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Editors:

Roman Kulikowski
Zbigniew Nahorski
Jan W. Owsiński
Andrzej Straszak

Systems Research Institute
Polish Academy of Sciences
Warsaw, Poland

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Names of first authors: **L-Z**

A Multicriteria Decision Support System
for the Planning of the Aids for Long-Period Unemployed

J.M. Labat, M. Futtersack, J.C. Pomerol

LAFORIA
Institut Blaise Pascal
Université Pierre et Marie Curie
4, place Jussieu
75252 Paris Cedex
France
tél. (33) 1 44 27 70 02   .
fax. (33) 1 44 27 70 00
e-mail. labat@laforia.ibp.fr

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1   Introduction

The French Employment Ministry has established different kinds of actions and aids to deal with the problems of reinsertion for the long-period unemployed (LPU). Each of these actions has a different objective in mind. As the unemployment situation in France differs according to the region involved, it is not always easy to choose the right action among many, which is best-adapted to each case. A decision support system (DSS), named MUPALU (an acronym for MUlticriteria PlAnner for Long-period Unemployed), has been designed to help the decision makers in the charge of programming the measures intended for the LPU.

Several imperatives were essential in the conception of the DSS. Firstly it was necessary to provide the deciders with a synthetic vision of all data about employment at a regional level. To dispose of a comprehensive view of information is, in itself, a form of support. Secondly, it is important to filter this information. We have designed an expert system which performs the reasoning relative to this information. The expert system scans the various data relative to employment and to the previous actions carried out for LPU and it synthetizes the information according to some indicators, which are used by experts. Then each of the possible actions or aids is evaluated by a multicriteria module. This aggregation is made according to the Borda method [Lévine and Pomerol 89], but with the particularity that the weights are depending on the indicators provided by the expert system. Based on this multicriteria evaluation, a distribution of the aids is proposed by the system. This policy will finally constitute a base of reflection for making the final decision.

As such, the MUPALU system is a true DSS, that is not intended to replace the decision maker but to provide him, by means of visual displaying, with a global view of the main parameters likely to guide him towards the choice of a decision. At each stage, the decision maker can either bypass the system and makes the evaluation by himself or performs a sensitivity analysis around the recommendations of the system. Endowed with this usual " What if ? " capability [Keen 87], MUPALU may be used as a learning system in order to improve the reflection of the decision maker and to enlarge his/her search for an adapted policy.

2   The main functionalities and the architecture of MUPALU

MUPALU includes three main components : the diagnosis system, the programming system and the affectation system (see Fig. 1). Each sub-system corresponds to a stage in the process of planning the distribution of the aids among the five main actions, which are possible. At the first stage, the information concerning the employment in the region is gathered and displayed on a spreadsheet. The aim of the second stage is to propose a policy for the distribution of the financial resources. The third stage is the interactive definition of the final distribution. The diagnosis system and the affectation system use the functionalities of a spreadsheet, whereas the expert system uses a shell, named SNARK [Laurière 88], based on first order logic.

2.1   The diagnosis module

The first purpose of the diagnosis module is to collect the information and to make it easy available for the decision maker. This module exploits two major sources of information : the statistical data provided by various social institutions to describe the employment situation. It also involves qualitative information interpreting local knowledge transmitted by regional Ministry staff.

The diagnosis system displays the information in the form of two types of spreadsheet tables. The first tables are used for data acquisition. The informations are extracted from a data base and/or the tables are fed by the decision maker. The other tables synthetize the collected data to summarize and display a comprehensive view of the situation in the region by using different kind of ratios.

2.2   The knowledge-based module

The knowledge base is divided into three sub-modules. The first sub-module performs a quantitative analysis on the data provided by the diagnosis module or introduced by the decision maker (for example for some local specific data). This analysis results in the evaluation of synthetic indicators [Giffard 89].
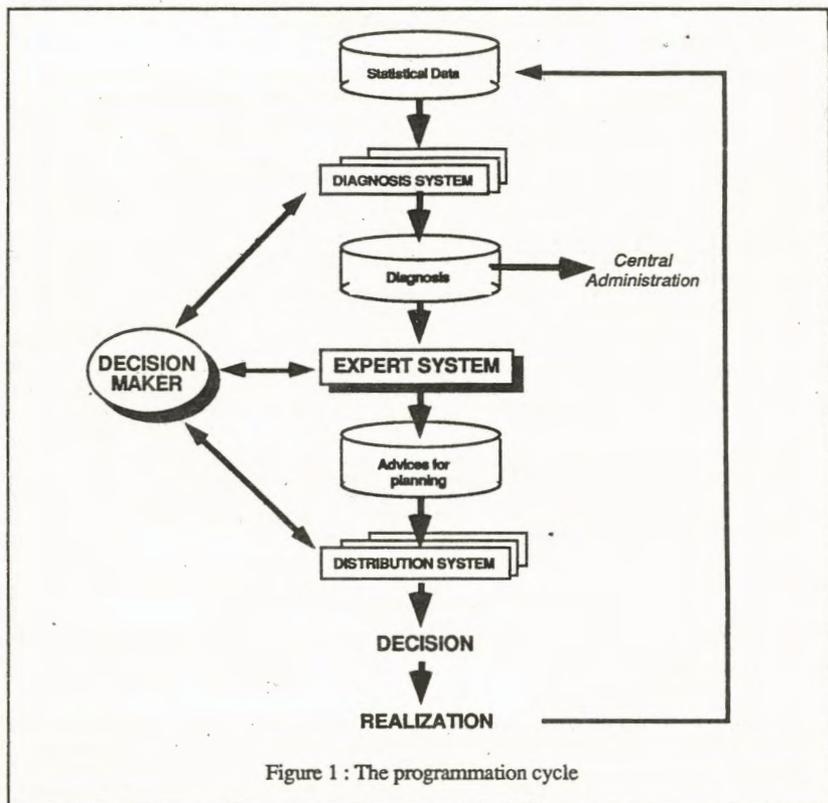
Figure 1 : The programmation cycle

The second sub-module is concerned with the qualitative data, introduced by the decision maker, regarding his/her knowledge about the employment in the region and the effectiveness of the already launched actions. The last sub-module produces some conclusions, which are displayed under the form of conclusive warnings relative to the employment in the studied region. Moreover the ES contains some rules, which are used for the multicriteria analysis, as we will see below.

2.3 The distribution module

This last stage concerns the distribution of the budget among the different actions, taking into account both the distribution policy, proposed in the preceding phase and the external constraints (thresholds imposed by the central administration, mainly concerning percentage variations compared with the previous year and with respect to the amount of available money). The distribution proposed by the system is displayed by the spreadsheet (see Fig. 2), which enables the user to simulate various hypotheses before fixing the final distribution of the money.

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	PHYSIQUE		% de VARIATION	FINANCIERE	RAPPEL DES CONCLUSIONS DU
	N+1	N+2		N+2	SYSTEME EXPERT
CRE					
AIF					
FNE					
SMAN					
SRP					
TOTAL					

Départ. : xxxxxxx   ANNEE : N+2

(Each row represents a measure. For example, CRE stands for "Contrats de Retour à l'Emploi", i. e. contracts between the administration and a company for promoting the return to employment. The column PHYSIQUE contains the number of LPU which are concerned by each measure. In the column FINANCIERE are displayed the cost of the distribution. On the right column are recalled the expert system's recommendations)

Figure 2 : Interface with the distribution module

3. Multicriteria analysis

The distribution of the global budget among the five main actions depends on the worth of the actions. This evaluation is typically a multi-attribute one. The quantitative criteria concern the already observed impact of the action during the preceding year and the qualitative criteria take into account the effectiveness of the vocational training program and the availability of a support from the administration.

More precisely, let $M(i, j)$ the rank of the measure i for the criterion j of weight P_j, the priority N_i attributed to the action i is computed using the formula :

$$N_i = \sum_j M(i, j) * P_j$$

The aggregation methods of criteria by weighted sum of ranks are often criticized for having weights fixed, once and for all. For example, it is impossible to express the fact that the criterion1 is three times greater than the criterion2, if the mean value of criterion1 is large and of equal importance when the mean value is small. In our system, the weights of criteria are computed according to the context, by means of production rules within the ES. For example, the criterion "Impact of a measure on LPU" will be of greater importance the greater the number of LPU and the more unfavourable.the overall economic situation in the region in question. Briefly, the weights depends on the context and on the qualitative knowledge involved in the ES.

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4. Conclusion and perspectives

The MUPALU system has been specially designed, at the request of the administrative control group involved in the policy defining task, to support, without hindering, those responsible for the programmation task. The design and implementation of a model, merging a spreadsheet and a knowledge-based module, seems to be a solution adapted both to the problems posed and to the decision makers. This result is acquired whilst preserving the modularity and maintenability of information processing. The choices are consistent and connectable with the existing information systems (data bases, statistical modules). This is the best warranty for the new system to be well-integrated in the organization.

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