

VOLUME XXII

NUMBER 1

Kyoto University Economic Review

MEMOIRS OF THE FACULTY OF ECONOMICS

IN

THE KYOTO UNIVERSITY

APRIL 1952

System of Shipping Theory—The Purposes of Shipping Policy	<i>Prof. S. Sawa</i>	1
Revolution and Reform in Meiji Restoration	<i>Asst. Prof. H. Horie</i>	23
Accounting of Foundries	<i>S. Shimme</i>	35

PUBLISHED BY
THE FACULTY OF ECONOMICS
THE KYOTO UNIVERSITY
KYOTO, JAPAN

ACCOUNTING OF FOUNDRIES

By *Shinshichiro Shimme**

PROBLEM I: Costing of Estimated Costs for Castings

CHAPTER 1. Meaning of Costing of Estimated Costs

Costing of estimated costs corresponds to "Verkalkulation" or "Planrechnung" advocated by German scholars and also corresponds to the estimated costs by the predetermined job cost system of the United States.

In our country it has been called simply "estimate" or "budget" and has been used for a long time an accounting system for the estimates of costs for the factory products, works and repairs and so forth. This accounting system is to account various requisite costs in advance under a definite manufacturing plan, before the factory starts the actual manufacturing of specific products. (Note 1). Therefore, this accounting can be said to be one species of future accounting (Zukunft-srechnung).

There are diverse opinions on the meaning and object of this estimated cost, and by various scholars it is "frequently confused and incorrectly used by mixing up 'actual', 'estimated', 'normal', and 'standard' costs." (Note 2). Especially this is often used as a synonym of the standard costs. (Note 3 & 4). The representative opinion of our country on the estimated cost is the regulation of the "estimated costs or 'pre-determined costs'" under "The regulations of cost accounting for manufacturing" of the Ministry of Commerce and Industry, in which "estimated cost" is to account the consumed amounts of various cost elements in advance. (note 5).

The objects of setting up the estimated costs by various industrial enterprises are varied for each case and we wish to mention some of the objects here in these cases.

No. 1: To estimate the original costs of the products before starting

* The author is now an auditor of the *Kawasaki Jukogyo* (Kawasaki Heavy-industry) Co. Ltd. and has been an invited lecturer of the Faculty of Economics at the Kyoto University since April 1952.

the actual manufacturing, when the products are for stock.

No. 2: To make the rational estimate sheets in reply to the specific orders from the customers for the products or works, etc. .

No. 3: The managers want to control the manufacturing and for the purpose of controlling the actual costs and wish to establish the estimated costs before starting on the manufacturing. (Note 6).

In each and every case mentioned above, in making up the estimated costs, we cannot depend upon the arbitrary and simple estimates, but we have to study the past results and future change of conditions and the normal quantity of production under the normal operation for the specific products and works, and estimate the consumed values of cost elements, which constitute the main bodies of the products and works. In other words, estimated costs can be established only after the deliberate study and investigation of the three main elements, which constitute the original costs of the products, i.e., estimate of material cost, estimate of labor wages, and estimate of manufacturing expenses. And when these three estimates are added, this constitutes the so-called estimated costs. This cost represents, in figures, the wishful and anticipated costs of specific products; and using this as the standard for the manufacture, it regulates the future activities of manufacture. Therefore, the estimated figures must be established on the rational basis and they cannot be arbitrary and simple estimates, as mentioned before. The estimated cost cannot be from the ideal figures, but it must have the practicability and it is essential that these figures have the controllability. Therefore, in the estimated costs the various estimates have to be based upon the past figures and then determined by the estimates of the future changes of conditions.

For this reason, great efforts should be paid for establishing the estimated costs. The estimated costs figured rationally under the deliberate considerations should be identical materially with the standard costs, which are the results of the scientific study. (Note 7). Estimated costs cannot, therefore, be inferior to the standard cost in its scientific accuracy. When the makers of estimated costs use utmost care in selecting the necessary materials in making same, such estimated costs will have the most practicability and controllability.

The meaning and object of the estimated costs are roughly as described before and the order of making up same is generally as follows:-

- (1) To make the estimate of normal quantity under the normal and ordinary operations of the factory, in figuring cost elements for the specific amount of the specific product from the technical standpoint.
- (2) To add the accounting technique into the estimate accounting made

on the technical standpoint and then make the estimate costs.

To estimate the consumed amount of cost elements for the specific quantity of specific products on the technical standpoint is to calculate the quantity and species of raw materials needed for the specific products, numbers of man-hours, conditions of factory etc., and adding the accounting technique into the technical estimated costs means the following. The estimates of the cost elements made on the technical standpoint are all technical and quantitative. We add the market charges of raw materials, wage rates, for the man-hours, allocation of indirect expenses for the man-hours. Effect of the operation ratio to the production cost, yield percentage of the products, etc.. These will be converted into the momentary values. Therefore, for accuracy of accounting of estimated costs, it is indispensable that the estimated cost made on the technical standpoint must have reliability.

Note 1: Dr. Ryoza Yoshida says: "Advance accounting means the estimates in advance of the costs which are needed for the specific economic acts happening in future", and is of the same opinion with this author".

Note 2: John G. Blocker:-Costing Accounting, 1940 P. 18.

Note 3: G. Charter Harrison, authority on the standard cost, points out the contents of the technical terms of "standard costs" which are explained as "estimated costs" or other similar expressions by various authors. (Standard Costs, 1930, P. 3-4).

"Like many a new idea, the one of standard costs have been called under a variety of names. Thus the terms, "pre-determined", "estimated", "predicted", "budgeted", and "scheduled", have been used by various authors and speakers".

Note 4: A. P. Stock in his thesis.

"Advantages and disadvantages of the estimated cost system" explains the estimated costs can be the standard costs in the following cases". ("Administration", January, 1922, P. 29).

"Those in which the costs are estimated, but which are continually being checked up by actual figures and revised accordingly. This class I shall call "standard costs".

Note 5: "Regulations" of the Ministry of Commerce and Industry. 3 (a).

Note 6: H. O. Horten and R. R. Mason express the following as to the objects of estimated costs. ("Costs and Cost Accounts, 1936, P. 9-10).

- (a) To enable production to be the subject of a considered plan.
- (b) To provide accurate and detailed record of the actual cost of the product, process or job.
- (c) To provide information necessary for the proper administration of expenditure and for comparison of expenditure as between periods.
- (d) To provide means of control of individuals by the fixing of responsibility.
- (e) To make it possible to avoid leakage or postage of material or the employment of unprofitable labour.

Note 7: There is no settled opinion among various authors as to the meaning of the standard cost. The control idea of this cost is as follows, according to Eric A. Camman, (Basic Standard Costs, 1932, P. 34).

"The standard cost of a product is that sum which is obtained by pricing a manufacturing specification for the product at predetermined basic rates for the materials, direct labour and burden entering into its manufacture".

CHAPTER II. Principles of Making the Estimated Costs

In making up the estimates of costs of castings in the foundries, as making up the same as in other factories, the products have to be

divided into various elements on the technical standpoint, and then make the estimates by each department and each kind estimating how many of these component elements were consumed under the normal operations. And these cost elements from the accounting standpoint have to be computed as to the raw material cost, labour cost and other expenses and these are assembled together for one definite amount of the specific products as the estimated costs.

Now the following points have to be considered in making up the estimated costs of castings by the practical method.

No. 1: Study of the materials for the cost accounting of the past.

For the making up the estimated costs, first considerations should be what would constitute these elements. In other words, on what basis the estimated costs can be computed. If the materials are accurate and reliable, the estimated costs computed upon these bases can also be reliable. And for the general material, the past cost data should be used. However, the past cost data will not always be the complete materials for the computation of the future estimated costs. Therefore, such deficiency must be filled up. For even the past cost data denote only the so-called historical and retrospective costs and the future cost (Zukunftskosten) which are going to be computed will have the periodical differences in the consumption of economic values, the difference of labour efficiency, and the fluctuation of prices of raw materials owing to the economic conditions. On this point the opinions of Dempster Smith and Philip C. N. Pickworth will tell the story on these points. (Note 1).

No. 2. Analytical and systematic making of the estimated cost elements.

The cost elements of the goods to be estimated must be analytical and systematic. In computing the estimated costs, the cost have to be divided into their component elements and each element should be estimated as to its cost and these later are added together and will be made the estimated cost of a specific product. On this point we quote Robert E Belt, who says; "the estimate has to be made in due order and with careful attention and has to be arranged most systematically. This estimate and the finished cost data after the completion of the operation have to be corresponding to each other, item by item; and such minute comparison will be useful for checking up the correct estimates when each item might be overlooked or regularly underestimated". (Note 2).

If the estimated costs are figure out only by adding up all the cost

elements, there could be some differences between the actual costs after the end of the operation and the estimated costs, and the cause for such differences cannot be determined.

No. 3: Establishment of objects of computation of the estimated costs.

In making up the estimated costs it is necessary to determine what are to be the objects of the estimated costs. As professor M. R. Laheman says, "in one enterprise, where either by order or by a special plan or design a machinery is to be manufactured, individual units are produced, or in the case of the mass production of the enterprise, where the production is for the indefinite mass of the same kind of products, we shall have to deal with the lot cost (Stickkosten) or unit cost (Einheitskosten)". (Note 3).

However, in the castings we estimate the total costs for one fixed period (one particular cost accounting period) and we shall measure these costs by special unit, i.e., by the definite unit of "ton" or "pound" or "Kan". The estimated costs for the particular unit can be computed.

Note 1: The opinions of Smith and Pickworth in making up the estimated costs are as follows (Engineers' Costs and Economical Workshop Production, 1916, P. 259):-

"The cost may be based on that incurred in previous identical or similar work, due regard being given to any change in the market price, either of labour or material".

Note 2: Robert E. Belt:- Foundry Cost Accounting, 1926, P. 259.

Note 3: Lehman: "Cost Accounting", Translation by Prof. Rokuro Yamabe, P. 74.

CHAPTER III Actual Method of Making Up the Estimated Cost of Castings

The principles of making up the estimated costs have been related in the preceding chapter and this chapter will treat the actual method of making up the estimated costs of the castings.

(1) Metal Cost.

The metal cost is determined by the investigation of the past prices, present market prices, and the tendency of the market price change in the future, for every kind of the metal.

(2) Charge rate of Metals.

The metals call for different charge rates for the different kinds of castings, and the different usages or specifications of castings.

It is a general practice that the casting of the same kind calls for different charge rates, in accordance with the variety of production technique; therefore, in the making of the estimated costs, the change of charge-rates of the metals have to be considered and adjusted accordingly. All the facts, which can be forecast at present, have to

be made the basis of making the estimated costs.

Special attention has to be called in the computation of estimated costs in proportion to charge-rates, because the raw materials for castings consist of pig iron, casting scraps, old pig iron, scrap iron or sprue and scraps and these have each different prices. Therefore, the change of the charge-rates will have considerable effects upon the cost.

(3) Prospect of Yield and Spoils.

Not all the metals charged in the furnace cannot be made into castings. The oxidation of metal, metal loss and sprue and scrap produced have to be figured out of the total quantity of the metals charged and this estimate has to be considered in setting up the estimated costs. The ratio between the metal used and the finished products of casting is called yield, and the difference of these two figures is the operation scraps produced and the loss of the metal. The estimated yield should be determined upon the standardized investigations of the finished castings and the metal consumption under the normal efficiency of the operation.

(4) Estimate of the Melting Cost.

It is required to figure the melting cost of a specific quantity of the metal under the normal operation and for this purpose, actual results for the past several periods have to be examined and the average cost determined. On such basis of computation is made the estimate of the melting cost. On the other practice, the cost of the catalytics, fuel, repairing cost of the furnace, tool expenses, wages, etc., which comprise the melting costs are figured together and the total sum of these is set as the estimated melting cost.

(5) Estimate of the Moulds Cost.

The number of moulds cost which are needed in accordance with the shape and type of the castings to be manufactured and the manufacturing conditions has to be considered, then we figure the estimate of the man-hours and multiplying same by the standard wages, we compute the estimated wage cost. For the cost of clay and sand which are the materials of the mould and other auxiliary expenses, the past result has to be examined and the estimate is made.

(6) Estimate of Cores Cost.

The estimate of cores cost is nearly the same as the estimate of the mould cost and same method can be applied.

(7) Estimate of Finishing, Annealing and Inspection Costs.

These costs can be estimated from the past actual results and on the prospect of the future price changes. After making the various foregoing estimates of all the costs above mentioned, the total sum is computed

out of these figures, and it will be the estimated cost of the castings.

Above is the prerequisite for the computation of the estimated costs of the castings but care should be taken in checking whether the factory is more economically operated or not, in other words, whether the operation is normal or not, and this fact has to be considered in, in making of the estimated costs. In order to get the satisfactory results in utilizing the estimated costs, after they are made, various conditions required in the making up of the estimated costs have to be thoroughly considered, and the following matters which will influence the estimated costs in the practice of the actual operation have to be carefully studied.

(1) Continuous repairs have to be made on the factory equipment, machinery, and tools and the constant standard production capacity is to be maintained all the time.

(2) Rate of the consumption of the raw material and the changes in the operation plans and other important facts have to be always recorded, which will enable to forecast the inevitable difference between the actual costs and the estimated costs, after the completion of the operations.

(3) One rigid standard has to be set for the valuation of inventory of bad castings, sprue and scrap products, unused raw material, etc. and we should try to eliminate the causes of the difference between the actual cost and the estimated cost, after completion of the manufacturing, occasioned by the arbitrary inventory valuations.

Thus, in actual computation of the estimated cost of the castings, we require for the basic material the monthly cost statement for the past six months from which the average figures for one month are computed and it is made the cost estimating data sheet. Suppose, the metal charges for this particular month is 300 tons and the weight of the products is 252 tons and the percentage of total metal goods is 84%. Also we make specific valuations of the casting scraps bad castings and eliminate same from the total, we shall get the actual result for one month as follows:

Cost Estimating Data Sheet

(Average of six month: July 1st, to December 30, 1951)

Remarks	Weight	Unit Price per 100 kg	Total
Aggregate cost of the casting	300,000 kg	@ ¥ 9,000.—	¥ 27 000,000.—
Loss by casting	20,000 „	0	0
Total casting and cost	280,000 „	¥ 9,642.85	¥ 27,000,000.—
Casting scrap	5,000 „	„ 1,500.00	„ -) 75,000.—
Bad casting, etc.	23,000 „	„ 2,500.00	„ -) 575,000.—
Net	252,000 „	¥ 10,456.35	¥ 26,350,000.—

We employ the above cost estimating data sheets as the basis and since the estimated cost of the casting to be manufactured now, is different in its manufacturing time, therefore, various conditions have to be figured in. For instance, the first consideration has to be made in checking the figures shown in the cost estimating data sheet, whether the operation is under the normal activity or not, because the effect on the cost is greatly different as the operation is under the normal activity (Note 1), or under the standard operation activity (Note 2), or under the maximum operation activity. (Note 3). The intelligent observation of the operation ratio is the most important factor in the estimate of the cost. Therefore, if the above figures in the cost estimating data sheet is under the normal activity, other cases require the modification and correction thereto.

If the amount of the casting does not accompany the production capacity of the factory, the expenses, such as the so-called constant cost of the factory, which arise regardless of the amount of manufacture, will increase the cost in proportion to the decrease of the products which burden this cost. (Note 4). Especially, in the casting operation, different from other manufacturing operations, the maximum amount of the manufacture is limited by the melting furnace and other equipment and it is rather constant. Therefore, when the maximum capacity is realized by a factory which has a constant manufacturing capacity, and when it is not so, the ratio of the constant cost burdened by the products must be different all the time. In making up the estimated costs, the existence of this kind of cost has to be realized, the effect of this cost must be studied.

The proportional cost or variable cost can be varied with the amount of manufacture and if the amount of manufacture becomes half, this cost also becomes half; and when the former is doubled the cost is also doubled and is not very difficult to figure in same in the computation of the estimated costs.

Next we consider the relation of the estimated costs and the yield of products. We see how much of the charged metal will be turned into the good castings on which the estimate of the cost is figured, or how much is the ratio of the finished products to the total metal charged. The yield will have different results by multiple causes, such as the kind and nature of the metals used, specification of the products, adequacy of the equipment, skill in the operation, and so forth. Therefore, in the forecasting the estimated cost of the prospective products we have to figure the yield beforehand and correlate same with the estimated costs. To forecast the yield it is the general practice, as in the statis-

tical study of the economic changes, to infer same from the past results. Supposing the charged metal is 300 tons, we figure the changing relation of the yield and the products cost in various stages.

Yield Total weight	Amount of Products	Variable Price of casting cost	Unit	Total casting cost	Rate of increase of the unit Price
100% 300 tons	300 tons	@ 100 kg	¥ 9,000.—	¥27,000,000.—	100
95% 300 "	285 "	"	" 9,473.75	" 27,000,000.—	105
90% 300 "	270 "	"	" 10,000.00	" 27,000,000.—	111
85% 300 "	255 "	"	" 10,588.23	" 27,000,000.—	118
80% 300 "	240 "	"	" 11,250.00	" 27,000,000.—	125
75% 300 "	225 "	"	" 12,000.00	" 27,000,000.—	133
70% 300 "	210 "	"	" 12,857.14	" 27,000,000.—	143
65% 300 "	195 "	"	" 13,846.10	" 27,000,000.—	154
60% 300 "	180 "	"	" 15,000.00	" 27,000,000.—	167
55% 300 "	165 "	"	" 16,363.63	" 27,000,000.—	182
50% 300 "	150 "	"	" 18,000.00	" 27,000,000.—	200

The above table shows only the relation between the yield or the complete products and the cost of the eliminating the bad castings from the total metal charged, but even the bad castings have a certain value as the mixed metal, therefore, the effect of such valuation on the estimated costs cannot be disregarded. Another example is given as follows:

Total metal charged: 300 tons, and the estimated costs based on the metal cost, melting cost, moulding cost, finishing cost, etc. are ¥ 28,500,000.00 or ¥ 95,000.00 per ton and the melting loss is 20 tons, scrap produced 2% or 6 tons, bad castings 8% or 24 tons, and these valuations are supposed to be based on the actual results on the above mentioned cost estimating data sheets, and we get the following estimated costs.

ANALYSIS OF ESTIMATED COST

Items	Metal weight	Estimated unit price per ton	Estimated cost	Remark
Metal cost and others	300,000 kg	¥ 95,000.00	¥ 28,500,000.00	
Loss in casting	20,000 kg	0	0	
casting	280,000 kg	¥ 101,785.72	¥ 28,500,000.00	
scraps	6,000 kg	" 15,000.00	" -) 90,000.00	(2%)
Bad Castings	24,000 kg	" 25,000.00	" -) 700,000.00	(8%)
Cost of good castings	250,000 kg	¥ 110,840.00	¥ 27,710,000.00	

As mentioned above, in the computation of costs of the good and computed castings, the valuation of casting scraps and bad castings has to be deducted from the total estimated costs for the total weight of casting and this valuation is expressed as follows:

Casting scraps (say 2%)	6,000 kg @ ¥ 15,000.00	¥ 90,000.00
	(valuation for the mixed metal)	
Bad castings (say 8%)	24,000 kg @ ¥ 25,000.00	¥ 700,000.00
	Total	<u>¥ 790,000.00</u>

and therefore, the estimated costs for casting of the specific weight will be figured by the following expression from the completed cost estimating data sheet.

Estimated cost of the casting per 1,000 kg =

$$\frac{\text{Estimated cost ¥ 28,500,000.00—mixed metal cost ¥ 790,000.00}}{\text{Weight of the prospective good castings 250,000 kg}} \\ = ¥ 110,840.00$$

The estimated cost ¥ 110,840.00 per 1,000 kg multiplied by the prospective weight of the specific good product, the estimated cost of the good casting will be figured by the following equation :-

$$\text{Estimated weight of the specific good casting 2,500kg} \times ¥ 110,84.000 \\ = ¥ 277,100.00$$

Estimated cost of the pattern for the specific products	¥ 42,000.00
Total	<u>¥ 319,100.00</u>

Note 1: The "normal operation" means the operation which can be done in the specific enterprise under the present economic conditions.

Note 2: "Standard operation" means the operation with the minimum cost by utilizing most economically the production capacity.

Note 3: "Maximum operation" means the operation utilized to the fullest extent of the production capacity.

Note 4: On this point prof. Masazo Toki says as follows:

("Principles of industrial accounting" Revised Edition P. 56) as is the general idea prevalent in this country:

When the operation ratio is low, the cost of the goods manufacture per unit is high, and as the operation ratio becomes higher, the cost of the manufacture is gradually lowered; but when the increase of the operation ratio goes to a certain point, then the cost of manufacture becomes high again."

CHAPTER IV Estimate of Pattern Cost

The estimate of the pattern cost, as in the estimate of the cost of the casting, requires the past cost data as the material and the following items must be investigated from the technical standpoint and proper adjustment has to be made on the estimates:

(1) The use of the pattern and the frequency of use will have no small effect on the manufacturing cost of the pattern and also the old patterns can be repaired and used again and these points have to be considered in the making up of the estimates.

(2) The frequency of the use of the patterns will affect the strength of the patterns to be made and the selection of the materials and the designing will have considerable effects on the cost and these has to be calculated on the estimate under the proper technical investigations.

Besides these, when the storage patterns are to be used, it must be put under consideration that the depreciation and the storage cost of same has to be added to the pattern cost of the particular castings. The estimate of the pattern will require the technical investigations, the estimated consumed amounts and the estimated prices of the main and auxiliary materials are set up, estimated man-hours and estimated wage rates are figured in the direct wages, estimated direct working hours and expense rate under the normal operation ratio are set up in the indirect overhead expenses and the products of these figures are computed, which will be aggregated as the estimated cost of the patterns. However, the materials consumed in the manufacturing of the patterns and the man-hours required in their manufactures can be regarded as the function of the castings and it is, therefore, "convenient to refer to the estimates, to find the experiment equation of the consumed amounts of the material and the man-hours required for the manufacture in each and every pattern". (Notes 1 and 2)

The estimated cost of the patterns are figured as above and, for an example, a specimen pattern cost estimate sheet is shown as follows :

PATTERN COST ESTIMATE SHEETS

Name.....				
Core.....	Frequency of usage.....			
Number.....	Date of Estimate.....			
Kind of Cost	Amount	Unit Price	Amount	Remarks
<u>Material Cost</u>				
Japanese Pine	230 (sai)	¥ 420.—	¥ 96,600.—	
American Cedar	80 "	" 630.—	" 50,400.—	
American Fir	10 "	" 700.—	" 7,000.—	
Misc. Lumber			" 3,000.—	
Auxiliary Materials			" 10,000.—	
Total			¥167,000.—	
<u>Direct Labour Cost</u>				
Pattern workers	200 (man-hours)	¥ 80.00	¥16,000.00	
Finishing "	20 "	" 85.00	" 1,700.00	
General "	15 "	" 60.00	" 900.00	
Total			¥18,600.00	

Department A	200 (man-hours)	¥ 40.00	¥ 4,800.00
Department B	200 „	„ 45.00	„ 9,000.00
Total			¥ 13,800.00
Cost of Drawings			„ 20,000.—
One set			
Total			¥ 219,400.—
Estimated cost of the left over patterns			—) „ 15,000.—
Total estimated cost			¥ 204,400.—

Note 1: Thesis of Mr. Taro Yamada:- "On the modern steel making" (Seitetsu Kenkyu) (No. 113 Page 11).

Note 2: Graphs and experiment equations with regards to the actual man-hours required for the pattern making and the number of board feet actually consumed and the weight of the casting. Refer to Pages 11-13 of the thesis above-mentioned.

CHAPTER V. Comparison of the Estimated Cost and the Actual Cost- Management Control Analysis of the Difference.

The objective of making up the estimated cost by an industrial enterprise consists in executing same in the actual operation in the factory and it aims to determine the result of the operation by the comparison analysis between the estimate and the actual cost after the operation, and to judge the management efficiency by analyzing the reasons for such differences and use same for the control and improvement of the management activities.

However, the estimated cost is the so-called previous calculations and is nothing but a foresight of the cost and it generally brings forth a few differences. When the actual costs are compared after the completion of operation, and if there is a difference between these two figure, we cannot take it for granted as though such differences occurs out of the natural causes, because the estimated cost is only a foresight of the actual cost. We have to study the causes of such differences and find out from what sources such differences arise and we have to find out where the responsibility lies. By such study the estimated cost will serve to show the accounting tendency of the actual operation, by grasping before and the economic values consumed in the manufacturing activities. A comparison is made between the estimated cost and the actual cost which is figured by the later calculations, by which we acquire necessary materials for the succeeding cost estimates, which will be used to make the management planning rationalized. However, some authority is of the opinion that the "estimated cost calculation should be invariable during one accounting period and estimated cost should be rectified only at the end of such accounting period by the

actual cost. Therefore, the estimated cost is hypothetically set up under the supposition that the actual cost is always the true cost". (Note 1). He means by that such estimated cost as figured by a rough and inaccurate method. The previous calculation or the estimated cost which is made up by a complex accounting technique, will serve to control by estimate various expenditures which actually arise in the prosecution of production, and such control of various payments will come to control the non-efficiency of processes and operations of each and every department and factory. (Note 2)

Estimated costs can be made up by the cooperation of the design department, planning department, and cost accounting department: but sometimes it is made up by the single estimating department separately set up. When the makers of these departments make up the estimated costs with the thorough knowledge of the actual factory operations and with the full understanding of the estimated cost accounting, such estimated cost will have a considerable control over the actual cost. However, in making up the estimated cost, as in other cases, by the untrained workers or by those who do not understand the correct meaning of such cost, it might be made rough and inaccurate. Otherwise, the estimated cost will function to control over the actual cost.

The most important thing in the estimated cost accounting system is to determine how accurate the estimated cost was and to what economical extent the actual cost is made up. It goes without saying such factors will govern the accuracy of the estimated cost and will be an important basis by which the true actual cost is determined. Therefore, estimated cost and the actual cost figures after the completion of the operations, will be compared one with the other and the cause of any difference must be determined. In this case, "the comparison table of the estimated cost with the actual cost" is employed. (Note 3)

Both the estimated cost and the actual cost demand the true accuracy. However, even though the makers grasp the theoretical meaning of these two accounting systems, it is not infrequent that there is, of course, a certain difference between these two figures, caused by the periodic differences, correlation of operations, separation and the control of the places of cost occurrence and from the personal and material differences of the cost elements. And this is not a problem of theory, but it is a matter of fact. The chief reasons for such differences will be enumerated as follows:

No. 1 If the job number to be written on the material requisition which are used in getting the material out of the store were erroneous, the estimated cost of the product which had an erroneous job number,

will naturally have inaccurate cost compared with the actual cost and it also will have the same result with the cost of the product with the erroneous job number.

No. 2 A delivery man or bookkeeper might lose the material requisition and cost of material is partly unapplied in the production and in such case the actual cost of the product will be lower than the estimated cost to that extent.

No. 3 In allotting the indirect expenses or the expenses which each department or product should burden, the basis for such allotment might be different with the estimated cost and the actual cost and will cause a difference to these two figures.

No. 4 The rate of use of an equipment might be higher or lower than the estimated use, and such fact will cause the indirect expenses unabsorbed or overabsorbed and a discrepancy will arise between the actual cost and the estimated cost.

No. 5 The plan of the planning department and the operation of the production department were good enough that the operation went very smoothly and the consumption of the raw material and wages, etc., did not reach the estimated, in which case naturally there will be an inconsistency between the actual cost and the estimated cost. There is a case of the reverse, too.

No. 6 The wage rate used in the estimated cost might be different from the actual wage rate and will cause differences between the actual cost and the estimated cost.

Of course, such matter will hardly arise, if the average rate of the laborers' wages in the same job is used. But when the actual wages by the laborers are used, the difference will inevitably appear by the employment of either low-paid or high-paid laborers.

No. 7 Time-keepers at the plant might make an erroneous entry of the wages, like the errors on the job number on the material requisitions, which will cause a difference between the actual and estimated cost.

No. 8 The fact whether the laborers worked diligently or not and whether the engineers and foreman were competent or not in the guidance of their subordinates, will also entail the natural result after the completion of any process, and will cause a difference between the actual and estimated cost.

No. 9 The material budget which was used at the time of making up the estimated cost may be changed in price by the financial conditions and material cost will be different, which naturally will cause differences between the actual and estimated cost.

No. 10 The amount of the operation estimated at the time of compiling

the estimated cost did not reach the actual operations, and the burden of fixed cost came too high, and the actual cost will be higher than the estimated cost. Of course, when the operation was completed under the best opportune conditions, the reverse result will happen.

No. 11 The yield of the products was different from those estimated at the time of compilation of the estimated cost and this will naturally cause the difference between the two costs.

No. 12 The spoils are unavoidable in the casting operations and such should be fully taken into consideration in computing the estimated cost of castings. However, wrong estimate of the spoils of the castings will result in the difference between the actual and estimated cost.

The foregoing are chief causes for the occurrence of differences between these two figures in the original materials we shall also find many other causes and reasons. By the through study of the reasons and causes of these differences, the places of responsibility will be shown, and the management will be put on the sound, scientific and rational basis.

A few disadvantages which are generally recognized in the estimated cost accounting system, will be given as follows:

1. If we are to compare the estimate cost with the actual cost after making up the estimated cost, and after the completion of operation, it will require considerably more clerical labor and expenses compared with the figuring of the actual cost only.
2. If we are to adopt the estimated cost accounting system and we are to control the actual operation by same, the factory hand will try to approach the actual cost to the estimated cost, and there may be a danger of their using some tricks to make both ends to meet.
3. The compilers of the estimated cost might make some allowances, anticipating the probable difference which might happen in the actual cost, when it is put into execution.
4. And then, the factory itself might be wasting some units, when they find out that there is some allowance in the estimated cost.

Above facts can be said to be the disadvantages of the estimated costs.

Note 1: Prof. Rintaro Aoki: "Factory Cost Accounting" Page 322.

Note 2: In principle, the estimated cost is a foresight before the actual manufacturing, and it close to the actual cost, and it does not have the meaning of the standard as its objective, but "when the estimated cost is determined scientifically and utilized in the control of manufacturing, such cost can be taken for the standard cost accounting". (Department of Commerce and Industry, Regulations No. 48), and therefore, by such regulations it does not permit the rough and arbitrary compilation of the estimated cost, on the ground that it is only the estimate.

Note 3: See page 366 of my book:- "Cost Accounting of Castings" for the facsimile of a comparison table of the estimated and actual costs.