Economic Reporting in different Configurations in Paper Mills

John Fogelholm* and Esa Hamalainen**

*Department of Industrial Engineering and Management, P.O. Box 950, Fin 02015 HUT, Finland

**Metso Automation, Finland

Abstract

This paper deals with the problems of determining an optimal hierarchical taxonomy for paper production, the possibilities to determine accurately the production resources and thus the corresponding production costs and calculated economic indicators on the different levels, and discusses the possibilities of present available computer programmes to supply corresponding information, required by different levels of mill management.

INTRODUCTION

Most management measures, as they are commonly understood, are worthless in the actual task of managing. Of course they are required, often legally required but they are elastic, and can be manipulated (1). This pertains particularly to measurements, where by difinition, usually of one of its component variables mill managers, who can thus approach economic steering information with a sceptic general attitude. The problems thus concerns both the allocation accuracies of the different resource components involved in the actual production and its general management activities, and the transfer of information from a lower hierarchical level to that of a higher one, as discussed in this paper. The aspect of connections between different hierarchical levels in paper mills, and their most useful taxonomy, and their applications in focused economic steering computer programmes like the DNAemico, owned and marketed by the Finnish company Metso, has received slight attention in professional paper journals and scientific computer science papers, dealing with these kind of problems. The most useful basic hierarchical taxonomy, from a practical point of view, is depicted in Fig. 1. The division is thus made from a maximal steering efficiency point of view, taking into consideration the resource groups, and their corresponding costs, identified on the different hierarchical levels.

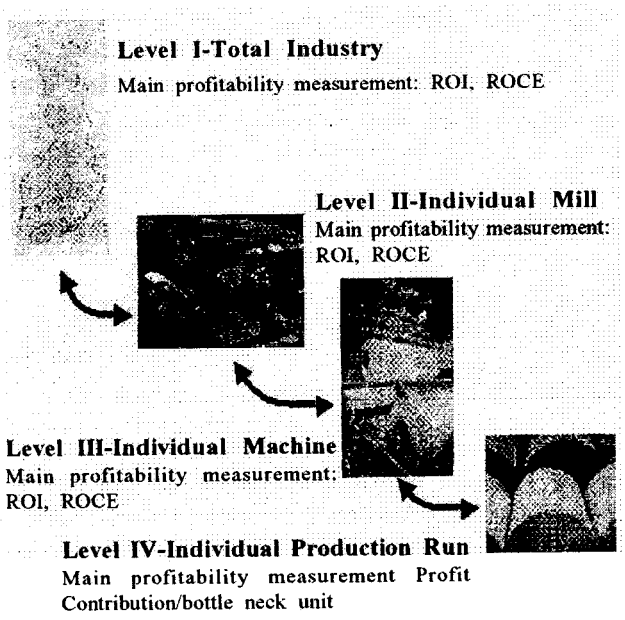

Fig. 1 Hierarchical levels in paper mill activities.

Resource group configurations on different levels

The picture in Fig. 1 deserves a more detailed scrutiny. There are some resource groups common to more than one level, the most prominent of which is the customer resource group, which is to be found on the three lowest levels, and the product resource group on two lowest levels, all of which resource groups have only a marginal economic impact on the profitability measurements. But the biggest discrepancy is to be found in the resource group contents on the level of the industrial production run, and the next higher level, usually consisting of one individual main machinery or an

individual production line. When comparing traditional resource consumption paradigms generally based on bookkeeping data bases, to modern accounting systems, first accurately promulgated by Cooper (2), the main omission in the old paradigm consisted in the omission of the batch level resources, not all of which are to be found in traditional bookkeeping data bases. This omission can be considered to have been the main reason for the corresponding resource consumption discrepancies, as reported through product cost specifications. In a typical paper production process, with fluctuating lengths of production runs, these dicrepancies have usually been investigated to be on the level of 5-15% of the total production costs (3). The problem of resource consumption estimations, required for future production runs, which represents the main practical problem for anticipating the behaviour of future production activities, is aggregated on the batch resource level, particularly when including those found in the paper production process. A typical example of this is shown in Fig. 2, which shows the recycled raw material, when changing over from one production run to the next one (4).

The possibility of accurate prognostication for these resource groups have been found to be considerably more difficult than those on the unit level. In the depicted case shown above, no clear correlation was to be found between this resource consumption unit, and any one of the potential single parameters available. The reason is all too apparently that the final result is clearly depending

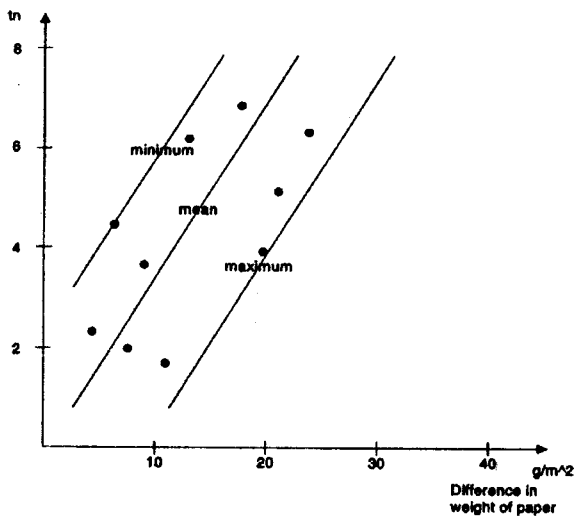

Fig. 2 Recirculated raw materials in grade change activities.

on a whole range of factors, with individual varying impacts. In cases like this, one has to accept a figure with a potentially big spread around its mean value, which significantly diminishes its prognostic accuracy.

Acutal vs. calculated resource consumptions accuracies

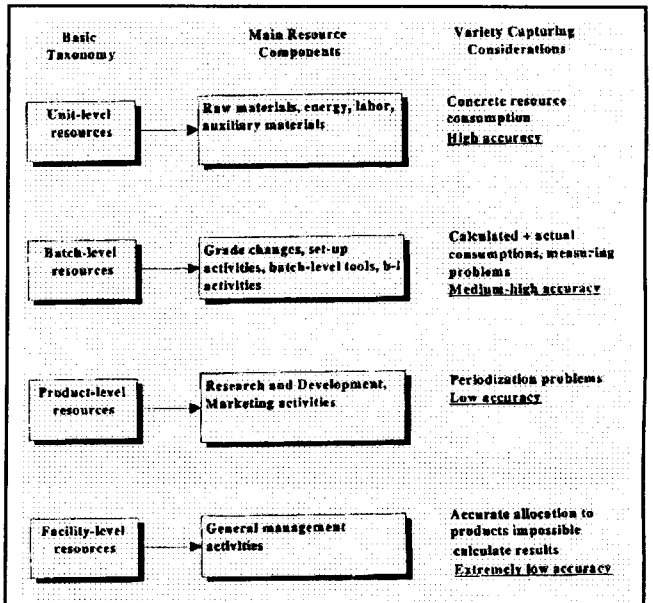

Fig. 3 Variety capturing capabilities of paper production model.

The actual variety capturing capabilities of any anticipatory economic steering model of an industrial process is hampered, both by difficulties of determining the individual resource component under scrutiny with sufficient accuracy with only one or two parameters or resource drivers, and by the fact, that some required resource components are to be allocated, and thus anticipated, only from purely accounting point of view, (Fig. 3).

It can thus easily be shown that the unit level resources are by far the most accurate in any anticipatory system for economic steering activities, with few or none merely accounting determined resource components involved. The situation changes drastically, when scrutinizing the allocation of resources on the faculty level, all of which generally have to be determined for any individual product or production run, using solely basic accounting principles. The final allocation of these different kind of resources, which include both human resources, different kind of depreciation, and a lot of general overhead activities and their costs, are not possible to allocate with the same

methods and accuracies as those of the unit and batch levels.

The best example of the problems involved is from the Finnish paper industry, and concerns the allocation of head office resources to the products, made on individual machines in mills, usually situated far away from these kind of offices. As an example could be quoted the solution, as found in one individual company, and which allocates the total resources of the head office first to the different factories, using the production volume as the main allocation base, and finally down to the individual production runs and products, using the production time as the basic allocation base. These kind of allocations neither anticipatory nor actual ones, can thus not be considered to be scientifically determined in the same way as those on the unit level and batch level, but have to be accepted as determined purely from an accounting point of view (5). This is the reason, why the economic steering information for everyday sales information of new products to be priced, should not include resource consumption costs outside unit-and batch levels.

Performance measurements on different levels

One of the main areas of the standardised industrial performance measurements, also used in the paper industry, consists of the economic and particularly profitability indicators, of which the long range ones, articulated in some form of return on investment, represents one of the main ones in any industry and its companies. However, the return on investment can not be applied to individual production runs, or the individual products thus being manufactured, but has to be expressed in profit contributions, or preferably, as profit contributions per bottle neck unit. This bottleneck usually consists of the time of the bottleneck machinery of the individual production line or its main machinery (Fig. 1).

All previous remarks of these economic indicators thus indicate that each type of industry by now is fully aware of the optimal basic methods available for economic steering purposes. This does not remove the intrinsic problem of utilizing the basic steering information from the unit level to the next higher level(s) of the hierarchy. As Fig. 1 indicated, from the level of the individual production line upwards, the return of investment is to be used, which does not make any similar difficulties of calculating the corresponding return on investment figures. But two main problems still remain to be discussed, owing to the innate difficulties of these calculations, their variety or complexity problems and the anticipatory or allocation aspects.

Connecting unit level and batch level main economic indicators

When scrutinizing the situation depicted in Fig. 1, one interesting feature is easily recognized. Except for the level of the individual production runs, the main profitability measurement consists of ROI or ROCE, which represents a longer range time horizon than a profit measurement for the continuous daily sales activities. This also means that to aggregate the ROI information to higher hierarchical levels, the same type of basic information can be used.

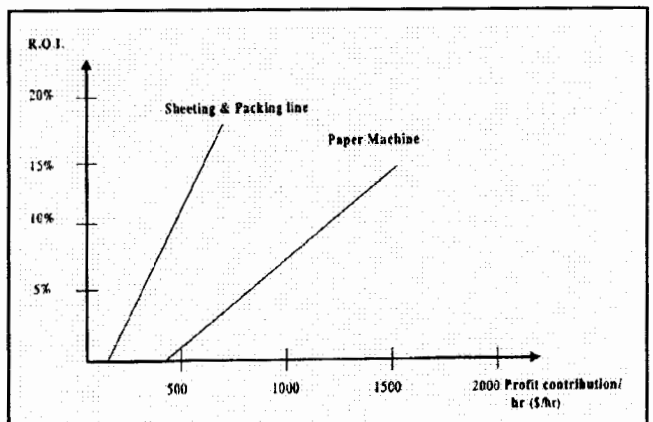

Fig. 4 The connection between economic indicators on different levels.

The situation of the connection between the individual production run and that of the individual machine or production line includes aggregation of short range profitability measures, which has to be compared to a longer range (1/2-1 year) indicators, which also includes figures (the calculated value for the investment, which has to determined through accounting principles), which are not acutal or resource consumption-based, in the same sense as that of those figures used determining the measures for the individual production run.

The author has once has to solve this problem in a real case, already a long time ago in company, with many factories and a paper mill, owing tothe need to find a solution to bridge the communication gap between the managers of the factory and the managers in charge of the economic results from the day-today activities (6). The basic results of this study and the corresponding charts are shown in (Fig. 4).

This type of diagram makes it possible to transfer crucial economic steering information from one hierarchical level, to another one. The algorithms behind these figures contain information, which partly is based on accounting figures, which to a certain extent can be considered to be "subjective" from a Systems Science point of view.

Variety capturing aspects of measurements on higher hierarchical levels

In this paper it has repeatedly been emphasized the need also to take into consideration the variety aspect of the anticipatory economic steering information of production processes, included in manufacturing companies. The accuracies in the determination of the main profitability measurement on higher hierarchical levels, usually calculated in the form of ROI, represent one main area of 'elasticity', already previously mentioned. As ROI by difinition is calculated as the annual profits/ investment, this definition makes it possible to use different values for the denominator, the problem is discussed in length in Management Accounting textbooks. The value of the investment it thus usually either overstated or understated, which has a decisive effect on the final value of the calculated investment. The problem is aggravated when the machinery is either old, or values for machinery replenishments are difficult to determine accurately. As a practical example of this could be quoted the situation, where the value of the investment is based on the initial cost of machinery, which could have taken place already 10-15 years previously, which is a typical situation in the process industries. The corresponding ROI values would in a case like this give a totally bias result. An understated investment could thus easily generate diminished requirements for the daily sales activities in the form of required profit contributions/unit of time in bottleneck machineries. Variety inaccuracies on the level of unit level resource consumption on the production run hierarchical level is transformed into problems of accounting approaches to investment values on higher hierarchical level, both of which have significant impact on the usefulness of information from economic steering systems, used for anticipating and maximising the behaviour of the system to be managed.

Computerized steering information configurations in dnaemico

The basic usefulness of any mill wide, economic steering software system, specially developed for paper mills, consists in the range, accuracy and requested combination of information, which is required by mill management on different

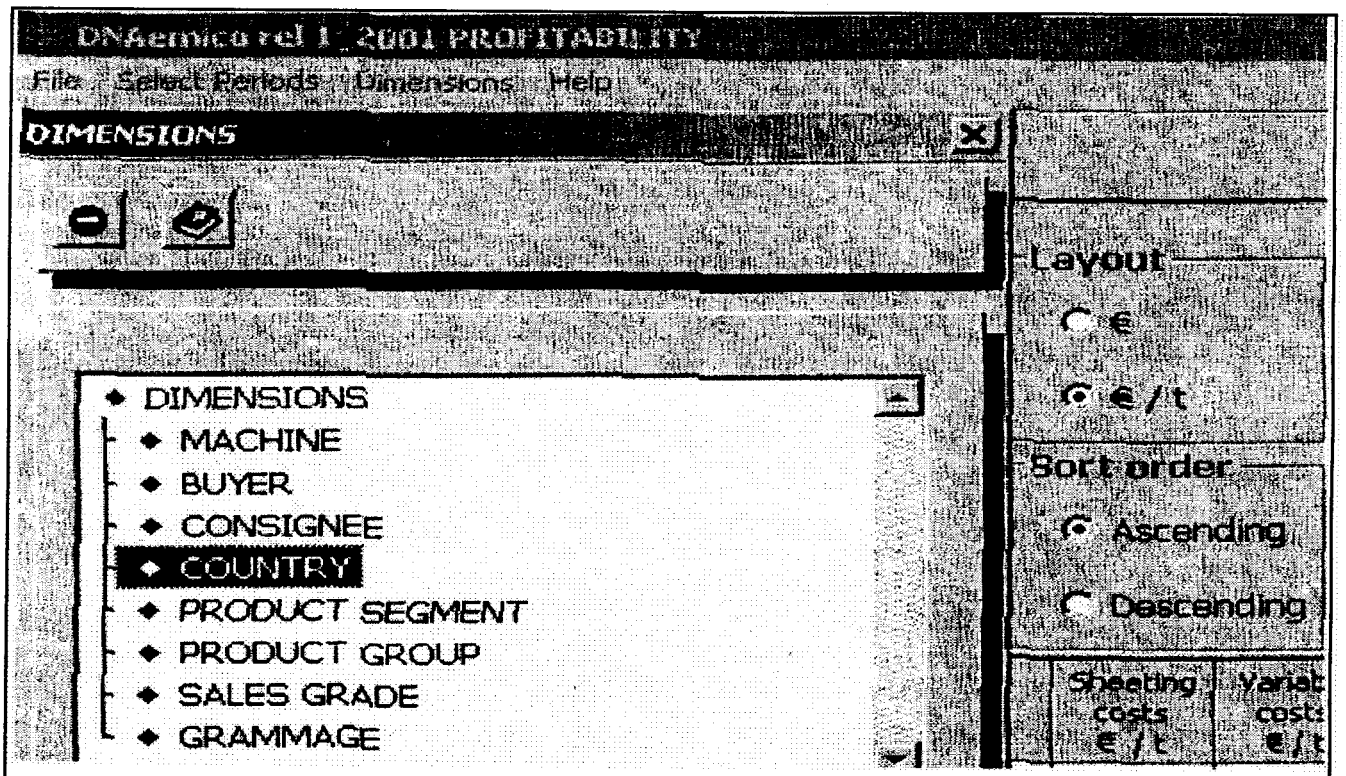

Fig. 5 Potential groupings of Economic Steering Information.

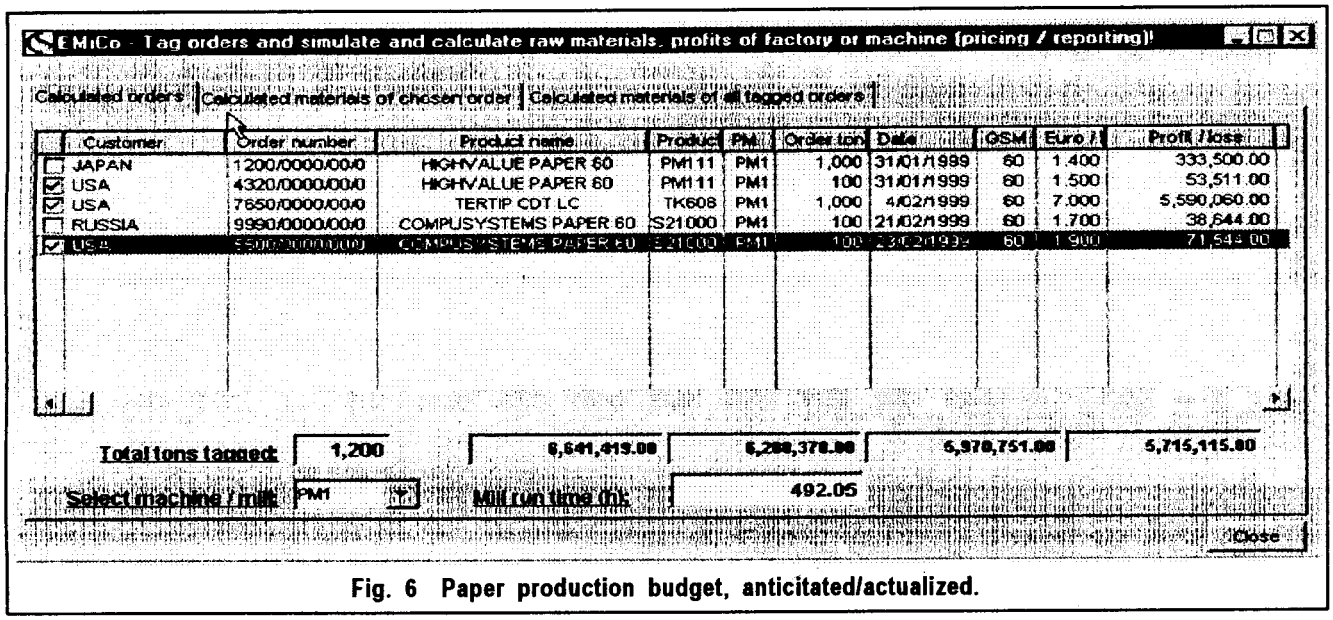

Fig. 6 Paper production budget, anticitated/actualized.

hierarchical levels in their everyday activities. This means in practice, that the different resource consumption, included in both anticipated and particularly actulized individual production runs, can be combined as required in different combinations and groupings. The main potential groupings in the Mill Wide Economic Steering System Dnaemico, already implented in Finnish paper mills, is shown in Fig. 5, where the potential basis for different configurations are also to be seen. This aspect of profitability information centres upon ex post or realized production runs, orders, and customers in different combinations.

The different configurations, which are called (reporting) dimensions in the DNAemico terminology, thus covers both the levels of the individual production runs, the individual machines, and also the whole mill. This means, that the programme can easily supply the information of accumulated profit on different levels, which is a typical example of these kind of anticipated resource consumption is shown in Fig. 6, which shows both an anticipated and reported production budget, which is possible to make, once the individual production runs are determined for the time period investigated.

CONCLUSION

The accurate part of the often required performance measurement ROI or ROCE. In most mills, the use of anticipated or Ex Ante steering or economic steering information, also discussed in this paper, is very rudimentary, in comparison with the use of realized or reported information of previous production runs. The emphasis in anticipation thus centres on the budgetary aspect, which is very time consuming in most mills, together with different simulation calculations.

REFERENCES

1. Beer, Stafford, The Hearth of Enterprise, John Wiley & Sons, (1990).
2. Cooper, Robin, Cost Classification in Unit Based and activity- based, Manufacturing Cost System. Journal of Cost Management, Vol. 4 No. 3, pp. 4-14. (1990).
3. Metz, Mike, and Hardy, Arlene, ABC Put Accountants on Design Team at HP. Management Accounting, September pp. 59-61, (1993).
4. Fogelholm, John, Cost function modeling in the paper industries, (additional) dissertation, Helsinki University of Technology, Department of Industrial Engineering and Management, report no. 11, 102 p., (2000b).
5. Fogelholm, John, Variety Capturing Capabilities of the Steering Models of Complex Production Processes, its input Elements and the final information hereby utilized: 12th Inthernational Confer. on Systems Research, Informatics and Cybernetics, (2000a).
6. Fogelholm, John. Kannattavuuslukujen niveltaminen investoinnim tuottoasteeseen puunjalostusteollis-uudessa (How to depuce the ROI from the profitability index in the paper converting industry). Paperi ja Puu- Paper and Timber, Vol. 53, No. 9, pp. 535-537, (1971).