AN INNOVATIVE PROPOSAL IN THE AREA OF PRODUCTION

THE USE OF A SECTORAL PRETENDER FOR MANAGERIAL TRAINING

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SUMMARY

The objective of the present work is to diffuse a managerial pretender that qualifies and it trains in the administrative economic area. It also allows, to develop managerial and financial abilities, of great necessity in the managerial activity. -

These objectives are achieved by means of cooperative games of strategies based in technical of Lineal Programming, besides use of technical heuristic and heuristic goal that you/they allow to obtain feasible results in complex models, where the search space is very big, and brief time is required, to find a plan of in agreement production to the demands of The Management. -

By means of the pretender for managerial training, it is qualified the student in the taking of decisions, achieving better results that in the manual training, always pointing to the solution of problematic situations common to the production area. -

The industrial sectors possess scenarios characterized to be unwrapped in a context of uncertainty. He/she puts under an obligation to that, the pretender captures the turbulences in that it can be this inmerso, correctly and this way it is good to contribute bigger quantities of feasible solutions that the classics analyzed by a manager, in the routine form of its work, inside managerial styles supported in the intuitive handling. -

KEY WORDS: Managerial pretender, Theory of Games, Heuristic, lineal Programming, Software.

ABSTRACT:

This paper aims to show to simulator up focused in training and improving skill in the the management fields.

This goals plows achieved through cooperative strategies games based in Lining Programming, added to puts and heuristic tools, that they allow to get feasibles solutions in complex models, where the search space is bigger than current space, short it cheats available given the Manager requirements.

Through the Management Training Simulator, student learns how decisions is taken, getting better results than in manual training, focused always to deal with current problem solutions at the productions fields. -

Industrial sectors run in uncertainty scenarios, that they compel at the simulator to collect rightly at them, and then, to give to the manager in his routinely work days, to feasible solutions quantities than through classical approach characterized by intuitive handle lives in decision taking styles. -

KEY WORKS: Manager Simulator, Game Theory, heuristic technique, to Line Programming, Software tools.

INTRODUCTION

A model is an image or representation of a system, generally simplified and incomplete. And it is denominated simulation to the experimentation through a model, to extract conclusions or to carry out predictions.

The simulation like formation method consists on locating the student in a context that he/she imitates some aspect of the reality (I model), and to settle down in that atmosphere similar situations to those that he will face in its professional life, so that he/she can "to experience" without risk and to extract conclusions.

The managerial pretenders and games of simulation of companies are modern methods of teaching learning that allow to recreate the reality, where the player applies technical of administration in order to understanding the complex managerial dynamics, to carry out an I diagnose of the problems in a clear way and the implementation of solutions through computer tools that improve his professional or labor acting.

The use of the simulation in the managerial formation allows to accelerate the learning process and to contribute to elevate the teaching quality, making more efficient the formation of students.

We expose the result of the first stage of the investigation project synthetically "Analysis of Managerial Pretenders Using Guided Evolutionary Heuristic Models to the Training in Sciences of the Administration."

The used pattern is a managerial pretender, more specifically in the area of production of the same one that will allow us the application of tools of Operative Investigation and Planning of the Production, with what is possible to integrate different necessities of the careers of Industrial Engineering and Degree in Administration of Companies.

1. I MARK THEORETICAL AND METHODOLOGY

1.1 instruments and used tools

1.1.1 theory of games:

In a game, several agents look for to maximize their utility eligiendo certain action courses. The final utility obtained by each individual depends on the chosen action courses for the rest of the individuals.

The theory of games is a tool that he/she helps to analyze problems of interactive optimization. The basic suppositions of the Theory of games, are:

" The players have very defined basic objectives (they are rational).

" The players take into account their knowledge or expectations of the behavior of the other players (they reason strategically)

The models of Theory of Games are abstract representations of situations of the real life. These abstractions allow to study a wide range of phenomena. For example, the Theory of Balance of Nash (Nash J. 1950) it has been used to study oligopoly and political competition.

1.1.2 model of Lineal Programming:

In the pattern of lineal programming two key elements that are the resources and the activities exist where "m" it denotes the total number of resources that you/they are used in the pattern and "n" it denotes the number of activities of the pattern.

The resources can be: quantity of money and times of hours scheme or used teams, hours men (manpower), among others. The examples of activities can be investment in projects, productive processes that insumen resources or any activity that it involves the use of the same ones.

The most common application in lineal programming is the assignment of resources to the considered activities. The total quantity of each resource this limited one, so that we have limited resources. The determination of this assignment includes

to choose the levels of the activities that will achieve the best value possible of the global measure of effectiveness.

Certain symbols are used in a conventional way to denote the different components of a model of lineal programming. These symbols are enumerated next, together with their interpretation for the general problem of assignment of resources to activities.

Z = value of the global measure of effectiveness

xj = level of the activity j (for j = 1,2,..., n)

cj = I increase in Z that is when increasing an unit in the level of the activity j

bi = quantity of resource available i to assign to the activities (for i = 1,2,..., m)

aij = quantity of the resource i consumed by each unit of the activity j

The pattern establishes the problem in terms of making decisions on the levels of the activities, for that that x1,x2,...., xn calls themselves variables of decision. The cj values, bi and aij (for i = 1,2,...., m and j = 1,2,...., n) they are the entrance constants to the pattern. The cj, bi and aij are also known as parameters of the pattern.

Standard or Generic 1.1.3 form of the Pattern:

With these definitions we can formulate to the mathematical pattern for this general problem of assignment of resources to activities. In necessary Data for a model of lineal programming that manages the assignment of resources to activities matter, this model consists on choosing x1,x2 values,...., xn for:

To optimize (to maximize or to minimize) Z = c1x1 + c2x2 +..... + cnxn,

Subject to the restrictions:

a11x1 + a12x2 +.... + a1nxn (<=, >=, =) b1

a21x1 + a22x2 +.... + a2nxn (<=, >=, =) b2

.

.

am1x1 + am2x2 +.... + amnxn (<=, >=, =) bm

X1 >= 0, X2 >= 0,..., Xn>=0.

1.1.4 study model

The established pattern is a game of simulation of companies, called Educational System of Integral Administration in the Area of Production (SEGIAP) based on the use of mathematical techniques of operative Investigation, and the application area is the Production that will allow us the use of tools of planning of the production that to its you see it will integrate necessities of the careers of Industrial Engineering and Degree in Administration of Companies.

The pattern is designed in electronic leaves of calculation (Excel) and it is programmed in the Visual software Basic Application (VBA) whose description is mentioned next:

1.2 description of the system:

The software SEGIAP contains two Computer elements that it uses of support:

" It structures general of the file Excel: it is an only file called chart of data where is all the information of the system.

" It structures general of the VBA: they are 6 forms with the reference solver.xla and Microsoft Excel 9.0.

The first one contains the database of the system like likewise the exit reports. The second is the system agent that facilitates prosecution of the information, allowing to store and later on to consent to the data in a quick and structured way, allowing the generation of the reports of Technicians and Economic of Production to each participant individually.

The two interactúan in a permanent way to give a friendly and comprehensible environment to the system.

The game possesses an innovation from him point of view of applicable computer tools, which contains an I modulate of optimalidad (Solver.xla indexes) that allows the Administrator of the pretender to obtain each player's good production, considering the good nº of units of products to elaborate in each shift considering:

" 2 Productive processes: that it involves the use of two types of you scheme in each process, used in all the established work shifts.

" 2 types Different from Matters Cousins: used in a different way for each product.

" 4 shifts of Production: two normal shifts of 8 Hs.. and two extra shifts of 4 Hs..

" 4 products: that insumen different quantities of resources.

1.2.1 operation of the SEGIAP

The (SEGIAP) that simulates the production area in a company manufacturer that elaborates products using the human resources (MO), industrial processes (MQ1 and MQ2) and matters cousins (MP1 and MP2) of a company in a competitive atmosphere. He/she finally has to introduce, to qualify and to perfect students, managers and managers in the development and administration of the production area, what implies the qualitative so much analysis of information as quantitative, applications of administrative tools, the taking of multiple decisions, revision of their repercussions and the adoption of having measured correctivas of being necessary, among other aspects.

The SEGIAP optimizes the production level for each one of the products, that is to say the best decision of mixture of products (number of products to elaborate for each product type, in each shift (normal and extra), with the available resources (MO-Maq-MP)) from the economic point of view and considering the objectives and limit of production.

The SEGIAP calculates all the values of the production report (costs, use of resources) with the good level of production (that is to say the value of the reports corresponds to the good value of the production considering the restrictions of the market, orders, provisioning and capacity) and not at the production level that the player has decided) and then it compares the good decisions with the decisions and the player's costs to determine the deviations of his decisions and the good of the game.

Of that it is two deviation indicators or the player's performance:

" I deviate percentage of production level: (DNP - NPO) X 100

" I deviate percentage of costs unitary average of the products: (DCUPP - COUPP) X 100

Being:

DNP: Decisions of the level of the player's production.

NPO: Good production level of the game.

CUPP: Cost Unitary Average of each product for the player.

CUPP: Cost Good Unitary Average of each product of the game.

Then, to inclination the ponderación of this indicators the general indicator of the game, or managerial ranking is elaborated.

1.2.2 the decisions that will take are:

At the beginning of each trimester they will take decisions on:

" Planning of the production, this is nº of produced units of each product in each one of the work shifts for the considered period.

" Number of People to Hire.

" Number People to leave Dismissed.

" Planning of the maintenance, this is machinery immobilization, in function to the readiness horaria.

" Investment dedicated to the improvement of the productive processes.

" Matters Cousins to acquire for each one of the products.

" Determination of costs averages of the products.

After having operated the GAME OF SIMULATION OF COMPANIES, a complete group of production Reports will determine the consequences of the decisions that have been taken and the new situation at the end of the trimester, which are described next:

1. Technical report of Production: it consists of 6 articles that provide information about the readiness of resources that possesses the production area like likewise the productive goal for each one of the products, settled down by the commercialization area and finances.

2. he/she informs Economic of Production: It provides the quantification of the available resources in monetary terms and it determines the costs for concept and for product in total and unitary terms respectively.

1.2.3 Technical report of Production

" Presage of sales: It presents the units of products required presently for their commercialization period. They are also the production goals to those that it is sought to arrive.

" Readiness of matters cousins (in kilograms): it Provides the information of inventory of matters cousins in units for each one of the products, revenues of products corresponding to the order of the present period and the previous one. It also determines the matter use it prevails for the production of each one of the products.

" Facility of human resources (manpower): it allows to appreciate the nº of operatives that possesses the production area to the beginning of the period, the happened modifications (high and low) and the final facility.

" Factory potential (industrial capacity): in the same way it provides us the information referred to the units of machines that it possesses the production area and the new readiness of machines and the acquisitions in course.

" It plows of it schemes and preventive maintenance: it shows the nº of machines that are insolent and outside of service, likewise the hours of applicable stop of machines to each one of the shifts.

" Planning of the production (units of products): it provides information of how many product units they were elaborated in each shift.

1.2.4 Economic report of Production

" Obtained revenues: It is of the product of the sold units (dear) and the price of each one of the products.

" Assignment of resources: it allows in terms of units of resources (Hs. Man, Hs. Machines and units of MP that were used in the productive process.

" Unitary costs of the resources: it shows the unitary monetary value of the resources in function at the production level.

" Total costs of the resources: It is of the product of the unitary costs for the quantity of units of used resources, it also contains not the fixed costs linked directly to the products.

" Cost unitary total average of each product: it is one of each player's decisions. It is given by the sumatoria of the costs unitary variable more the sumatoria of the averaged unitary fixed costs.

1.3 process of Optimalidad:

The optimalidad process this captured in a series of algorithms computacionales in Visual Basic that works together with the solver.xls, in order to achieve the optimization of the production allowing the I calculate of optimalidad in exact form for each one of the products, in each shift and in function to the available resources, in the way but quick and with the certainty of not making mistakes.

The optimalidad process, is a model of lineal programming that calculates 16 variables that are the quantity to take place of each product (product 1, 2, 3 and 4) in each one of the shifts, subject to the restrictions of:

1. readiness and requirement of matters cousins

2. hours available men and required for the production settled down by the player and subject to the demand of the market and in function to the specified work shifts.

3. hours you scheme available for the production that is in function to the quantity of used machineries and available in each work shift.

4. other questions that they make to the minimum production of each one of the offered products and to their demand according to the politicians settled down by the player.

5. other aspects that are of the case of study of the game.

1.3.1 model of PL simplified for the SEGIAP:

Value Z of the function of optimization:

Z = Value of the measure of utility of the company. (maximization of the value of net utility).

Variables of decision Xij:

xij = Number of elaborated units of each product (for i = 1,2,3,4) in each work shift (for j = 1,2,3,4).

Coefficients of the function objetivo(parámetro):

cij = Margin of utility of each product (for i = 1,2,3,4) in each work shift (for j = 1,2,3,4).

Recursos(parámetro variables):

MOi: Hours Men used in the elaboration of a product i (for i: 1,2,3,4).

MQ1i: Hours you scheme (type 1) used in the elaboration of a product i (for i: 1,2,3,4)

MQ2i: Hours you scheme (type 2) used in the elaboration of a product i (for i: 1,2,3,4).

MP1i: Units of Matter Prevail (type 1) used in the elaboration of a product i (for i: 1,2,3,4).

MP2i: Units of Matter Prevail (type 2) used in the elaboration of a product i (for i: 1,2,3,4).

Readiness of resources (right side of the restriction-parameter):

bmoj = Quantity of resource of available manpower to assign to each work shift j (for j = 1,2,3,4).

bm1j = Quantity of resource (Hs.. it schemes) of machinery 1 of the process, available to assign to each work shift j (for j = 1,2,3,4).

bm2j = Quantity of resource (Hs.. it Schemes) of machinery 2 of the process, available to assign to each work shift j (for j = 1,2,3,4).

bmp1 = Quantity of resource of Matter 1 Prevail available for all the products.

bmp2 = Quantity of resource of Matter Prevails 2 available for all the product. -

bxij = maximum Quantity of product units to elaborate in each work shift. -

bxminij = minimum Quantity of product units i to elaborate in each work shift j. -

Quantity of each resource insumido in the process (parameter):

aMOij = Quantity of Hs.. man MO insumido for each work shift j (for j = 1,2,3,4).

aMQ1ij = Quantity of Hs.. MQ1 insumido schemes for each work shift j (for j = 1,2,3,4).

aMQ2ij = Quantity of Hs.. MQ2 insumido schemes for each work shift j (for j = 1,2,3,4).

aMP1ij = Quantity of units of MP1 insumido for each product i (for i = 1,2,3,4) and I alternate j (for j = 1,2,3,4).

aMP2ij = Quantity of units of MP2 insumido for each for each product i (for i = 1,2,3,4) and I alternate j (for j = 1,2,3,4).

1.3.2 presentation of the Pattern:

Function objective:

To optimize (to maximize) Z = c1x1 + c2x2 +..... + cnxn,

Subject to:

Manpower restrictions for each work shift:

aMO11x1 + aMO12x2 +.... + aMO1nxn <= bmoj

Restrictions of it Schemes 1 for each work shift:

aMQ111x1 + aMQ112x2 +.... + aMQ11nxn <= bm1j

Restrictions of it Schemes 2 for each work shift:

aMQ211x1 + aMQ212x2 +.... + aMQ21nxn <= bmp1j

Restrictions of Matter Prevail 1 for each work shift:

aMP111x1 + aMP112x2 +.... + aMP11nxn <= bmp2j

Non negatividad restrictions or minimum production:

Xi >= bxminij

Restrictions maximum production:

Xi <= bxij

CONCLUSIONS

The Educational System of Integral Administration in the Area of Production allowed to advance significantly in the understanding of the pattern of optimization that contains many of the suppositions and tools used in the programming you line him operative investigation.

With the managerial Pretender, it can settle down parameters and characteristic of the design of the game of companies and also teaching-learning methodologies that allow to incorporate to the player's abilities, as the study of the case, as pedagogic element that allows to understand the learning process, the incorporation of procedures and computer techniques that allow the student to build mathematical models in order to optimizing similar processes to the real ones and for I finish the incorporation of similarity of the reality manager, the solution of complex problems and the taking of multiple decisions.

BIBLIOGRAPHY

Please refer to Article's Spanish Bibliography.