

# **THE SOFT SYSTEMS METHODOLOGY ON THE IMPLEMENTING OF A GPS SYSTEM, IN THE TRUCKING COMPANIES**

**Adrian Elizalde-Medrano, Ricardo Tejeida-Padilla Oswaldo Morales-Matamoros  
Jorge Mendez-Díaz**

Instituto Politécnico Nacional, México

Emails: elizalde05@yahoo.com.mx rtejeidap@ipn.mx, omoralesm@ipn.mx,  
jorge\_ivanmendez@yahoo.com.mx

## **ABSTRACT**

The identifying of the complex systems of the real world not only require of the participating and the interpretation of the different actors in the society with several Weltanschauung, but also of participative and holistic methodological process of planning-action with a feedback that confront and articulate to the set of subjective visions of each social actor that is involved in the whole process. The trucking face recurrent problems as the empty trips, delays in times for delivering-receiving of merchandises, trips out of route, insecurity of the charging, lack of logistical planning, and high costs of operation, among them. That's why, as a result of the applying of the soft systems methodology SSM, the system Global Positionment System GPS of localization, monitoring and control of vehicle units is a logistical technique that can convert by itself in a model to support the enhancing the levels of productivity in the trucking transportation industry.

Keywords: SSM, Weltanschauung, GPS, logistical, trucking

## **INTRODUCTION**

Nowadays, We live in a world in which the science is revolutioning quickly through its technological growths (Kumar, 2002) and new disclosures developed with paradigms in positive, interpretative, critical and systems types, (Kuhn, 2007), that allow to the men to generate useful knowledge to several areas. Moreover this evolving is obviously related to the logistic topic and the increasing of the productivity of trucking companies.

In this document We find that the logistical action such as its different procedures have invariance of scale within an abroad rank of kinetic items in the chain of supplies of the trucking of the State of Mexico. Besides we disclosed that the fluctuations of the logistical activity of the transport behave in a no linear way and have a symmetrical chaotic tendency.

We pretend through the theoretical results obtained in this Project can characterize the behavior of the chain of supplies and at the same time to model the prototype to measure the logistical impact because the implementation of innovative technology (GPS). Furthermore to identify the parameters that govern the phenomena in case allow us to build a viable model of measuring and to implement it to real situations of transport using methodologies of engineering. Although we must mention that this Project has not developed wholly yet in the case of Mexico. However we believe that with this methodology we will achieve the final objective that was established as a goal.

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We hope for achieving this goal using the Soft System Methodology SSM (Checkland, 1990).

### NO STRUCTURED PROBLEMATIC SITUATION

We did an analysis of the environment and the inner system beneath a economical, political and social focus of the logistics of the chain of supplies-products of the trucking in agriculture, livestock farming and specialized charge.

The trucking in the State of Mexico have mainly a characterization very specific (Mintsis et al., 2004), which is detailed as follow:

- 1.-It has a number very high in empty trips from one origin to one destiny to all its routes.
- 2.-It has an amount very high of costs of operation such as oil, engine, wheels, and maintenance in general.
- 3.-There is not a logistical planning enough to satisfy the demand of trips in the Just in Time.
- 4.-There is not a control on the vehicle units to avoid the abandon of the assigned routes.
- 5.-There is not a network of security against robs and accidents.
- 6.-There is not a way of communicating reliable between dispatch center and the vehicle unit.
- 7.-The 90% of the roads in Mexico have many problems in their structures.

### RICH PICTURE

It integrates the different interpretations of the social actors that participate and for this work in process until now It is a short representation of the problems expressed in the change goals:

#### **Cost-Benefit analysis to the trucking companies because of purchasing of the System GPS.**

The companies of public service calculate a monthly cost by truck of \$ 345.00 USD (\$95.00 by satellital duty and \$ 250.00 USD by financial loan of the equipment). So each owner of transport will have the opportunity to enhance the number of charged trips (the productivity analysis practiced to the companies of transport shows that in average can make from 3 to 5 extra trips charged by vehicle unit and before they made empty). Besides one charged trip represent to the transport company a utility from \$ 300.00 to \$ 600.00 USD ,That It means if the transport company makes one extra trip per month He pays by the service of GPS and receives net utilities by \$ 300.00 USD by additional trip (Reimers, 2000).

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By another hand, Cost-Benefit analysis of the private companies focuses towards 4 main areas: Holistic Control of the productive process, security of the charge, diminishing the costs and service to clients. The main comparative advantages because of the purchasing of the System GPS are the followings:

A.-) With the System GPS we have communication to the vehicle units and the monitoring of the positionment with a margin of error of 30 meters that allows to implement the system Just in Time.

B.-) The continuous monitoring of the conditions of the journey and the security of the charge. El monitoreo continuo de las condiciones de viaje y la seguridad de la carga, permitirá a las compañías privadas, evitar pérdidas millonarias en caso de ordeñas, robos o accidentes.

C.-) The System GPS will help to elaborate a better logistical planning and will allow reduce costs of distribution to increase the productivity of the trucking companies as a whole.

D.-) The System GPS will give direct communication from the dispatch center to the vehicle to inform the state of the charge and thus the transport company will improve its image and will have more participation in the market of this type of duty.

### **Potential of the System GPS in aintercontinental level.**

If We consider the North American market as a reference point to forecast the potential of System GPS in Mexico, We observe that since its introduction in the U.S.A. the mobile services for type GPS has gotten a great success with more of 40,000 bought equipments in its 3 first years of commercialization (Reimers, et al). That's why mobile services of type GPS are considered some of the main means of communications, monitoring, positionment and control to the future, The Department of trade of USA forecasted that these equipments will generate an amazing amount on the next 10 years in a continental level. To evaluate in an objective way the potential of Mexico in comparison to USA. We must consider that there is a great difference between both countries in quality and coverage of the services of telecommunications. By another hand, in function of the low density of the telephone net and the low quality of the service in Mexico. We can argue that the implementation of the System GPS to mobile units will represent to the owners of transport a quantum jumping that will be reflected in the increasing of their monthly net income levels.

### **ROOT DEFINITION**

In the particular case of State of Mexico. The usage of the System GPS (Global Positionment System) It generated the root definition with the aid of the mnemotecnia CATOWE (Checkland, 2008) that is detailed in the following matrix:

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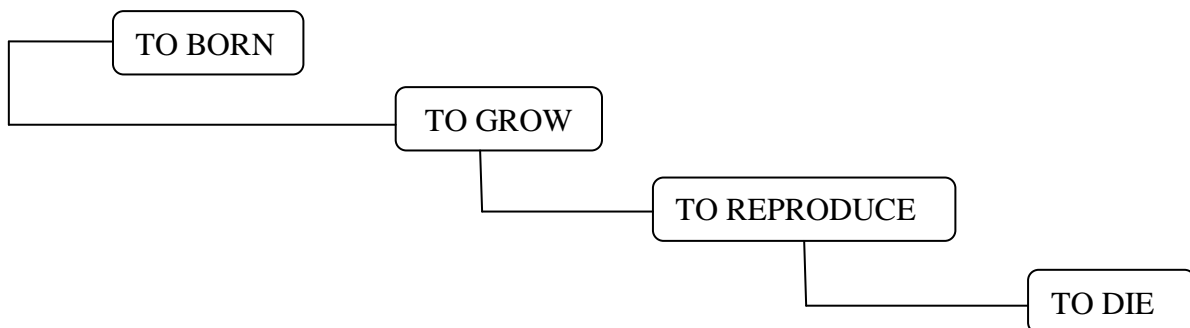
**Chart 1.CATWOE**

CONCEPTS	STRATEGICAL OBJECTIVE	GROUP OBJECTIVE
<b>C</b> CLIENT	Livestock farming, farmers and Commercial centers in a great scale	SAGARPA, SARH
<b>A</b> ACTOR	CANACAR, AMAV	SATMEX, SCT
<b>T</b> TRANSFORMATION	Technological shifting in the logistical process of the chain of supplies/ trucking	Applying of technology to the transport system through the System GPS
<b>O</b> OWNER	Owners of rent transport in the federal public and private ways.	Apply a System of monitoring, Positionment and Control to improve the productivity levels.
<b>W</b> WELTANSCHAUUNG	To guide to solve in a polite way to take operative decisions of trucking.	To change the conciousness of the transport companies to get better income levels through the best productivity levels.
<b>E</b> ENVIRONMENT	Normative, Logistical	Social e Institutional

### OPERATIONAL CONCEPTUAL MODEL

It serves to give an order to the sets of procedures with strategic essence of the technology GPS as an instrument to support in the logistical improvement of the trucking to do the ideal design (OMNITRACKS, 2000). Furthermore the Soft Systems Methodology is complemented with the metaphor of the natural law of the human being (living System) that apply according to the autopoiesis to the proposed model such has the following steps:

#### Metaphor of Natural Law (Living System)



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### MODEL DESIGN

It results from the confronting of the steps I, II, III y IV de la SSM to determine the viability of the design since of the point of view of the user (owner of transport and investor to the system) of each involved company in these processes.

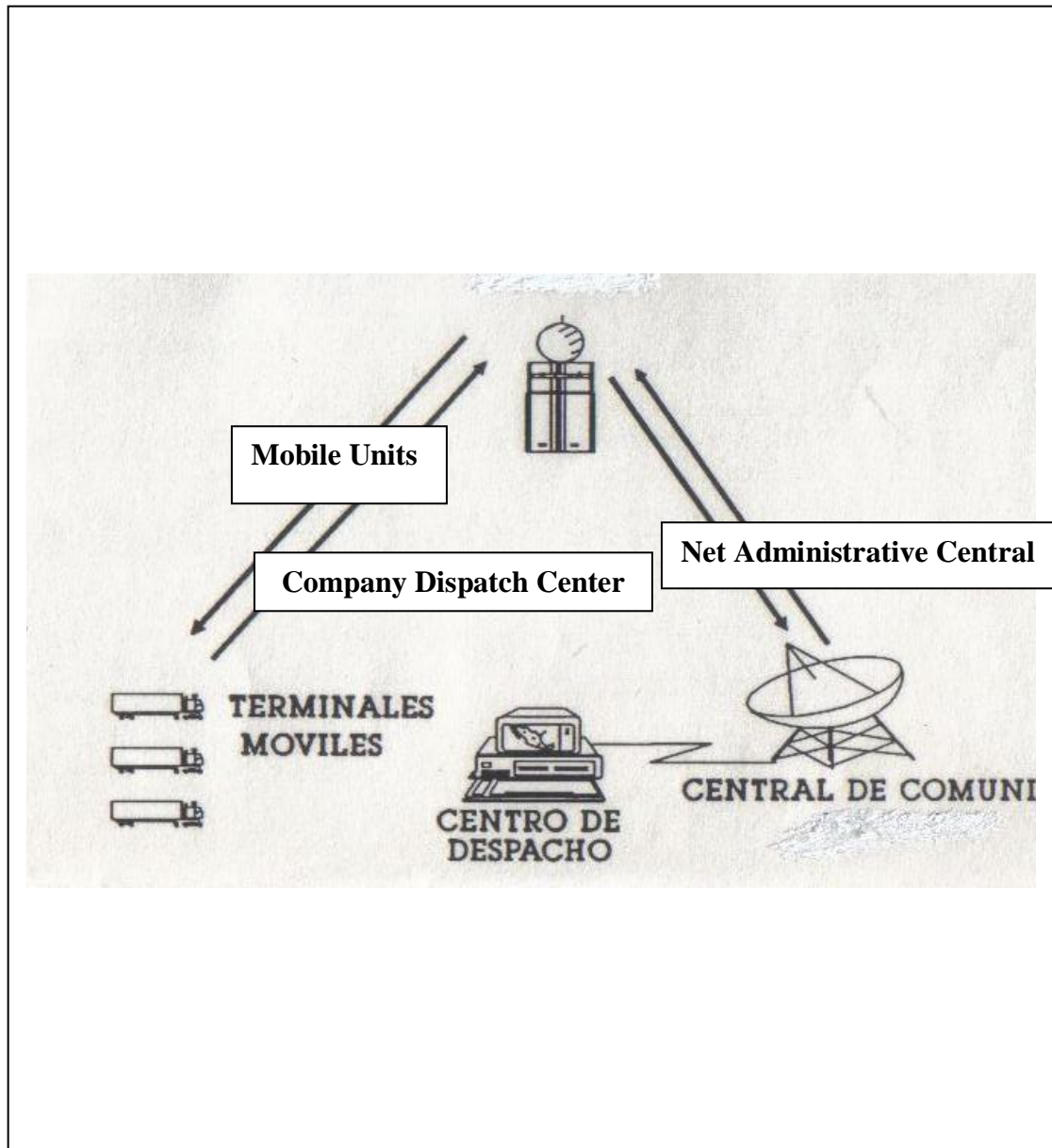


Figure 1. Duty of the System GPS to mobile units

### Components

The System GPS is composed by 4 main components(OMNITRACKS, et al):

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- 1.-Movel Units of Communication (MUC) or transreceptormobileunits (TMU).
- 2.-Net Administrative Central (NAC).
- 3.-Spatial segment compound by Mexican satellites.
- 4.-Company Dispatch Center (CDC).

### Functioning of System GPS to mobile units

The transreceptormobile units harvest information related to the positionment of the mobile units using the sailing system adapted specifically to the needs of the country. That information is transmitted to the spatial segment of the Mexican satellite in group with some message that the operator of the unit requires to send (Wong, 2008). At the same time the spatial segment acts like a mirror and through the propagation of the radio waves. It makes to arrive the data to the Net Administrative Central (NAC) The information is processed and stored there obtaining the positionment and messages of the mobile units. By another hand the Company Dispatch Centers (CDC) establish link to the Net Administrative Central (NAC) through the available means as satellital link (similar to the mobile units), Telephone Net, Telepac, so forth. Receiving in this way the positionments and messages of the flotilla vehicle units.

At the moment in which It requires to send a message to a mobile unit in particular or to a group of them within the flotilla the Company Dispatch Centers (CDC) communicates to the Net Administrative Central (NAC) which through the spatial segment will send the data to the mobile unit (Romero, 2003).

**Chart 2. Percentage Distribution of the objective market of GPS of trucking.**

TYPE	PERCENTAGE
A.-) Public Self-transport	
Heavy	21.95%
Chassis Armour	4.33%
Trucks	4.54%
Other	1.64%
B.-) Private Self-transport	
Heavy	39.18%
Chassis Armour	7.73%
Trucks	8.10%
Other	2.64%
C.-) Different types	9.69%
<b>SELF-TRANSPORT TOTAL</b>	<b>100.00%</b>

**Source: Asociación Mexicana de la Industria Automotriz y SCT**

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The objective market of the System GPS lays on public and private trucking.

### **Technology**

The criteria used to the selection of the technology of the System GPS are:

- 1.-Lider Technology in a world level in the market of satellital mobile services.
- 2.-National coverage with less investment.
- 3.-Total operation through the national links specially.
- 4.-No interferenceto links installed nowadays.
- 5.-Technology abroadly proved..
- 6.-Back up and continous updating of the technology from the provider.
- 7.-Operationof mobile applications in the same band from neighbor countries to allow a possible coordination of international trucking.
- 8.-Confidentiality with the communication.
- 9.-Integration of the data to the administrative systems of the transport company.
- 10.-Equipment with characteristics of rude usage fabricated by the supplier of the Defense of the United States of America Qualcomm (Quality Communications, inc.).

### **Technical Assistance**

The technological supplier gives technical assistance in the following areas:

- 1.-Selectionand integration of equipments of other with special characteristics according to the specific needs of Mexico.
- 2.-Adaptation and development of the own equipments to conform to the operation requirements in the country.
- 3.-Training of the national technique personal to operate, maintain, and give the service to the equipments.
- 4.-Support to the qualified personal to warrant the optimum operation of the movil equipments and the other in the Net Administrative Central.
- 5.-Delivering of technology in case of breaking or disappering of the supplier.

### **Competitors of similar technology**

Within the competitors of similar technology nowadays there are in the world two types of equipments that allows to the mobile units the communication of data with satellite. They operate on C Band and other on Ku Band.

The difference among these consists in that the equipments on L Band requires of satellites or specialized transpondedors that transmit a high power in that Band, while the

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equipments of Ku Band can do the usage of the majority of the satellites in orbit which operate in the Bands Ku and C.

In an international level some competitors that have begun efforts to give service to Mexico are: Geostar, American Mobile Satellite Consortium (AMSC), Inmarsat of Inglaterra, and Telesat Mobile of Canada. Some competitors with alternative technologies are: Cellular telephony in general, Radio Civil Band, and Trunking among others.

### PLANNED CHANGING PROGRAMME

This is the bridge between the planning process, and action or implementation of the System GPS in the transport industry of charge (trucking) planned in a particular form beneath real conditions.

The management that we had with the different social actors and the hoped results is summarized in the following chart of indicators:

**Chart 3. Comparative stage of the System GPS in a intercontinental level.**

INDICATORS	U.S.A. CASE	MEXICO CASE
Bought equipments in a National level	40,000	28,000
Time for sale	3 years (first years)	18 years (from 1992 to 2010)
Main supplier	QUALCOMM	OMNITRACKS
Apply of ABC analysis	100%	5%
Usage of financial support	100%	75%
Problems on roads	0%	80%

### PRELIMINARY CONCLUSIONS

The soft System Methodology SSM because of It is a flexible methodology It adapts to the expressed problem situation in the transport of charge (trucking) generating an abroad vision in the implementation process of the technology GPS in the trucking of the State of Mexico and although the applying follows in process, the hoped results are the followings:



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Chart 4. Hoped Results with the implementation of the System GPS

INDICATORS	MÉXICO CASE
Bought equipments in a national level	84,000
Time for sale	2010 a 2020
Main Supplier	OMNITRACKS
Apply of ABC Analysis	100%
Usage of financial support	100%
Problems on roads	80%

We hope to implement an important number of GPS equipments in a period of ten years from 2010 to 2020 with the aid of the productivity analysis. Besides we will support to the transport companies to get financing to buy the required equipments. Thus we will focus the logistics of the chain of supplies towards a new paradigm to get the best success.

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