The Journal of Management Accounting, Japan
Vol. 1, No. 1 Autumn 1992

MANUFACTURING COST SYSTEM IN COMPUTERIZATIONAL SOCIETY

Susumu Sato*

ABSTRACT

As industrial society is being replaced by computerizational society, cost accounting is now faced with the need of a radical reform. The trinary cost system for industrial society has lost its usefulness at automated factories. This paper discussed the way to reconstruct cost system for automated factories, a subject which has increased in importance in recent years. The writer proposes the quaternary cost system. The following points are the essential of the quaternary cost system designed to suit automated factories:

(1) classifying the cost elements by transaction form into "material cost," "equipment cost," "labor cost," and "expenses."

(2) dividing equipment cost into "equipment maintenance cost" and "equipment working cost."

(3) calculating the cost of productive equipments based on the operating hours spent for products as "direct equipment cost."

(4) computing direct equipment cost and direct labor cost as "direct conversion cost", and dividing it into "set-up cost" and "substantial conversion cost."

(5) costing as "direct inner-expenses" the cost of sub-operating incurred by products.

(6) grouping other costs into "indirect conversion cost" and "manufacturing management cost."

(7) finding out the "by-cost" and adding up it to the "major-cost."

KEYWORDS

Quaternary Cost System, Equipment Cost, Equipment Maintenance Cost, Equipment Working Cost, Set-up Cost, Substantial Conversion Cost, Direct Conversion Cost, Direct Inner(composed)-Expenses, By-Cost

Submitted April 1992.
Accepted August 1992.

*Professor of Management Accounting, Department of Accounting, Faculty of Commerce, Chuo University.

1. *The Origin of the Trinary Cost System*

Manufacturing cost system changes with the change in production environment because the system itself reflects the actual situation of production activity. In the agricultural society, product cost consisted of material cost and wages. With the transformation of agricultural society into industrial society following the industrial revolution, machinery which has become the vehicle of production, enters the cost of production and is regarded as "overhead cost" in cost accounting. The result was the evolvement of the trinary cost system which comprised direct material cost, direct wage and overhead cost. This system gradually found acceptance by factories in England in the 1870s. Used as the means to measure the cost involved in a mechanized process of production, the trinary cost system includes the elaborate method of measuring the cost of maintenance and working of the machine used in the production, particularly the steam cost and machine depreciation. In short, the trinary cost system is a product of mechanization.

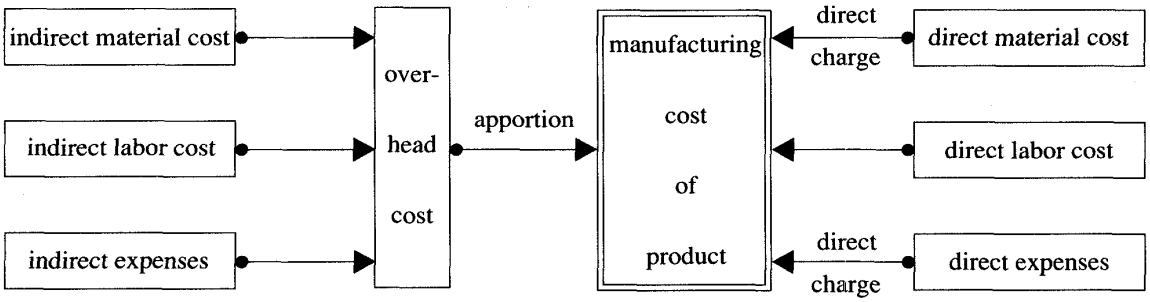

Figure 1: **Cost Composition of Trinary Cost System**

Figure 1 shows the cost composition in trinary cost system. Under the trinary cost system, all the direct material cost, direct labor cost, and direct expenses enter the cost of the products. On the other hand, all the indirect material cost, indirect labor cost, and indirect expenses are grouped as "overhead cost" and are apportioned among the products in accordance with proper bases. This method of measuring the manufacturing cost has predominated in the industrial society for over a century.

2. *Development of Industrial Society and Invalidity of Trinary Cost System*

With the emergence of the United States as the leading industrial power in the 20th century, standard cost system became the norm for factories appeared under mass production system and scientific management.

At the same time, a significant change occurred in the substance of overhead cost. Mass production and scientific management gave birth to flow conversion system which was represented by the Ford System. Flow conversion, however, rendered the meanning of overhead cost ambiguous, from the standpoint of manufacturing cost system. In the first place, the system clearly divided the laborers working in the factory into foremen and workers. This gave rise to a new group of laborers who were distinguished from the other laborers and led to the classification of cost connected with supervision as overhead cost. Secondly, by taking off indirect operation from direct workers, the flow conversion system created a group of indirect workers whose cost was treated as overhead cost.

As a result, the term "overhead cost" lost the original meaning of "machine cost" and broadened its scope to include all manufacturing costs other than those of direct cost. Overhead cost become a mixture of machine cost, sub-operation cost, and supervision cost, thus making it difficult to find out an appropriate base for apportionment. The apportioned amount of overhead cost and the actual situation of production become so unrelated to each other that one could hardly trust the figures that calculated by cost accounting.

The indirect cause that has contributed to the invalidity of trinary cost system is the fact it fails to provide an accurate measurement for overhead cost, because, under the system, overhead cost has become so unrelated to the condition existing manufacturing activity. To restore the validity of the trinary cost system, attempts have been made to rationalize the overhead cost apportionment.

Most of the scholars concerned with the subject divide the overhead cost into several item groups and apportion the cost among the groups by means of an appropriate application base. In the United States, Henry R. Schwarzbach & Richard G. Vangermeersch proposes "the 4th Cost of Manufacturing(1)" while Goerge J. Staubus suggests "Activity Costing(2)," and Robin Cooper & Robert S. Kaplan considers "Activity-Based Costing(3)" as the proper solution to the problem.

3. *The Changing Production Environment and Its Impact on Cost System*

The decade of 1970s witnessed the transition from industrial society to computerizational society. In the computerizational society, computers dominate every secter of society and social activity is controlled by data processing at on-line and real-time of a network that combines computers and communication devices. In the computerizational society, manufacturing activity is automated by the use of computers. The result is the creation of an entirely automatic and no-laborer production system which is different from an extension of the mechanized and labor saving system in the past.

With the change in the society and the production environment, it is almost impossible to trace out the actual condition of production activity in a computerizational society by means of the trinary cost system which had evolved as a tool for analyizing the manufacturing activity in industrial society. Hence, a new method of cost accounting is requested to be developed in order to meet the needs of the new society and the new production environment.

To understand the structure of the new manufacturing cost system which is to be created to cope with the production environment in the computerizational society, one needs to know the characteristic features of the new production environment, the automated factories, which are outlined below:

(1) production is carried out under automation and without direct laborer.

(2) automation of production requires large amount of investment.

(3) management and maintenance of equipments require many personnel, time, and expenditure.

(1) See Schwarzbach and Vangermeerch [2], pp. 24-29
(2) See Staubus [3].
(3) See Cooper and Kaplan [1], pp. 20-26.

(4) the soft-ware technology related to automatic conversion and production management necessitates the employment of a great number of personnel, and the time and expenditure needed are enormous.

(5) to meet the diversification of the products and the contraction of their life cycle, it is necessary to adopt a production system that is capable of manufacturing multiple products with variable production volumes adjusted to market demand.

4. *The Essential Points of a Reconstruction of the Cost System*

In view of the above-mentioned characteristic features of automated factories, a reconstruction of the cost system designed to suit automated manufacturing would have to take into account the following points.

(1) classifying the cost elements by transaction form into material cost, equipment cost, labor cost, and expenses, which, until recently, have been classifyed into material cost, labor cost, and expenses. By so doing, equipment cost can be easily recognized as part of cost composite.

(2) dividing equipment cost into equipment maintenance cost and equipment working cost. This makes it possible to distinguish all the expenditure incurred in the ownership, maintenance, and working of the equipment from each other. So far, academic researchers have generally defined equipment cost as the cost that covers only the ownership and maintenance of equipment.

(3) costing the cost of productive equipment based on the operating hours spent for each products as direct equipment cost. Such cost have generally been treated as overhead cost, regardless of whether or not the equipment grasps the hours spent for the products. In order to avoid this irrationality it is necessary to examine the concepts of direct cost and indirect cost. This makes it possible to measure the amount of direct equipment cost for each products.

(4) dividing direct conversion cost into set-up cost and substantial conversion cost. So far the prevailing practice is not to divide direct conversion cost into the two components or to treat set-up cost as an overhead cost. This method enables us to find out the substantial conversion cost for each products, as well as to measure the cost efficiency of production carried out under the production system of multiple products with variable production volume.

(5) costing the sub-operations and services that grasps the quantity consumed for each products as direct inner-expenses. Generally, these expenses have been treated as overhead cost. Proposed method makes it possible to find out the amount spent as direct cost for the design, inspection, etc. of products.

(6) dividing indirect cost into indirect conversion cost and manufacturing management cost. At present, all the indirect costs are treated as overhead cost. This method enables us to rationalize the apportionment of indirect cost as well as to have a better understanding of manufacturing management cost.

(7) finding out the by-cost and adding up it properly to the major-cost. This method distinguishes all kinds of by-cost, including by-cost of material, by-cost of labor, by-cost of conversion by outer-manufacturers, and by-cost of equipment. It also facilitates

the rationality of calculation of overhead cost. Presently, only a small number of by-cost, such as by-cost of material is categorized.

5. *Four Cost Elements Classification by Transaction Form*

By classifying cost elements into three elements based on their form of transaction, the traditional cost accounting has overlooked the significance of equipment cost. But as automation becomes the dominant form of production in the computerizational society, it is natural to recognize equipment cost as a cost element in place of labor cost. Table 1 shows how the system of four cost elements by transaction form differs from the traditional three elements system. The items of cost in the table are merely used as examples for illustration.

Table 1: **Cost Classification by Transaction Form**

trinary cost system	cost item	quaternary cost system
material cost	staple materials cost. purchased parts cost. subsidiary materil cost. material management cost.	material cost
	oil and fuel cost. cosumable tools and implements cost. cosumable parts cost. lubrication and grease cost.	equipment cost
expenses	energy cost. repair cost. cuterly grinding cost. insurance premium rent of equipments. tax and due on equipments depreciation cost preservation cost equipment management cost	
	communication cost travelling and traffic cost stationery cost light,heat,and water cost miscellaneous expenses	expenses
	expenditurs to welfare facilities welfare expenses new laborers invitation cost training and educational cost labor management cost	labor cost
labor cost	legal welfare expenses reserves for pension and retirement allowances wage salary bonuses and allowanccs	

6. *Equipment Maintenance Cost and Equipment Working Cost*

The term "equipment cost" refers to the cost involved in the ownership, maintenance, and working of the equipment, in addition to its depreciation. It is divided into two groups of cost: equipment maintenance cost and equipment working cost.

Equipment maintenance cost consists of owning the equipment and the cost of keeping the equipment in such a condition that it is always ready for use. They include depreciation cost, tax and insurance on the equipment, overhaul cost, repair cost, preservation and protection cost, and others.

Equipment working cost includes the cost of operating the equipment. It comprises steam cost, energy cost, oil and fuel cost, lubrication and grease, consumable tools cost, and cutlery grinding cost. Equipment maintenance cost is essentialy a capacity cost and could be grouped as fixed cost. On the other hand, equipment working cost is an activity cost and is classifiable as variable cost. Accordingly, the division of cost into maintenance cost and working cost makes it easier to differentiate fixed cost from variable cost and enables us to provide useful information relating to cost behaviour that could be used for decision making and evaluation of performance.

Moreover, such a cost division is one of the pillars of the quaternary cost system. It serves as the basis for calculating the direct conversion cost which reflects the actual condition of manufacturing activity—the set-up cost, substantial conversion cost, and the cost efficiency.

7. *Direct Equipment Cost and Indirect Equipment Cost*

Direct productive equipments are the machinery and equipments that are directly used to provide products with effective quality and form. The direct equipment cost, which is part of the direct productive equipment cost, is the cost relating to the number of hours in which the direct productive equipment is directly used for the processing of products.

The basic principle of manufacturing cost system for an automated factory is to directly charge to the products the direct equipment cost for any time consumption contained in the direct productive equipment cost which is closely connected with the manufacturing process. Figure 2 shows the way how they are inter-related.

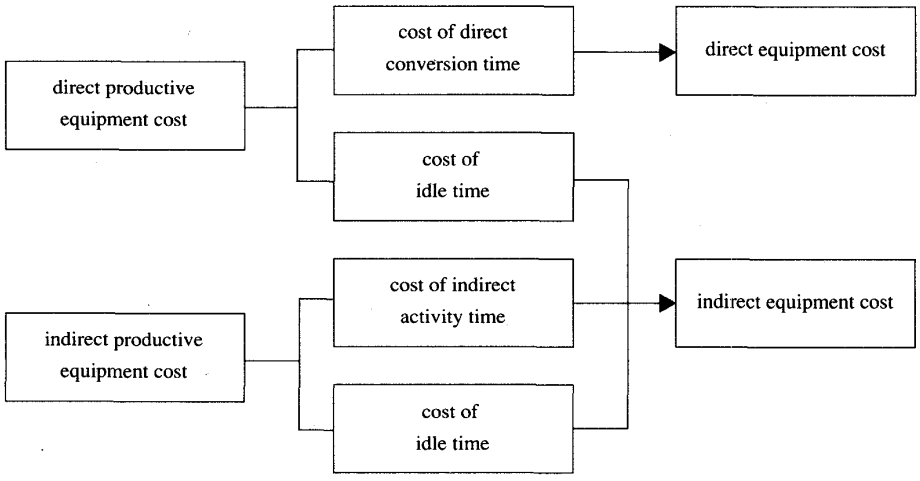

Figure 2: **Relations Between Direct Productive Equipment Cost and Direct Equipment Cost**

8. *Calculating of Direct Conversion Cost*

1. Processing Method and Composition of Conversion Cost

As noted above, dual costing is used for calculating the product cost in agricultural society, while trinary costing is introduced in industrial society to serve the same purpose. In computerizational society, quaternary costing is elaborated for calculating the manufacturing cost.

The composition of direct conversion cost in these three types of society are as shown in Table 2.

Table 2: **Component of Conversion Cost**

age	conversion method	component of conversion cost
agricaltural society	by manual labor	labor cost
industrial society	by machinery and manual labor	labor cost and machine cost
computerizational society	by automation	equipment cost

In agricultural society, processing is carried out manually, and conversion cost consisted only of labor cost. The cost of tools and instruments is not significant. In industrial society, machines are used for processing, and conversion cost is composed of two elements, that is, labor cost (wages) and equipment cost (machine cost). The trinary cost system that had developed in England called this equipment cost "overhead cost." But the term "overhead cost" gradually lost its original meaning of machine cost, and has come to denote "all manufacturing cost other than direct cost," that is, "indirect cost."

In computerizational society, processing is totally automated by the use of computers, and manufacturing processing is carried out without the use of human labor. Thus, conversion cost consists only of equipment cost. This is why quaternary costing, which includes equipment cost as a new cost element, is indispensable to manufacturing cost system in computerizational society. In this society, production environment has been so changed that the vague term and concept of "overhead cost" can no longer deal with manufacturing cost.

2. Set-up Cost and Substantial Conversion Cost

Automated manufacturing in computerizational society is characterized by multiple products with variable production volume. Thus, set-up cost and substantial conversion cost should be computed separately to obtain direct conversion cost.

In the factory of the multiple products with variable production volume, set-up changes frequently, and the way to carry out an efficient change in set-up poses an important problem in terms of both time and cost.

In principle, set-up cost is the cost of preparing the equipment for operation and the cost of clean-up, after its use, in the production of certain quantity of products. As a means to increase the efficiency in changing the set-up, the set-up process is sometimes divided into two parts: outer set-up and inner set-up.

Outer set-up is the preparatory work carried out while the set-up of the equipment to be changed is used to process other kind of products.

Inner set-up the work of changing the set-up while the operation of the equipment is suspended.

Outer set-up is usually carried out manually by set-up workers. Because of this, outer set-up cost is calculated by multiplying the time spent for outer set-up work by labor hour-rate.

Since inner set-up is performed directly by workers after the operation of the equipment for set-up has been stopped, its cost is obtained by adding up the equipment maintenance cost incurred during the suspension and the labor cost for working hours needed.

Figure 3 shows the formulas for calculating these costs.

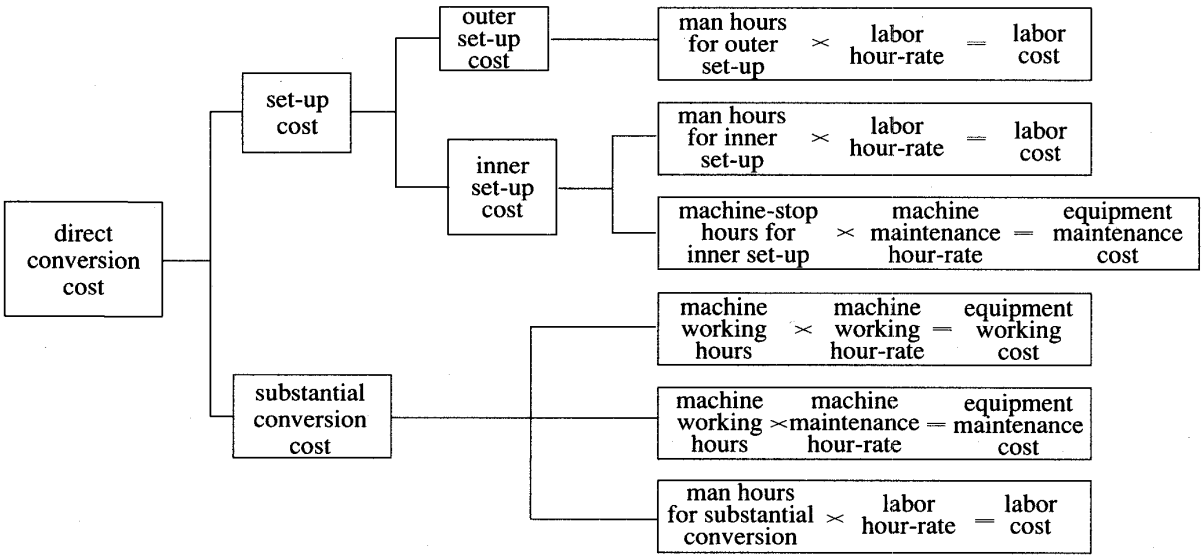

Figure 3: **Direct Conversion Costing**

Substantial conversion cost is the cost involved in the number of times the machine or the laborer repeats its operation in order to produce certain manufacturing units. It includes not only main-operation time but by-operation time as well. In other words, substantial conversion time is the time needed for the main-operation and by-opereation, which is repeated again and again to provide satisfactory quality and form to the product, and for a series of the by-operations directly related to the main-operation. Substantial conversion cost is composed of three elements: labor cost, equipment working cost, and equipment maintenance cost for the time spent for the substantial conversion. But in the case of totally automated processing, the only cost involved is the equipment cost.

9. Expansion of Costing of Direct Expenses

In traditional cost system, direct expenses are composed mainly of those paid to outside parties, such as conversion cost paid to outer-manufacturers and royalty.

But in manufacturing activities in computerizational society, with the increase in the direct expense items paid to outside parties, direct expense items incurred internally as composed cost increases rapidly.

As shown in Table 3, direct outer-expenses include cost of conversion by outer-manufacturers, royalty, design fee, survey fee, inspection fee, removal charge, test and

Table 3: **Direct Expenses**

direct outer expenses	conversion cost paid to outer-manufacturers design fee survey fee inspection fee test and analysis fee removal fee data processing fee royalty other items paid to outer
direct inner expenses	design (dep.) cost inspection (dep.) cost experiment and analysis (dep.) cost trial manufacture cost modeling cost spoilage cost repair cost materials handling cost cutlery grinding cost other items composed by inner

analysis charge, data processing charge, and others. Direct inner(composed)- expense items incurred internally as composed cost include design cost, inspection cost, trial manufacture cost, modeling cost, spoilage cost, repair cost, materials handling cost, and others. There are two methods of calculating the expenses internally composed: one of them is to provide composed expense accounts by purpose and the other is to provide subsidiary departments and sum up expenses for each department. In both methods, direct expenses must be obtained directly on the basis of the volume of consumption for each product. For example, to compute the cost of the design department as direct expense, it is necessary to calculate the time spent for designing or the number of plans for each product.

Traditional cost system deals with the internal expenses mentioned above mostly as overhead costs. But to grasp the actual condition of production and to ensure good management, the best method of increasing the usefulness of cost information is the adoption of the job-order cost system and the inclusion as direct expenses by products as many expenses as possible.

10. Indirect Conversion Cost and Manufacturing Management Cost

In the early years of the traditional trinary cost system, overhead cost consisted of machine and tool cost. With the growth of industries, however, its content changed gradually. At present, overhead cost means "all the manufacturing cost other than direct costs." As a result, it becomes impossible to grasp the actual condition of manufacturing activity by cost, thus the need of improving the calculating method of overhead cost.

Despite effort made to improve the calculating method of overhead cost within the frame-

work of the trinary cost system, we are still unable to overcome the limitations imposed by the cost accounting used in industrial society. What we need today is not cost accounting for industrial society but one for computerizational society. Thus, unless we devise new cost system suited to computerizational society in the light of social changes that have taken place, we will not be able to have a basic solution to the problem.

The quaternary cost system is a costing method suitable for the production environment of computerizational society. In this system, all manufacturing costs other than direct costs are grouped into two categories: indirect conversion cost and manufacturing management cost. Thus, the concept and calculation of overhead cost are completely abandoned, as

Table 4: **Break Down of Overhead Cost**

	cost treatment in quaternary cost system		
overhead cost in trinary cost system	direct cost	direct equipment cost	direct productive equipment cost that spent for products
		direct inner-expenses	costs of desing dep.,inspection dep.,etc.applied to products.
	indirect cost	indirect activity cost	costs of light,heat,water,indirect laborers and equipments.
		manufacturing management cost	cost of production control,quality control,and shop management.
	by-cost	material by-cost	costs of purchasing,receiving. storage,etc.,of materials.
		by-cost for conversion by outer	cost of instructing purchasing. receiving,issuing,etc.,for conversion by outer-manufacturers.
		rabor by-cost	cost of welfare,training,education, new laborers invitation,etc.
		equipment by-cost	costs of overhaul,repair,preservation, automating,etc.,of equipments

shown in Table 4.

Indirect conversion cost is the miscellaneous costs not applied directly to products, which include the cost of lighting, air conditioning, water and sewer for factory, and that of indirect manufacturing equipment and indirect workers (except for those applied directly to products are direct inner-expenses).

Manufacturing management cost is also the miscellaneous costs not applied directly to products, such as the costs of process control, work control, quality control, and other factory management.

The application base of indirect conversion cost is generally related to the operating hours of productive equipment (set-up time plus substantial conversion time) or working hours of productive equipment (substantial conversion time), depending on the contents of the cost. Manufacturing management cost, in order to cover the expenses incurred, should use an application base that take into account cost chargebility (cost collectability). More specifically, the application base should be direct conversion cost plus cost of conversion by outer-manufacturers. This is because the higher direct conversion cost is, the greater will be both the value added and the collectability of manufacturing management.

11. Flowchart of the Quaternary Cost System

Figure 4 shows the flowchart of the quaternary cost system, which we have discussed as a method of manufacturing cost accounting suited to computerizational society.

The figure shows the cost flow from left to right.

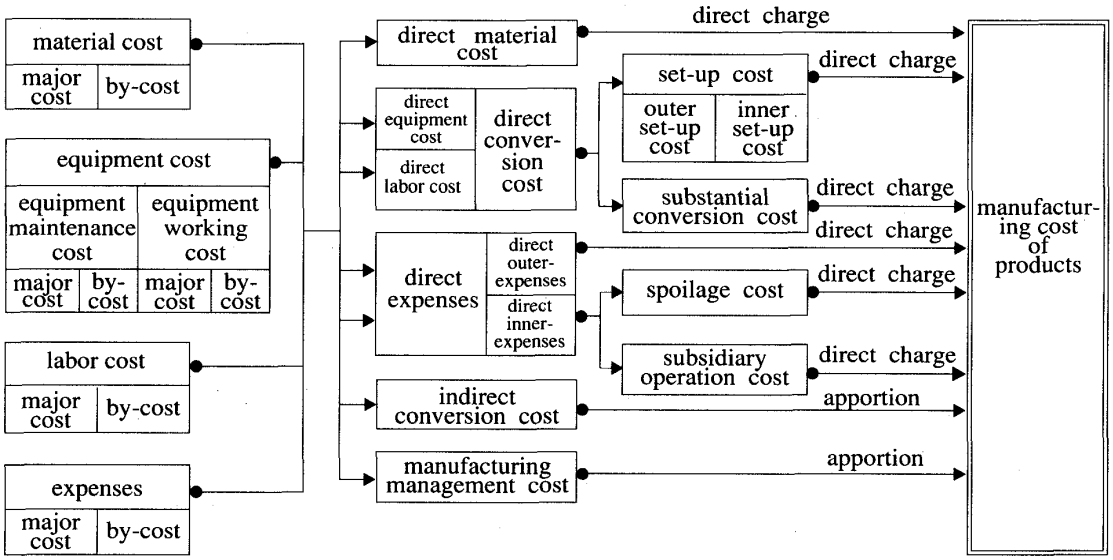

Figure 4: **Flowchart of the Quaternary Cost System**

First, cost is classified according to its transaction form into four elements: material cost, equipment cost, labor cost, and expenses. Each of these cost elements consists of major-cost and by-cost. Equipment cost is sub-classfied into maintenance cost and working cost.

Next, cost is classified into direct and indirect costs according to its relation to products. The former includes direct material cost, direct equipment cost, direct labor cost, and direct expenses. Of these, direct equipment cost and direct labor cost are collectively called direct conversion cost. To obtain direct conversion cost, set-up cost (outer and inner set-up cost) and substantial conversion cost are separately calculated and summed up.

Direct inner-expenses include spoilage cost calculated by combining direct material cost and direct conversion cost (repair cost and manufacturing cost of substitute products) and the cost of subsidiary operations (designing, materials handling, inspection, cutlery grinding , etc.), which is dealt with as direct expense by product.

Indirect expenses are sub-divided into indirect conversion cost and manufacturing management cost, and are applied to products using an appropriate application base.

12. Quaternary Cost System by Department

Costing by department in the quaternary cost system is performed basically as follows: First, the cost department is divided as shown in Figure 5. It is roughly classified into the manufacturing and subsidiary departments. The former is the department where direct conversion is carried out to manufacture the products in accordance with desired form and quality. The cost of manufacturing equipment incurred in this department is directly charged to products as direct equipment cost based on operating houre. Idle cost of equipment is apportioned to products as indirect conversion cost.

The sub-operation department is the department in charge of designing, inspection, and materials handling of products. In principle, the cost of this department is directly charged to products as direct inner-expenses. The other cost of the department not charged directly to products is apportioned to the manufacturing department.

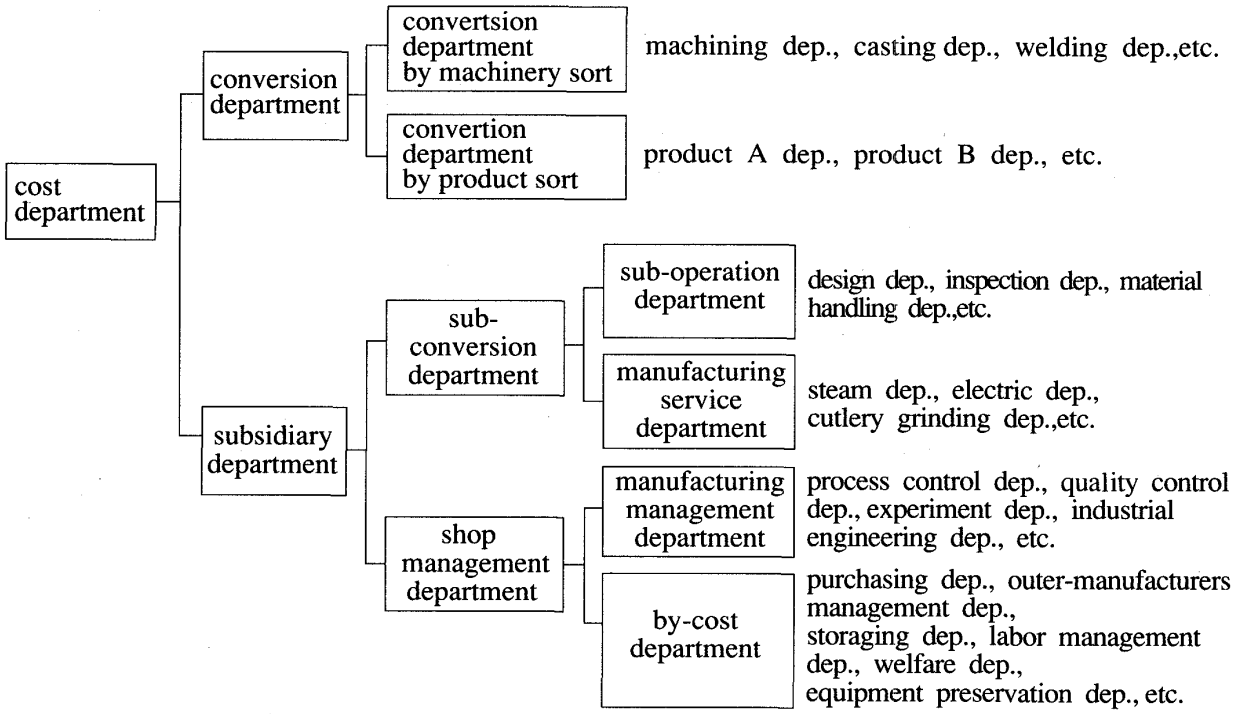

Figure 5: **Classification of Cost Departments**

The manufacturing service department provides various types of service, such as electric power, steam power, air conditioning, cutlery grinding, and repairing. These services do not contribute to the manufacturing of products, directly but indirectly. For example, electric power is supplied directly to machines and equipment, which are then operated to make products. From the viewpoint of calculating equipment cost, this indirect relationship means that the cost of the manufacturing service department, including electric power, should be calculated as equipment working cost. Thus, the cost of electric power, steam power, cutlery grinding, etc. is transferred to the equipment working cost of the equipment concerned. The other cost of this department not transferred to equipment working cost is apportioned to the manufacturing department (and the subsidiary departments using the service concerned).

The factory management department consists of the manufacturing management and by-cost departments. The cost of the manufacturing management department is apportioned to products. In this case, cost chargeability (cost collectability) is used as the apportionment base.

The cost of the by-cost department is added to related major-cost as by-cost. This cost includes material by-cost (instruction cost to suppliers, material purchase cost, material storage cost, material ipspection and acceptance cost, etc.), labor by-cost (labor management cost, welfare cost, welfare facilities cost, education and training cost, recruiting cost, etc.), by-cost of conversion cost paid to outer-manufacturers (instruction cost to outer-manufacturers, cost of management for outer-manufacturers, inspection and acceptance cost of outer-products, etc.), and equipment maintenance by-cost (equipment preservation cost, monitoring cost, design cost of automation, etc.).

Figure 6 shows the basic relationship of the cost system by department described above.

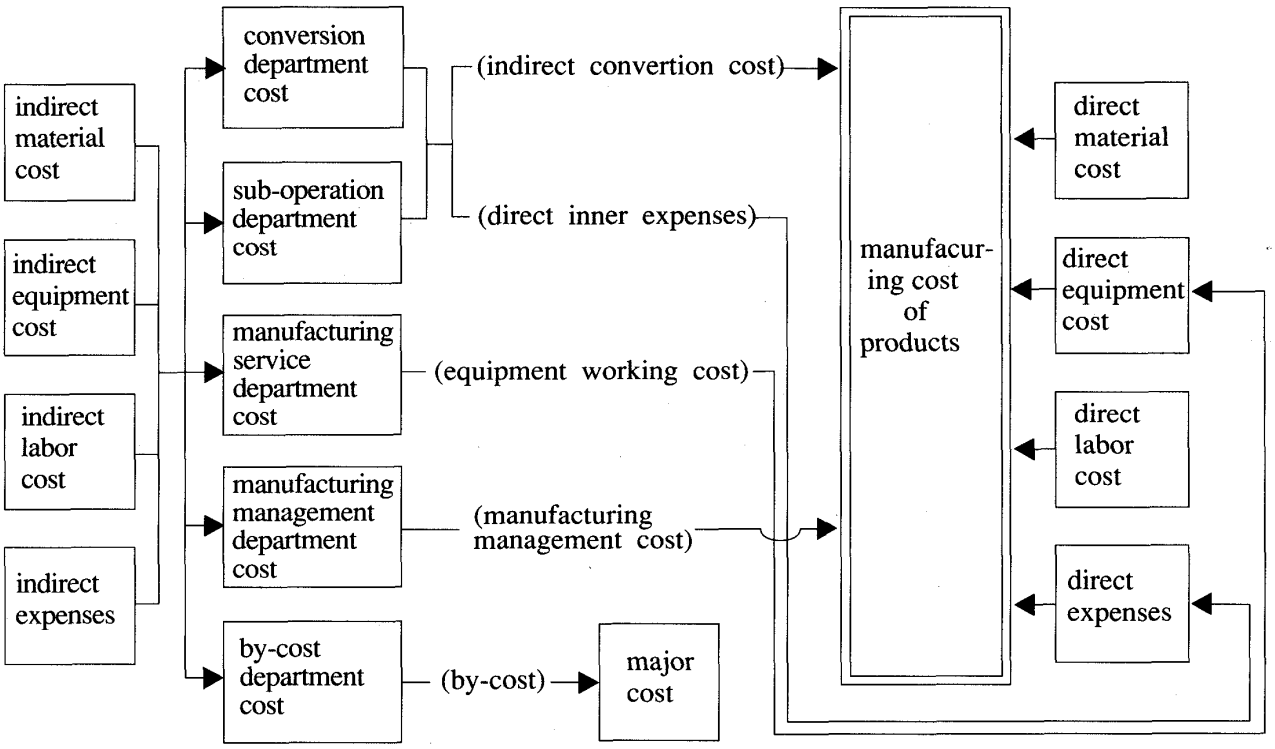

Figure 6: **Quaternary Cost System by Department**

13. Conclusion

As industrial society is being replaced by computerizational society, cost accounting is now faced with the need of a radical reform. The trinary cost system, the cost accounting method for industrial society, has completely lost its usefulness at automated factories, making it an out of date system. As a result, the need of reconstructing cost accounting for computerizational society has been a major topic of discussions in both the United States and Japan, and in both the industrial and the academic circles. Cost accounting is a practical subject. Its system could only be applied and improved at factories. It is for this reason that the system is proposed as a new cost system that could meet the changing factory environment.

For many years, the writer has proposed the use of quaternary cost system for computerizational society. The quaternary cost system is the method of classifying cost elements into four categories: material cost, equipment cost, labor cost, and expenses. It also divided direct product cost into of four elements: direct material cost, direct conversion cost, direct outer-expenses, and direct inner-expenses. The writer demonstrared that this is the cost system suitable for computerizational society. But the concepts described in this paper in limited in scope, and the writer is aware that many detailed problems remain to be studied in the future. The writer also recognizes the fast that unless effort is made to adjust the new system with financial accounting and tax accounting, may encounter unexpected difficulties in its application. So for the writer's main concern is to provide the first step for the solution of the problem that has risen from automated factories both at home and abroad. The writer also hops that his proposal would contribute to the re-examination of the conventional concept of cost accounting and help in the introduction of a new system through the effort of industrial and academic circles.

REFERENCES

[1] Cooper, Robin and Robert S. Kaplan, "How Cost Accounting Distorts Product Cost," *Management Accounting*, April 1988, pp. 20-26.

[2] Schwarzbach, Henry R. and Richard G.Vangermeersch, "Why We Should Account for the 4th Cost of Manufacturing," *Management Accounting*, July 1983, pp. 24-29.

[3] Staubus, Goerge J., *Activity Costing for Decisions: Cost Accounting in the Decision Usefulness Framework*, New York, Garland Publishing, 1988.

日本管理会計学会誌
管理会計学 第 1 巻第 1 号
1992 年秋季号

情報化社会の製造原価計算制度

佐藤 進*

〈論文要旨〉

工業社会から情報化社会への発展に直面し，原価計算はいま大変革を迫られている．工業社会の原価計算である三要素原価計算は自動化工場において完全に有用性を失ってしまった．本論文では，自動化工場の原価制度をいかに再構築すべきかについて考察する．そして四要素原価計算制度を提案する．四要素原価計算の特徴は，次の諸点にある．

(1) 原価要素を取引形態別に「材料費」,「設備費」,「労務費」および「経費」の 4 要素に分ける．

(2) 設備費を「設備維持費」および「設備稼働費」の 2 要素に分ける．

(3) 製品別に操業時間を把握できる生産設備の費用につては，これを「直接設備費」とする．

(4) 直接労務費および直接設備費で直接加工費を構成し，これを「段取り費」および「主体加工費」の 2 要素に分けて計算する．

(5) 製品別に消費量を把握できる補助作業の費用は，これを「直接内部 (複合) 経費」として計算する．従来の伝統的直接経費は，これを「直接外部経費」と名づけて区別する．

(6) その他の費用は,「間接加工費」および「製造管理費」の 2 つに分ける．

(7) 「副費」を把握し，これを「主費」へ加算する．

〈キーワード〉

四要素原価計算，設備費，設備維持費，設備稼働費，段取り費，主体加工費，直接加工費，直接内部 (複合) 経費，副費

1992 年 4 月受付
1992 年 8 月受理
*中央大学教授 (商学部会計学科)