BUDGET FORMULATION, UNPREDICTABILITY AND THE USE OF SYSTEM DYNAMICS AS A COORDINATION AND LEARNING MECHANISM IN REGIONAL GOVERNMENT MANAGEMENT

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ABSTRACT

The *incremental* view in budget formulation is still widespread today, particularly in the Public Administration context. Quite often, such an approach offers politicians an expedient to artificially *inflate* expected tax revenues that can budget for higher expenses and promise higher financial subsidies to a wider circle of voters (i.e.: unemployed, trade unions, industrial representatives, etc.).

In this perspective, budget formulation is only used as a political consensus (rather than a managerial) tool that is useful to achieve agreements on virtual objectives and, consequently, only to provide votes for politicians. Moreover, particularly in the Italian Regional Government context, a lack of coordination has been observed between strategies and policies pursued by different departments. In fact, several *grey* or *overlapping areas* can be found in departmental budgets.

Even though strategy formulation and implementation in the Public Administration context has been referred as a *muddling through* process (implying political bargaining), it is our convinction that budgeting must help technostructure to manage and, particularly, to learn from that management process.

This paper aims to show how System Dynamics and Systems Thinking may support the budgeting process in the above context. It will do so by showing how such models help the technostructure to evaluate reliability of budgeting evaluations and the predictability of the future, how the communication and organizational coordination may be improved and how organizational learning may be fostered.

1. Regional Public Organization in Italy

Italian Public Organization consists of four main levels: 1) national; 2) regional; 3) provincial; 4) municipal. According to the *subsidiarity principle*, a higher level is called to intervene in the management of public affairs if the lower one is not able to efficiently and effectively satisfy the needs of its community.

Particularly in those Regions which are ruled by a so called *special statute*, that allows them a higher authonomy, as in Sicily, the regional level is an important decision making and financial

centre that coordinates and supervises a wide range of activities at the lower steps of Public Organization and influences the private sector as well, as it operates and regulates several fields of activities e.g.: financial aid to companies, take-overs to prevent business wind ups.

In those contexts, the State plays essentially the role of a financial allocator, as it receives money from taxes and redistributes it to the different Italian regions, according to several parameters (i.e.: their population, area, special programs to be financed, etc.). Moreover, regions receive funds directly from the European Community to manage various activities related to different projects.

The Sicilian Regional Goverment consists of twelve Departments (*Assessorati*), each of them managing different sectors of the economy, ranging from agriculture to industry, Public Works to Labour, health to environment, public instruction and cultural heritage to tourism, etc.

2. Some peculiarities concerning the Budgeting process in the Regional Public Environment in Sicily.

Particularly in the past fifteen years, the budget of the Sicilian Regional Goverment has been more and more characterized by an artificially inflated revenue forecast e.g. the gap between budgeted and actual revenues from 1980 to 1995 in real terms moved from nearly 2,000 MLDs to 15,000 MLDs Italian Liras (1 MLD is 1,000 million Liras). For this reason, in the past ten years, the Sicilian Regional Government built a financial deficit (difference between budgeted and actual expenses) of about 19,000 MLDs, that is not explicitely reported in the balance-sheet. In the same way, the regional balance-sheet does not explicitly account for a net asset decrease of nearly 12,000 MLDs (Sorci, 1995).

Such a dramatic difference between reported and actual figures is mainly caused by a political use of the budgeting process. The head of each Department (the so-called *Assessore*) in order to get more and more social consensus, is prone to inflate budgeting expenses, very often in favour of social assistance activities, such as temporary working, financial aids, etc. Moreover, a lack of coordination between several regional departments exists, particularly regarding the *inter-sectorial* fields of the regional economy, such as tourism.

The budgeting process is also characterized by an *incremental view*, i.e. more attention is paid to figures related to past expenses (which are increased according to higher financial resources available each year) and to bureaucratic matters, rather than on an assessment of expected performance related to activities carried out.

3. System Dynamics and the Budgeting process in a Regional Public Environment.

In order to overcome such limitations in the budgeting process, it is opportune to support *accounting* by *dynamic models*. Dynamic modelling may better allow decision makers, and particularly the *technostructure*, to perceive feedback loops connected to activities that could be carried out in the future and, consequently, to understand inter-departmental trade-offs concerning public policies affecting the same business sector, as well as to detect *policy levers* through which it is possible to improve performance (Sedehi, 1992).

More particularly, *dynamic models* may support decision makers to understand trade-offs between short and long term policies and to assess *current expenses productivity*, i.e.: their capability to act as an *engine* of regional economic system growth. Current expenses productivity related to regional department activities should be able - on a medium-term perspective - to generate a performance increase in the regional productive sectors (tourism, agriculture, industry, etc.) both under an effectiveness and efficacy profile. This may self-finance new *capital expenses* to improve infrastructure (roads, airports, dikes, parking, etc.), so to make

the regional socio-economic environment more responsive to productive investments (Bianchi C., 1995). Assessing cause-and-effect relationships between planned activities and performance increase after a period of time, may also improve the decision makers understanding of *limits to* public regional expenses *growth* (fig. 1).

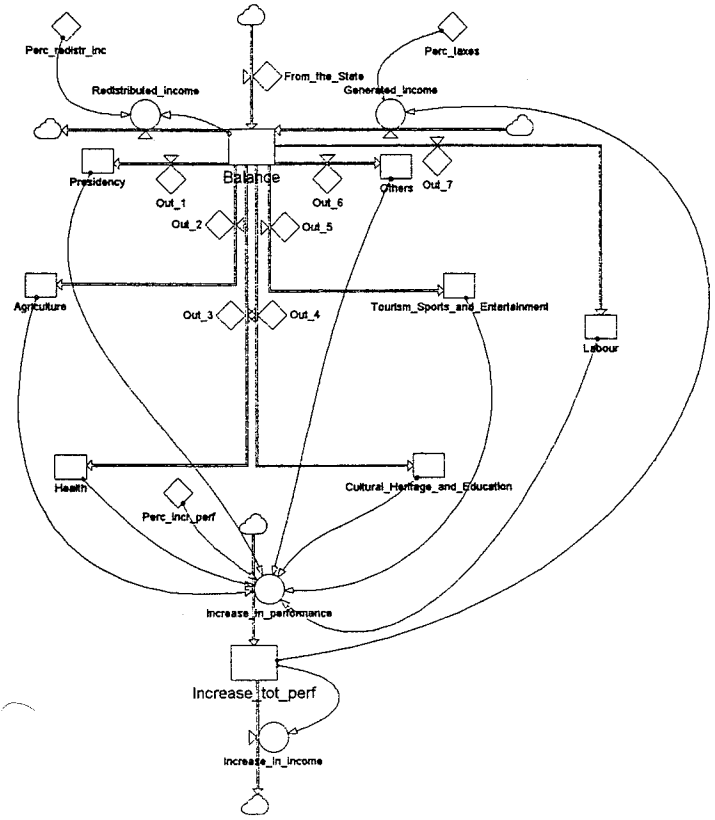

Fig. 1: The Regional Budgeting process.

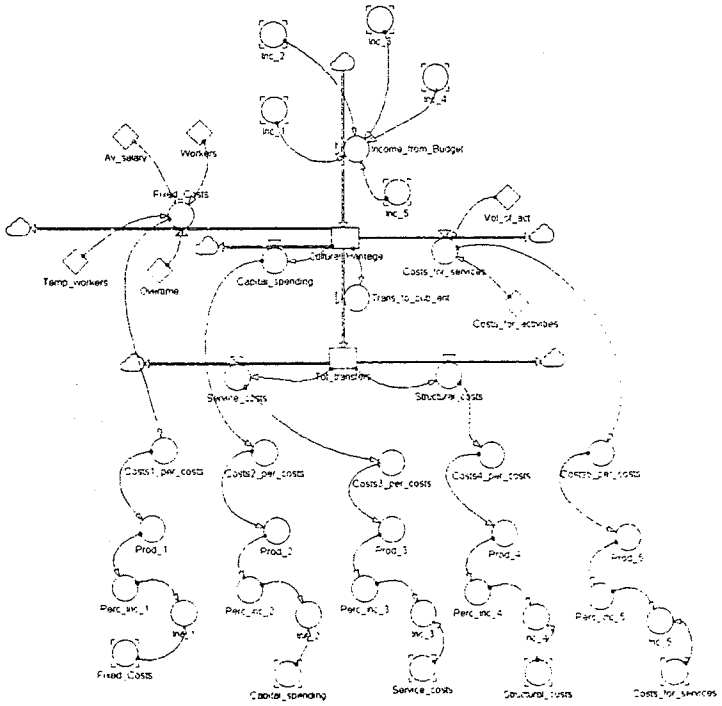

Fig. 2: Modelling of Cultural Heritage Budget.

4. System Dynamic Modelling applied to Budget Formulation

The insights gained from identifying archetypes and the ability to dynamically model feedback suggest that System Dynamic models may be a useful complement to the normal accounting models for budget formulation. Two important factors that can be shown more clearly are the intertransfers between departments and the feedback between costs - productivity and improved revenue. Using the hierachical structure of Powersim, it is possible to model the budget for Sicily as shown in figure 1 above. Here the six principal assessorati are modelled individually and then placed in the meta-systemic model shown. Each assessorato has an improved performance fed back into the total budget. This loop will have a delay imposed on it as the effects will not be felt till the following year.

One assessorato - Cultural Heritage - has been selected and modelled in detail. A major difficulty to model was the increase in income due to the increased productivity. This has been done as follows. The costs are first normalised with respect to the previous years costs (costs per cost) and then related to a variable called *productivity*, by a table function of the form shown below:

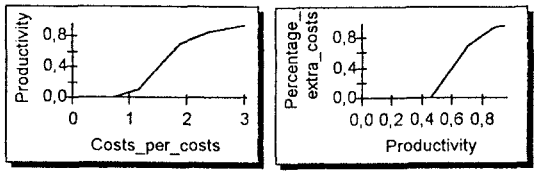

Fig. 3: Table functions

The shape of this curve is extremely important and will be improved by further research. It is suggested that for a cost per cost ratio of one or under, the productivity will be less than 0.5 reaching its maximum value at the ratio of three. The assumption here is that if the costs are increased, i.e. more money is spent on workers, amenities and activities, then productivity will also increase.

A second assumption is that these improvements will lead to more tourists and thus more income to the island. This has been modelled, as seen in fig. 3, where any productivity of 0.5 and below will result in no extra tourists and the maximum increase that can be expected is 20%.

Using these functions, a model for Cultural Heritage is shown in fig. 2.

5. The use of Archetypes

One advantage in using mathematics is that isomorpisms can be identified and thus a particular piece of theory is applicable to many situations. In a similar manner, there has been much Systems Dynamics research (Senge, 1990) in the identification of archetypes, i.e. generic structures which are common to many dynamic systems. In the previous section, two such archetypes can easily be identified: "fixes that fail " and " growth and unnderinvestment".

The first one occurs when there is an immediate problem which can be solved (fixed) by a hastily thought out solution. Unfortunately there is also a side or long term effect which eventually will dominate and undo the " fix ". An example is shown in figure 4.

Here, because of a cut in the budget, there is a transfer from spending on culture to other types of spending such as social assistance and overstaffing in public administration. The budget available for other spending initially increases because of the cuts in cultural heritage. These cuts eventually result in less tourists which then decreases revenue and thus the budget decreases.

This has been modelled and the results are shown in fig. 5.

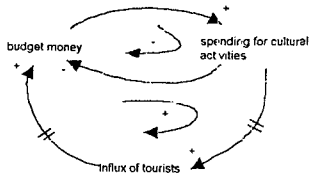

Fig. 4: "Fixes that fail" archetype

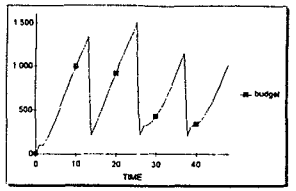

Fig. 5: Budget Behaviour

Another archetype is "Growth and Underinvestment" which is shown in fig. 6.

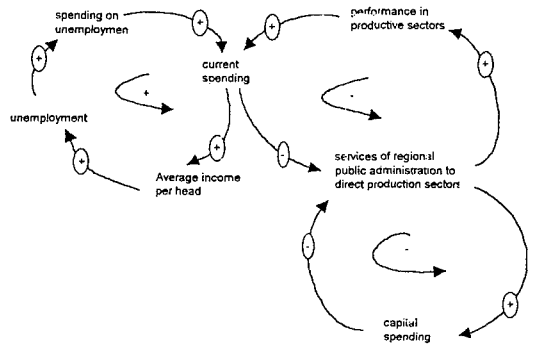

Fig. 6: "Growth and Underinvestment" archetype.

The concept demonstrated by such an archetype is that growth in current spending is subordinated to the capacity of regional departments to effect a commensured performance related increase in productivity. But such an increase can negated by an insufficient capital spending.

6. Summary.

The paper attempts to show how System Dynamics modelling can be an aid in budget formulation. It has been shown how an individual department can be modelled and this can be used as a sub-model in the global model of the regional administration. Examples have also been given of two archetypes which help to explain common problems concerning budget allocation.

The authors wish to develop these models further, using real data taken from the Sicilian Regional Administration Budget.

7. References

- Bianchi C., 1995; *La produttività delle spese correnti dell'azienda Regione. Alcuni risultati di un'analisi economico-aziendale condotta sulla Regione Siciliana con particolare riferimento all'Assessorato Turismo, Comunicazioni e Trasporti*, in: Azienda Pubblica, Giuffrè, Milan, n. 1.
- Sedehi H., 1992; *System Dynamics for Budget Planning in Public Environment*, System Dynamics Conference Proceedings, Utrecht.
- Senge P., 1990; *The Fifth Discipline*, Century Business, London.
- Sorci C., 1995; *Dall'assistenzialismo allo sviluppo. Il riorientamento dell'azienda pubblica*, Giappichelli, Torino