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A Rational Integrated Use of Heterogeneous Equipment

A proper and correlated programming on heterogeneous items of equipment integrated in a unitary data processing system requires a perfect knowledge of the programming subtleties of the whole fleet of equipment

1. INTRODUCTION

The scientific and technical progress characterizing the last two decades of our century has given rise to an almost continuous emergence of conceptions and devices for data collection, transmission and processing. The main stimulating factor of the present trend to impetuously develop computing equipment is the acute need for an ever more exhaustive and rapid information regarding the socio-economic phenomena and processes whose scope has been constantly widening.

Bearing in mind this characteristic feature of our time, particularly of contemporary economy, it is quite easy to understand why a number of enterprises and economic units provided at various stages with data processing devices have got a fleet of rather heterogeneous equipment. This state of things is sometimes led to a critical point by the idea (and this is an erroneous idea, in our opinion) according to which the availability of up-to-date data processing equipment rules out the use of the existing older equipment whose construction design and operation are characterized by an advanced moral wear. However, such older equipment is, owing to the force of circumstances, available with the respective economic unit and is in an operating condition.

2. CERTAIN REMARKS ON THE MORAL WEAR

The moral wear is an economic category whose existence is manifest mainly in the market, in our case in the market of computing equipment. This economic category is taken into account and estimated at the level of

each enterprise possessing older and newer items of equipment in agreement with certain technical-economic indicators characterizing the efficiency of the economic activity. The enterprise is to make decisions on the use or disuse of the existing material, morally worn out, in keeping with the contribution which it can make to the activity of the whole economic unit.

The elements to be considered when making the relevant decision are both of an economic-financial character (as, for instance, the operation costs, including the sinking fund, the cost of equipment or devices that can be replaced, the money to get through a possible sale of the respective item of equipment, etc.) and of a technical nature (such as reliability in operation, operating speed, capacity, etc.) which are also to be reflected in a number of economic indicators.

It should not be omitted that the indicator regarding the computation of the sinking fund contains rather a large amount of subjectivism and this can be substantially corrected provided that solid evidence is produced. As a rule, the sum of money that can be recovered througn a possible sale of the morally worn out equipment is quite small, for the respective sale implies the presence of the equipment in the market, that is precisely the place where the effects of moral wear are more strongly felt.

Far from underrating the decisive importance of the economic-financial indicators, we should state that, in most cases, the decision concerning the use or disuse of the respective equipment should finally be taken by considering the technical elements.

It goes without saying that a more easy-going decision would be the one regarding the disuse of the morally worn out equipment — which, as a matter of fact, has engendered the aforesaid conception —, but there are many instances in practice when morally worn out equipment can supplement certain parts or capacities of the new equipment and it is advisable to maintain it into operation together with up-to-date equipment.

Having in view all this, the enterprise in question should make the most of the fuller and more rational use of the whole fleet of equipment. The extent to which the drawbacks caused by the moral wear of some of the available items of equipment are overcome and the necessary compatibility between the older and the newer equipment is secured rests on the staff's ability and inventiveness.

3. SECURING THE COMPATIBILITY AMONG HETEROGENEOUS ITEMS OF EQUIPMENT.

In our opinion, the ways enabling to cope with such requirement of usefulness and compatibility may be grouped as follows:

— organizational measures aimed at a new designing of the information system, that is a reorganization of the data flow processing;

— programming procedures and contrivances (software) enabling the integration of the equipment into the new technological flow;

— technical adaptations, as minor as possible, to be performed at lower costs by qualified workers and with materials belonging to the enterprise.

With this end in view mechanical workers and programmers will examine and ascertain the common (connecting) elements of the heterogeneous

items of equipment, such as similar technical information carriers with identical or traductibile codes, possibilities of achieving the output electric pulses of an item of equipment able to be used as input pulses for another one. On the basis of the common elements, the same staff will draw up one or more principle solutions with respect to the compatibility of the equipment under study.

These principle solutions are forwarded to the system analyst who has the task of drawing up — in co-operation with the aforesaid staff — a draft design of the data processing system adapted to the new requirements. On this occasion, the work to be mechanized will be parcelled into chapters in agreement with the processing of each of them on different types of equipment, depending on the following criteria:

— the kind of arithmetical and non-arithmetical operations specific of the chapter of the work, in close agreement with the possibilities of the respective equipment;

— the volume of data to be processed.

The distribution of the work by items of equipment, in accordance with the criteria stated above, will have in view the following objectives:

— shorten the gross duration of performance of the whole work by fully extending the operations to be carried out in parallel;

— curtail the overloading of the types of equipment which constitute narrow places;

— lessen to the minimum both the number of the operators' interference and the possible sources of errors;

— reduce the consumption of technical data carriers.

We should also mention, among the organizational measures, a restatement of the conception regarding the destination of certain items of equipment, which sometimes becomes a psychological drag in achieving the integration of heterogeneous equipment into the new technological data flow processing. We particularly refer to the conversion and, respectively, the use of the equipment — previously considered essential — into ancillary, peripheral equipment.

For instance, in a computing centre lately provided with an up-to-date computer, a system made up of a tabulator connected with a totalling card punch, previously considered a basic equipment, can still be used as peripheral equipment. In the new data processing system, the tabulator can be used for listing numerical data cards — punched by the operators — in order to check them. Since the operation of summing up certain indicators can also be performed (without requiring an additional processing time) and punched cards containing the results of this summing up are available concomitantly with the listing, the computer is in condition to carry on processing only totalling cards, i.e. it will read a considerably smaller number of primary data. Taking into account this very commonplace example, the profit made by the computing centre lies in the following:

— purchase of a limited number of alpha-numeric punches provided with interpreting devices (a rather expensive equipment), to be used exclusively for program punching necessities, forgoing such devices or an interpreting machine for other purposes;

— reduction of the time required for introducing data into the computer, which is one of the slowest operations.

It stands to reason that nobody can draw up a generally valid formula for heterogeneous integrated equipment programming; however, the aforesaid elements shoud underlie any program. At the same time, we have to specify that the resulting programs may sometimes lead to changes in the draft design and even in the very principle solutions concerning the data flow processing.

No matter with the solution and program drawn up, the specialized staff of programmers should provide sufficient logical and arithmetical testing (checking) instructions regarding both the output data and, especially, the technical carriers at the input of the higher level equipment. This testing and, accordingly, the instructions pointing out the errors, are particularly necessary where punched cards are used as an intermediate agent between two types of equipment.

When mentioning the programming contrivances, we have had in view the different variants for splitting the totalizers, store words and automatic printing and punching devices, which can secure compatibilities and savings of working cycles, as well as of use of the so-called fixed pulses for constant data through which the programmer can shorten the time required by certain operation, thus avoiding possible sources of errors.

It is also obvious that a faultess and, particularly, correlated programming on heterogeneous equipment integrated in a unitary data processing system supposes a perfect knowledge of the programming subtleties of the whole fleet of equipment.

It will be ideal that these details are known by the one and same person but, since this is hard to achieve, it is necessary to set up a homogeneous team acting as one man. Consequently, the persons co-operating to this team's setting up should grant particular attention not only to professional elements but to psychological factors as well.

The technical adaptations are not the object of this article but, since we have mentioned them, we should like to point out the following:

a. These adaptations must occur but where programming has quite exhausted all its possibilities.

b. The adaptations should, as a rule, be limited to changes in code matrices, design and manufacturing of synchronized interconnecting devices and to the introduction of voltage dividers.

c. A perfect co-operation between the programming staff and the technical staff should be observed in designing and working out the respective adaptations.

4. CONCLUSIONS AND RESULTS BASED ON A CONCRETE EXAMPLE

Without pretending to give an uncommon example, we shall point out the profit derived from the integration of a set of analytic computers and of an accounting electronic machine in a data processing system concerning each worker's piece earnings and the work cost per manufacturing orders.

It is well-known that one cannot perform logical operations on a tabulator; neither are the multiplying operations — though theoretically possible— adequate for this type of machine. However, the accounting electronic ma-

chine we refer to has got a serial punched card reader and a column by column printing device, which diminishes the operation speed when having to do with a large amount of primary data. Nevertheless, the same machine can perform logical and multiplication operations at a relatively high speed. Thus, following a survey concerning the possibilities of two items of equipment (the SAM T5M tabulator and the electronic accounting machine NCR 395), it has been possible to write for the Întreprinderea Optică Română, in Bucharest, a correlated program concerning the preparation and processing of primary data related to the work consumption in order to find the piece earnings per worker and the cost per manufacturing order. Both in writing the program for the two items of computing equipment and in determining the data processing technological methodology account was taken of the rational grouping of primary data and the relevant arrangement of tabulator totalizers which, by means of the totalizing card punch, provides punched cards containing data semi-processed in agreement with a model required by the possibilities of the electronic accounting machine. At the same time, the accounting machine was supplied with a number of tests meant to check the number of totalling cards, of piece workers, respectively of manufacturing orders, to compute them in increasing order, to collate the total of minutes afforded, irrespective of the class of work performed, etc.

The practical implementation of this study has led to the following results;

— it has eliminated about 4,000 operations related to the application of the tariffs corresponding to the class of work performed and to the multiplications previously carried out manually in the enterprise;

— it has eliminated about 4,800 operations of summing up per orders and workers' roll, also carried out previously in the enterprise;

— it has ensured a perfect conformity between the computation of the piecework wages fund and the post-computation of the cost of work per manufacturing orders.

These advantages have resulted directly from the integration of the two types of equipment, while primary data related to the time consumption were also in the past centralized on the tabulator, i.e. mechanically. The mechanical processing should come to an end at this level, because the aforesaid operations could not be performed on the tabulator and the duration of the work performance would have doubled.

ESSAIS D'UTILISATION RATIONNELLE INTEGREE DE CERTAINS EQUIPEMENTS HETEROGENES

Toute une série de conditions et de réalités contemporaines determinent l'existance dans les entreprises, de plusieurs types d'équipements de calcul hétérogènes, présentant différents degrés d'usure morale.

En analysant quelques aspects économiques, générés par ce phénomène, les auteurs aboutissent à la conclusion que, dans certains cas, l'utilisation intégrée de certains équipements hétérogènes apparait comme rationnelle et efficace.

C'est en ce sens qu'on présente quelques indications concernant la façon d'assurer la compatibilité des équipements respectifs et leur inclusion dans un système complexe de traitement des données. Aussi, on expose certaines conclusions et résultats obtenus, suite à l'expérience personnelle dans le traitement des données à l'Entreprise Optique Roumaine.

ПОПЫТКИ РАЦИОНАЛЬНОГО КОМПЛЕКСНОГО ИСПОЛЬЗОВАНИЯ РАЗНОРОДНЫХ УСТРОЙСТВ

Ряд современных условий и действительность обусловливают наличие на предприятиях разнородных типов вычислительных устройств, имеющих различную степень морального износа.

Рассматривая некоторые экономические аспекты, порожденные этим явлением, авторы приходят к заключению, что в определенных случаях комплексное использование разнородных устройств является рациональным и эффективным.

В этом отношении приводятся некоторые указания о способе обеспечения совместимости соответствующих устройств и о включении их в комплексную систему переработки данных. Приводятся также заключения и результаты, достигнутые на основе собственного опыта переработки данных на оптическом заводе I.O.R.