Modularization of the enterprise and System Dynamics models

An application to the explication of suggestions from the shops

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Summary

Organization design can benefit from the utilization of the currently available simulation techniques . The utility is greater where new organization profiles are in experimentation phase.

This work has been developed as part of a larger study (still in process) related to the experimentation that is developing in manufacturing. We are observing the creation of manufacturing units that manage , nearly independently, the manufacturing and the related supporting processes.

One of the peculiar characteristics of these organizations is the way these units manage the suggestions (technical, management, maintenance) coming from the employees. The New Holland case shows the dynamic of transformation of the suggestion processing and implementation. The models developed clarified the reasons of some problems observed and suggested some possible corrective actions.

1 - Introduction

This paper is divided in two parts : the first one briefly describes the characteristics of the new units ("shops") that are object of the study and the prototype we have studied. The second one is a brief description of the models built, of the tests performed and the discussion of the results.

2 - The "shops" : generalities, structure and working principles

The institution of the "Shops" is caused from the rethinking still in act related to the manufacturing. This rethinking is motivated from the necessity to manage the downsizing processes and, at the same time, do not rely only on the automation in order to achieve the desired level of effectiveness.

Many are the reasons motivating the institution of this new organization units; we believe that the main ones are : Process simplification and the desire to adopt management logic's used into small sized organizations . In this way the advantage of small and large scale are pursued simultaneously.

The "shops" are nearly independent units that perform, with large autonomy, activities related to a given set of products and/ or geographic domain. The decomposition is guided by a simple set of rules : size, competition (internal and/or external) , organizational identification, accountability etc.

The resources are allocated on the base of the activities to be performed. The basic idea is that the "shop" should be able to manage the maximum number of factors affecting the production. In fact , at a first glance, the difference between a "shop" and an independent enterprise are negligible.

The "shop" manage directly (within certain limits) these functions : *Personnel* (Education and training, allocation, incentives, temporary hiring etc.) *administrative*

(traffic management, information's with other internal or external units), *Purchasing* (choice and management, order etc.), product and process design (interacting with the centralized Marketing and Laboratories structures) , process maintenance (quality, facilities).

The "shops" show evident advantages Vs the traditional solutions - the structure is reduced , information and decisions flows are greatly accelerated . The design principles of the "shop" are : facilitate the participation of the employees and exploit the skills of the "human capital". The "shop" encourage proposals of improvement of all the manufacturing process' components . These proposals (subsequently denoted as suggestions) are the subject of the second part of our paper.

3 . The laboratory : generalities

Our laboratory has been the New Holland , one of the few cases of "shops" that has been implemented in Italy. New Holland has a large number of products in the Agriculture automation field. It is part of the FIAT holding and it comes from the fusion of Fiat Geotech and Ford New Holland in 1991.

The survival of the new company was immediately a problem due the market situation and the level of competition. In the first part of the 90 this business segment had a spectacular crisis : yearly demand dropped 20-25% Production capacity utilization fallen from 80% (1985) to 40%(1992).

In 1991 New Holland started a restructuring process that radically changed dimensions and activity of the company (in less than two years the employees from 30.000 became 19.000) . The restructuring affected all the areas - especially the industrial ones (Aa Vv 1993).

In this areas the restructuring has been made in four steps : the first one was the integration, the second one the definition of strategic products and allocation to the proper production facilities , the third one was the redesign of the relation with the suppliers and the restructuring of the suppliers' base, the last (still in process) was the organizational redesign of the production units with the creation of the "shops" (Manufacturing Business Units in the company language).

4 - The simulation in support of organizational analysis

The theater of our operations has been the New Holland plant located in Modena.
Starting 1994 , after a design lasted for one year, the first Manufacturing Business Unit has been established. Our study begun exactly one year after (may 1995).
The MBU produces hydraulic groups and has the characteristics outlined in the prevoius chapters : direct management of the suppliers, work organization, personnel management of the continuous improvement process.

The continuous improvement is based on "suggestions" that are improvement proposals coming from any person part of the MBU. The majorities of the suggestions comes from the blue collars. The written proposals trigger an evaluation and implementation process. The process has been designed in such a way that the MBU itself has the maximum amount of responsibility in their analysis and implementation. The accepting criteria were: i) importance of the suggestion ii) level of competence needed in order to implement it.

For the first point the evaluation is both technical and economical with an estimate of the forecasted saving. In the second one two paths could be chosen : the simpler one being the technical analysis and the implementation carried forward directly by the MBU itself the most complicated one being analysis and the implementation done by centralized functions.
The classification adopted for the suggestions is the following : *Technical* (regarding the process and the products), *Maintenance* (equipment's, fixture , tools and workplace) and *Management* (Procedures, internal logistics, relation with the suppliers, etc.)
The cumulative curve of all the suggestions of the first year is in the first graph

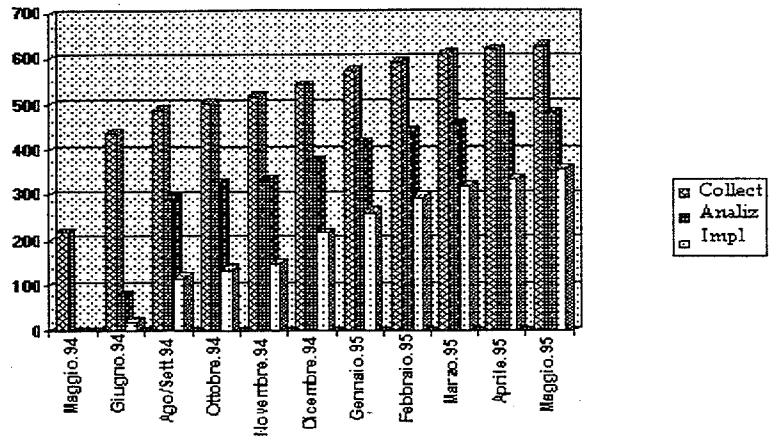


Figure 1

The two basic question coming from MBU management were :
1 - Given the curve of the collected suggestions can we build a simulation model able to generate a behavior similar to the one observed ?
2 - Supposing that we were able to reply to the first question could we identify the variable key explaining why the collected suggestion had such a trend ?
a corollary to this question was : could we advice to the management an alternative strategy , or else: could the model help the management in evaluating a set of new actions they were going to implement in order to revitalize the process that looked stopped.?
1 - To answer the first question we modeled the analysis and implementation process of the suggestion as it has been performed in the first year.

The results of the first model we run using as exogenous input the number of suggestion collected are in the following picture:

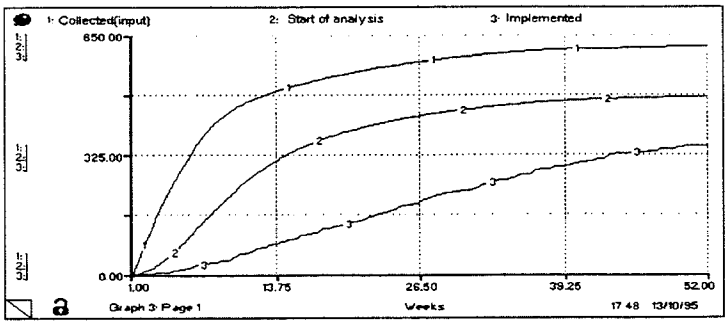


Figure 2

The model has the same trend and the results are very close to the ones observed in reality.
The answer to the first question was : the gap observed from the suggestion collected and

implemented depends on the degree of autonomy of the MBU and on the number of resources managing the suggestion process.

To answer the second question we modeled the suggestion developing process taking into account three soft variables (represented as storage's in the model) :
1 - Employees motivation to put forward a suggestion : it depends on the direct action of the management (commitment, incentives), on the accepting probability , on the accepting time and on the implementation time.
2 - Employee competence : composed by a basic skill and improved through training activities (technical, management etc.) performed by the organization
3 - Improvement potential : depending on new ideas (related to competence) and on the innovation level of the processes (mainly dependent on organization decision). The potential is diminished by the implemented suggestions.
This model suggests a set of leverage that can be acted in order to drive the suggestion creation process . These leverages are all the variables influencing the three storage's now described.

Setting the parameters we were able to reconstruct the historical trend

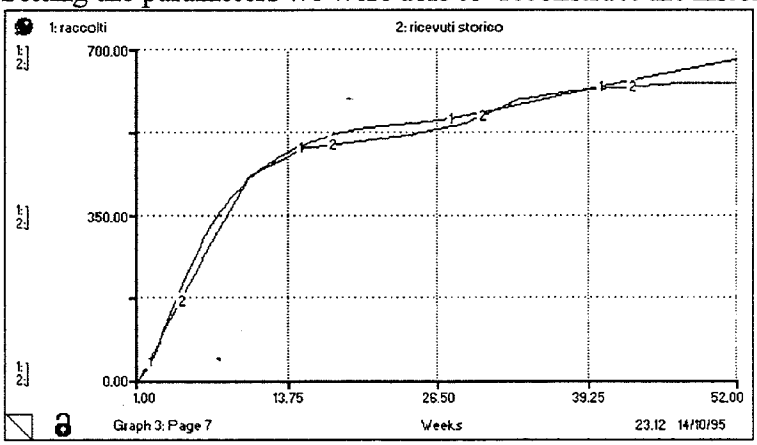
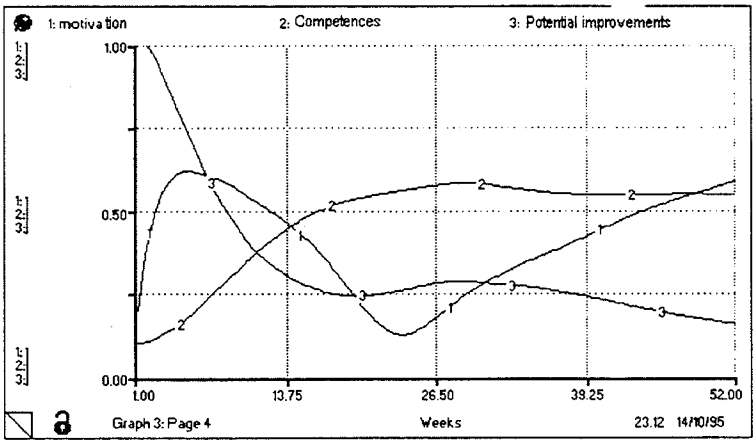


Figure 2

the interactions of the three fundamental storage's looks as follow



The trend of these soft variables explains the behavior of proposed suggestions and is quite reasonable. On this base we could build a "Management flight simulator" that unit manager could use to test the probable outcomes of the actions he intended to implement.