
The next step is that of the filling department of the cleanser flacons. This sector is divided into two productive lines that are: traditional and integrated lines.

Traditional Lines:

- filling at high speed (untill 300 flacons each minute);
- usage of purchase flacons by external providers;
- limited and automotive storage;
- maximum usage of 5 operator each line.

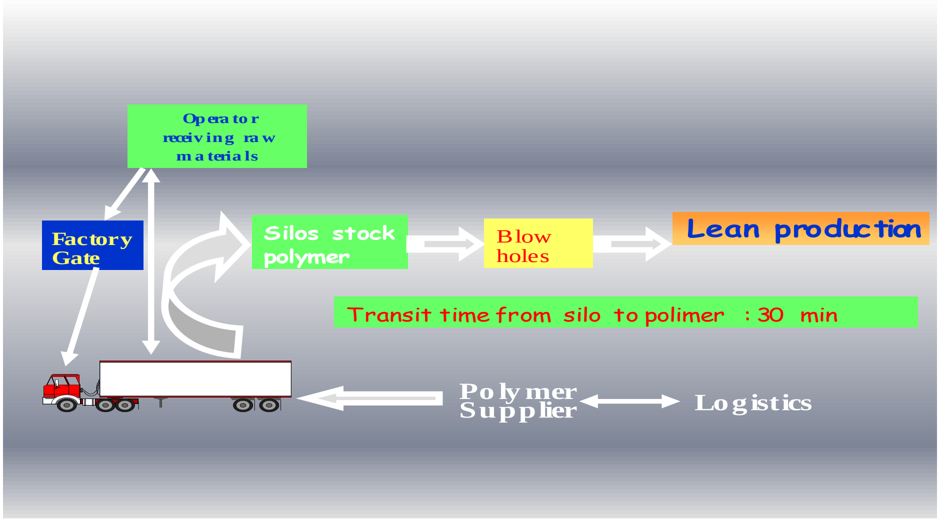
It exists four packaging solution subdivided by line, type of cream and concentrate. Figure 2 above show what the traditional process.

Figure 2. Logistic flux on traditional lines



Integrated Lines:
This process evidences a better transit time. Production of flacons with circular blowing machine (untill 78 flacons each minute). Filling until 120 flacons each minute, even if exists the possibility to use flacons of external providers. Estimated usage of around 3,5 operators per line. The figure 3 above evidences the overall process.

Figure 3. Integrated lines framework



An automotive warehouse absolves to the so called “lung” function because in it should be storage pallets of ended products waiting for dispatch. It is provided of three machines that bring in an automotive way pallets and arrange them in a precise and ordered way. Each machine slide on a binary that allow it to deposit/collect on two cushions, both on right and on link. The automotive warehouse is so composed by six shelves each one containing 50 columns for six high levels. The deepness of the warehouse is of around 50 mt while the dimension of each cell has to be defined in function of the standard dimension of pallets (80x120). The pallet position is recorded and filed in an informatics database in order to bring pallets themselves automatically at the dispatch moment. Than deposited pallets in the warehouse are positioned with sense in such a way that to level always contained quantities in order not to heavier shelves and rescue in this way to break down the structure. At last also for the exit of pallets are following adequate criteria that is to keep pallets with the more elevated dead stock and if the keeping is made in the three halls it will be used the same logistics. At the moment of despatch pallets have to be sent to the unloading places, that are five more one for the trail, where operators of *Industrial Logistic* (external society that deals with a moving service inside the company) make the loading of tilt trailer, swap body and wagon.

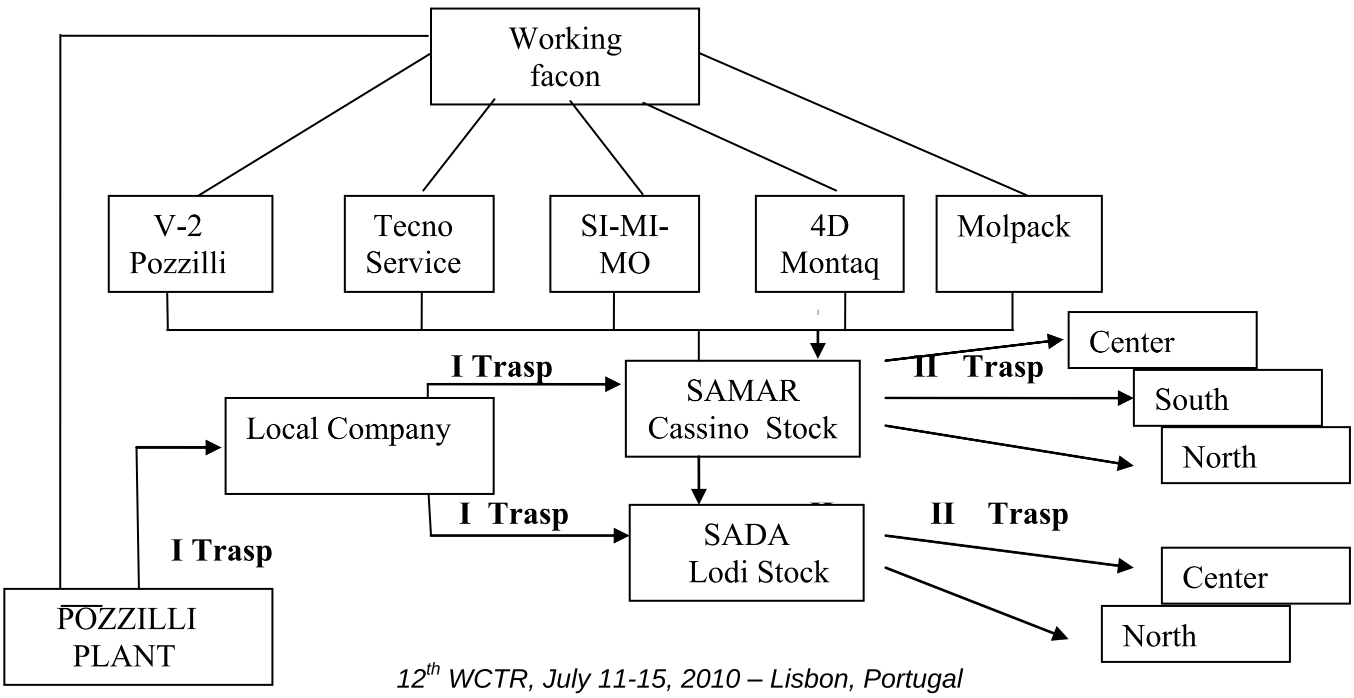
6. OUT LOGISTICS IN THE UNILEVER PLANT OF POZZILLI

Unilever, in the period between the end and the beginning of each year stipulate transport contracts with external companies for transport (Hangartner, FERCAM, Ferroviaspeed etc) for supplying and control quality (Molpack, Montaq, Tecno Sevice etc) and for wharehouses (SADA and SAMAR). The various ways will be awarded by those who will make the best offers. Contracts are different and more precisely they are subdivided in contracts for the European market, those for the Asiatic and for the national market (II Transport) . For the distribution of the ended products realised by the building Lever Fabergè di Pozzilli and Casalpusterlengo have been used two warehouses: that of Cassino managed by SADA and that of Lodi managed by SAMAR who deals with the distribution of the product in the centre-northern Italy (Lambert D., Stock James R. (1993),.

As regard the transport activity originated by Pozzilli plant uses three kind of transport: shuttle (local carrier), intermodal and wheel transport (international carrier) (figure 4). The shuttle service is served by a local carrier, done only by truck, covering the way Pozzilli-Cassino and vice versa (I Transport). It is the carrying service of the product from the local company (carrier) to the main warehouse (warehouse where goods will be distributed in the centre-southern Italy and islands) with a single cost relatively low. Since the wheel transport has a deep impact on costs.

The entire process develops in many step: the ended product is loaded on containers that cross the railway line until the main warehouse in Cassino. Although there is some functionality overlap, the differences between warehouse management systems (WMS) and warehouse control systems (WCS) can be significant . To put it simply, the WMS plans a weekly activity forecast, based on such factors as statistics, trends, and so forth, whereas a WCS acts like a floor supervisor, working in real time to get the job done by the most effective means.

For instance, a WMS can tell the system it's going to need five units of SKU A and five units of SKU B, hours in advance, but by the time it acts, other considerations may have come into play or there could be a potential logjam on a conveyor. A WCS can prevent that problem by working in real time and adapting to the situation by making a 'last-minute decision' based on current activity and operational status. Working synergistically, WMS and WCS can resolve these issues and maximize efficiency for companies that rely on the effective operation of their warehouse or distribution centre. The overall cycle of log out system is illustrated in figure 4.



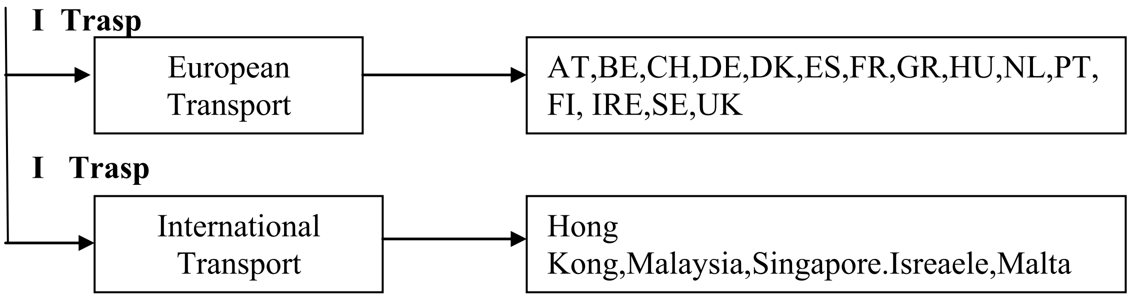


Figure 4. Out logistic of Pozzilli plant with primary and secondary transport

8. LOGISTIC COST PARAMETER ESTIMATE BY MIXED LOGIT MODEL

Aggregate models are based on data and attributes corresponding to aggregate freight flows between different zones with available transport modes. These models use mainly level-of-service attributes (e.g. consignment times, average prices, etc) aggregate models, although simple to apply, have proved to have limited analysis capabilities since many important decision factors cannot be taken into account without a greater level of disaggregation (Jang F., Johnson P. and Calzada C., (1999)) .

Disaggregate mode choice models have recently been studied more frequently. These typically refer to the random utility paradigm and can be divided in two types: *consignment models* simulating mode choice for individual consignments, and *logistic models* simulating a sequence of logistic choices including the size and frequency of consignments, as well as the transportation mode .

Consignment mode choice models are more frequently used in applications. They usually have a functional form that belongs to the logit model, most often of the multinomial logit type although hierarchical logit models have also been proposed in several applications. Choice alternatives typically correspond to the transport modes available for a given consignment (truck, train, ship, air) and often different services are also distinguished (e.g., conventional railway or combined road/railway, etc (Murphy P.R.and Hall P.K., (1995)). *Logistic mode choice models* are newer and so far have found few applications in spite of their theoretical interest and their usefulness for evaluating innovative supply combinations (logistic + transport services) (Cascetta E.2001) These models simulate mode choice in the context of the logistic decisions of the firm determining the transport mode which, depending on the case, may be the selling or purchasing firm. In particular, it is assumed that the choice of transport mode depends on the *logistic cost* connected with its use, which in turn is made up of different components such as :

- ✓ costs associated with orders management
- ✓ costs of transport (prices required for the transport service)
- ✓ costs associated with loss and damage

- ✓ costs of capital locked up during transport
- ✓ costs of inventory
- ✓ costs related to non-availability or delayed arrival of equipment for transport
- ✓ costs of unreliability (early or delayed arrival and related costs of longer storage or locking up of larger supplies)

Logistic costs depend on several factors such as the total (annual) quantity of consignments over a given commercial relation, the average frequency and size of the consignments and the value of the goods . Furthermore, they depend on the characteristics of the service offered by the different modes such as price, reliability of consignment times, and the possibility to know damages. Information on the components of the logistic cost is very difficult to obtain, so it is assumed that the systematic utility function for each mode j. In any case, a great deal of information is required to specify and calibrate these models and their use, at the time, is mostly limited to the analysis of the factors influencing mode choice rather than to large-scale applications (Morton A., (1969) .
The aim of this application is to analyze a model able to calculate the logistic cost parameter of a multimodal transport system operating in the international distribution of product coming out of Pozzilli plant. The model used is based on the Train code (Train K. 2001) interacting with a mixed logit model to determine the logistic cost function. The input data used to calibrate the model consists of many variables: weight of the freight, lead time ,transport cost, flexibility, damages and losses, inventory cost. The base data used is the export matrix for year which contains the following information as regards the sending:

- Customer bill to code
- Costumer ship to plant
- Annual plan (pallets9
- Truck load
- Carriers with name and all sending each
- Full truck load/half truck load
- Equipment
- Transit time unit/load
- Gross weight
- Load price
- Surcharges
- Total load price year
- Cost/pallet
- Cost/ton
- Total bid (pallet) value €
- Inco terms
- Losses and flexibility

The output of the Train code will provide the transport system which optimize parameters of utility function. This takes on particular importance in the case of freight exported in the European area. This case leads us to consider the behavior of Lever that must allocate transport units operating in a multi-European network minimizing the running time and cost(

Catalani M. 2001).In our case, we have a multi destination points (nodes) interconnected by a multimodal routing (links) constituting the network served by a fleet of transport means. We must consider the possibility for each unit of transport to move containers (maritime) , tilt trailer, box trailer and swap body at each point.

As regard the employed methodology for logistic cost calculation it uses a mixed logit model such as McFadden D. and Train K. (2000). This is one of the most complete models developed by McFadden D. and Winston C (1981), McFadden D, Winston C. and Boersh-Supan A., (1985).

The utility function uses only a few logistic cost variables due to the limit of computer program with a large extension of variables. The econometric model application reflects the repeated choice of Plant of Pozzilli who operate at international area with a few forwarders in the distribution of products. The Bayesian procedure in mixed logit model considers the choices (repeated) from the plant among three different mode of transport : road, rail and intermodal rail-road in t time periods (Allemby G. 1997) and (Train K. 1998). The perceived utility from alternative j in period t becomes (Train K., Sonnier G. 2003) [1]:

$$U_{njt} = \beta'_n \; x_{njt} + \varepsilon_{njt} \qquad (1)$$

where $\varepsilon_{njt} \cong$ iid extreme value and $\beta_n \cong N(b,\Omega)$. The vectors of variables x_{njt} and parameters β_n extended to K. Conditional on β_n the probability sequence of choices being the product of standard logit formulas (Train K, 2003):

$$L\langle y_n \mid \beta_n \rangle = \prod_t \frac{e^{\beta'_n x_{n y_{nt} t}}}{\sum_j e^{\beta'_n x_{n y_{nt} t}}} \qquad (2)$$

Successively the parameters are defined by c_n, = *T(* β_n*),* where T is a transformation that depends only on β_n and is weakly monotonic.

The distribution of c_n, is determined by the transformation. Utility is specified as:

$$U_{njt} = T(\beta_n)' x_{njt} + \varepsilon_{njt} \qquad (3)$$

The chartered probability choice sequence given β_n , as Train K. and Sonnier G, 2003 is :

$$L(y_n|\beta_n) = \prod_t \frac{e^{T(\beta_n)' x_{n y_{nt} t}}}{\sum_j e^{T(\beta_n)' x_{njt}}} \qquad (4)$$

The overall explication of the formulas (1,2,3,4), the code and the papers, as said, are available on Train website. The software is based on Train code integrated by Gauss 8.0 of Apthec Co.

8. DATA AND EMPIRICAL RESULTS

[1] Train K. and Sonnier G. 2003‘’ *Mixed logit with bounded distribution of partworths’’*. The methodology, the papers and the manual to implement the procedure described in this paper are available on Train’s website at http:\\elsa.berkeley.edu\~train

The data used in the application derives from the export matrix of the Pozzilli plant by carriers transporting sending in a year. Three different modality of transport as road, intermodal and railways are used with three different transport units as tilt trailer, swap body and rail car. We have a total of 79 sending in Europe (Austria, Belgium, Switzerland, Germany, Denmark, Finland, Nederland, Hungary, France, Spain etc) subdivided by eight carriers which operates also with thermo controlled and thermo wagon units (ICF Kotler P. (1986), Nuzzolo A. and Russo F., (1995-1998)). The matrix contains many information and can be subdivided essentially in three modules:

- the first module contains information as regards the customer bill (code), customer ship to plant (code), the town to send in Europe the unit load, the annual plan of pallets (moved), the amount of trunk loads
- the second module contains information about carrier name with his full trunk load, half trunk load transported with equipment, transit time, units load,
- the third contains information as regard 'pricing, costs, losses and extra costs ,inco terms and so on.

A mixed logit model has been applied to implement the logit cost function. The main variables are the weight of the sending, lead time, transport cost, flexibility, losses and damages and inventory cost (Lee L.R., Maddala G.S.. and Trost R.P., (198)). We adopted the criteria to eliminating variables found to be insignificants in various iteration of the Train mixed logit code with an extension of application in Gauss 8.0 of Aptech Co. This model as noted overpass the traditional limits of I.I.A. mutinomial logit model . Mixed logit estimation by Bayesian methods also called, hierarchical Bayes, allow for panel and cross-sectional data bounded or unbounded distribution and correlated or uncorrelated coefficients. The coefficients of utility function are transformation of the latent terms. The code allow for distribution of coefficients each of which implies a transformation of normal latent term as reported in the paper http://elsa.berkeley.edu/wp/train1202b.pd. The program contains 10.000 iterations obtained converged parameter in a priori distribution. The final estimation of the results are shown in table 2 for model of choice with transformation of normal. The simulated log-likelihood is equal to -198.8388 and is considerably higher compared to others. Infact the modal choice model with all normal distribution evidence a log-likelihood results of-1258.8654 with T-statistic of same coefficients minor of 1. The same for a distribution of all coefficients(type 4 equal log-odds-normal with a specified min and max) with a simulated log- likelihood equal to – Inf Agha M and Branker D.S. (1997). The negative of lead time, such the coefficient is expected to be positive so that log-normal distribution, which have positive support can be used. As stared above after 10.000 iteration are obtained from their posteriori distribution the coefficients of parameters β_n by the transformations of normal. The value of these transformation is given in the latter column of table two. The specification of this assures that the shipper don't like a an increasing of transport costs, lead time, or inventory costs jointly wirth the carriers. Again the estimates of inventory costs evidencing that shipper and warehousing firm are on equines about a variation of the costs (50 %). At last the shipper seem dislike flexibility of transport . These shares seem lower as expected.

However this result might simply indicate that other attributes want to be included in the choice analysis and others investigation are needed.

Table. 2 Estimates of parameters for vehicle choices with transformation of normals

Parameters	**Estimates β**	**T statistics**	**Coefficients estimates with transformations**[2]	
Weight	**-12.47**	**1.85**	**1.00**	**0.01264**
Lead time	**-18.65**	**3.12**	**1.50**	**0.00213**
Transport cost	**28.77**	**3.24**	**1.50**	**0.00 639**
Flexibility	**-6.28**	**2.76**	**0.09**	**0.52458**
Losses and damage	**2.39**	**2.12**	**2.80**	**3.26 341**
Inventory costs	**-46.32**	**7.45**	**0.5**	**0.00239**
Log-likelihood	**-198.08**			

8.CONCLUSION

Logistics as a analytical concept evolved only in the 1950s. This was mainly due to the increasing complexity of supplying with materials and shipping out products in an increasingly globalized supply chain. The goal of logistics work is to manage the fruition of project life cycles, supply chains management modeling and resultant efficiencies .
In this contest it has been studied the criteria of choice by the industry the more efficient means in the logistic transport distribution process. Random utility models has been applied to simulate logistic freight modal choice with a good level of fit. The model seem simulate correctly the behavior of shipper carrier interaction in front of the logistic cost parameters evaluation as evidenced by the results of application.

[2] The coefficients distribution can be normal, log-normal, normal with values below zero massed at zero, log-odds-normal with a specified min and max.

As regard the various signs testifying the will of the companies to pursue the Just-in-Time philosophy, whose strategies will be analyzed according to the choices made using directly specific carriers . As a matter of fact Lever Fabergè, with the drastic reduction of mid-span supplies, made the transport efficiency one of the key elements, in order to set about its products at a national and international level. As a consequence there are more frequent deliveries but in reduced quantity and also the programs complying requested**.**

The unpredictability of markets and the increasing pressure of competitors require today a big adaptable capacity to the various situations and a continuous improvement of quality of products . In other words the most important phenomenon that has deeply changed the behaviour of the Pozzilli plant are the function of the productive-logistic chain. They can give to minor companies secondary activities and/or the management of warehouse and the principal and secondary transport leaving to the company the mansion to plan the entire logistic chain. The externalisation of transport activities close to the plant and provided in third parties not limit the overall control of the transport cycle. If from an hand it defocused form the other hand there is a strong need for the company to coordinate a series of external activities on which it tries to search the control, granting an efficient integration plant - warehouse - suppliers and buyers. Another important phenomenon is that of concentrations: many brands once independent belong today to a big group. That bring to the birth of a network of companies and of establishments that have to be coordinated, because they can be complementary or alternative.

Among these activities there is the logistic cost and in particular the transport cost and the inventory costs. The goodness of the mixed logit modelling as regards these two parameters evidence the relative importance of them in logistic cost calculation. From this the necessity to analyse in the features other parameters as reducing company wastes, dead stocks and same financial aspect of the value of sending and the direction. At last the simulation model seems to give a good answer in terms of liability even if the variables used in logistic function must be extended. The whole answer has allowed to do a correct calibration through the use of the Train code. **It consents to plan** directly by the shipper raw materials, intermediate inputs and finished products that are needed at specific locations in precise terms Therefore the primary focus of this model attend directly freight transportation demand modelling by aggregate-disaggregate matrix imports-exports data interacts with carriers by using full truck load/half truck load. At international level the aim of this class of models is to estimate truck load for the industry and to forecast truck loads for transportation services so anticipating equipment acquisition and labour requirements. The main results of this model are some transport choices regarding the logistic decisions of Lever Fabergeè of Pozzilli that have been simulated evidencing the main logistic costs parameter. All the information useful for this survey have been possible thanks to Pozzilli factory. I think that there is again much work to do in this specific field of logistic model and has been open the road for a wide collaboration between the industry and the advanced research.

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