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The Application of Engineering Methods to Finance

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In defining the profession of engineering as the application of the forces of nature to the uses of man, the Institution of Civil Engineers no doubt had in mind those forces which at the present time we are accustomed to call physical forces. There is no reason to limit the definition of such forces, and it is becoming increasingly recognised that the province of the engineer, and in particular the scope of the engineering method, can with advantage be extended to cover forces of a more metaphysical and psychological character.

Assuming that there is reason to bring the financial system under review, on the ground that it is not operating satisfactorily, and that, being in essence a combination of an enlarged Works Order and Distribution System combined with a metaphysical scheme for the mobilisation of human activities, it is at any rate interesting to consider the matter from an engineering point of view, and stripped of the emotional irrelevances with which it is frequently clothed.

In attacking an engineering problem the first point we settle, with as much exactness as possible, is our objective. No engineer observer of the discussions which take place in political and lay circles on the industrial problems of the present day can fail to be struck with the fact that the problem itself is rarely stated with any clearness. For instance, the paramount difficulty of the industrial system is commonly expressed as that of unemployment. Therefore the suggestion involved is that the industrial system exists to provide employment, and fails. Those who are engaged in the actual conduct of industry, however, are specifically concerned to obtain a given output with a minimum of employment, and in fact, a decreasing amount of employment. Consequently, those who are talking about industry and those who are conducting industry have in their minds objectives which are diametrically opposed and incompatible. On the other hand, the great majority of those engaged in industry, anyhow, in its lower ranks, would claim that what they want from the industrial system is goods. Finally, those whose interest in industry is purely financial, require from industry, simply, money.

We have, therefore, to recognise that there are at least three separate and distinct objectives alleged in the industrial system—(1) Employment, (2) Goods and services, (3) Money.

(1) *Employment as the Objective of the Industrial System*—For a given programme of production and a given standard of development of the industrial arts, output is proportionate to the energy employed in industry. Broadly speaking, the source of this energy is immaterial. So much

solar or mechanical energy, so much less human energy. If employment is accepted as the objective of the industrial system, therefore, and output to be a dependent variable of this objective, (a) either process and mechanical energy employed must be kept rigidly constant, or (b) output must be completely unfettered by any difficulties of sale.

(2) *Goods and Services as the Objective of the Industrial System*—There are here two possible cases: (a) A fixed programme of production with unlimited improvement of process and employment of mechanical energy, resulting in a rapidly and constantly decreasing amount of employment in man-hours. (b) An advancing programme of production with unlimited improvement of process and employment of mechanical energy, resulting eventually in a saturated psychological demand, and automatically becoming similar to (a).

(3) *Money as the Objective of the Industrial System*—It is perhaps only necessary to state this in brief form. Money is not made by making or selling goods; it is made: (1) By digging gold, silver, and copper out of the earth and minting them. This represents perhaps 0.3 of 1 per cent of money in circulation. (2) By the printing of paper money, representing, perhaps, 10 per cent of the money in circulation. (3) The creation of credits by banks, representing, perhaps, 90 per cent of the money in circulation. With the exception of the labour employed in mining and working the metals in the first insignificant division, and the labour employed in the elaborate organisation of the banking system, the creation of money has nothing to do with the industrial system, although it represents an effective demand upon the whole product of the industrial system. The making of money as an objective of the industrial system, therefore, bears a close resemblance to Charles Lamb's method of obtaining roast pork by burning down the piggery.

Since money is not made by the industrial system, it is important to understand whence it originates and whither it eventually returns. The matter has been epitomised in a short sentence by Mr. McKenna, Chairman of the Midland Bank: "Every loan creates a deposit, and the repayment of every loan destroys a deposit." The following explanation may make this clear to those who are not familiar with the technique, and who imagine that the money which banks loan to their customers is limited by the amount they receive from other customers. Imagine a new bank to be started—its so-called capital is immaterial. Ten depositors each deposit £100 in treasury notes with this bank. Its liabilities

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Economic Reality

The purpose in re-publishing in these pages the Paper presented to the World Engineering Congress in Tokyo in 1929 by the late C. H. Douglas is to make readily available a precise and exact statement of the essential factors which underlie modern industrial economies. The non-recognition or denial of these factors is responsible for the growing economic chaos in a world which in terms of physical reality is literally growing richer *every day*.

Almost certainly because of the hypnotic effect of modern education—indoctrination is a more exact term—large numbers of people profess themselves unable to understand the nature of the relationship between an industrial system in which the ratio of machine-power to man-power is constantly and rapidly increasing—a physical fact which may be verified by the most cursory observation of everyday constructive activity—and the economic system. World productive capacity measured say in horse-power has probably multiplied several times over in the forty years since Douglas presented his paper. The correct economic expression of this reality is to say that the *physical* purchasing-power of human effort has been increased in the ratio of the increase of machine-power to man-power, just as the purchase gained by the use of a lever increases in the ratio of the lengths about the fulcrum.

Monetary purchasing-power, particularly that available to the individual as opposed to the institution, has not reflected this increased physical purchasing-power. This is quite unquestionably the case; but it is of the greatest importance to note that this fact does not mean that all that can be produced *should* be produced, and consumed. A product of modern industrial efficiency quite probably of more importance than its physical output is its output of potential leisure, which is the economically important meaning of the increased real purchasing-power of human effort. Modern industry is far more than capable of providing a high physical standard of living for every man, woman and child within the industrialised area with a fraction of the man-hours of effort actually employed. The difference is reflected in mis-directed effort, revealed in the preposterous proliferation of bank, insurance, government and other office buildings; and in the struggle for export surpluses—a direct cause of conflict between nations.

This situation naturally has profound moral and philosophical implications, which have been explored in more extended works by Douglas and others. These implications cannot be fruitfully explored, however, unless the economic substratum is correctly understood. Full employment, for example, is a moral precept, not an economic necessity; to treat full employment as an economic axiom is like insisting that a motor-car should be driven twenty-four hours a day, and faster and faster—which could only lead to disaster.

And the economic situation is leading to disaster. Britain's industrial *capacity*, not even *despite*, but *because of*, two world wars, is greater than it ever was. This is so because the finance required to conduct the wars was forthcoming and resulted in a rapid industrial expansion subsequently available for conversion to peace-time uses. This expansion, it should be noted, was achieved with a diminishing work-force, the 'unemployed' being disposed of in the trenches and bureaucracy, both governmental and industrial.

Governments, and particularly the British Government, continue "to endeavour to re-allocate the initially deficient amount of purchasing-power by taxation". It is not so many years ago that doctors treated patients suffering from anaemia by blood-letting. 'Controlled' inflation (dilution of purchasing-power) is the economic equivalent of anaemia; and confiscatory taxation is the economic equivalent of venesection.

The British are still alive, but they are threatened with a living death; economic therapy, based on what one might call a correct knowledge of the physiology of the industrial system, is urgently necessary. The remedy is known; but those in charge of the patient have a vested interest in his illness (Full Employment means Big Government, and Power, not Prosperity, is the objective of politicians).

But the attempt to maintain Big Government, which already is barely disguised Cabinet dictatorship, through purely financial means is already doomed. Physical compulsion, very likely through the Communist Party, grows closer every day and is signalled by the approach of an economic crisis. To imagine that the Party and ballot-box systems will avert disaster is delusion. The present British Government has identified itself with the policies which are leading to catastrophe; and the immediate necessity is to call it to account.

The Colonial Disaster

One of the fundamental bases of Social Credit philosophy is the recognition that a supreme end for Man is differentiation; but for Man, differentiation is overwhelmingly a cultural rather than a physical phenomenon*. It seems quite possible that the origin of so-called colonialism lies in a subconscious urge towards this differentiation—an expansion into and adaptation towards a new environment. But where emigrant peoples carried with them sophisticated technologies into lands inhabited by peoples less technically accomplished the former subdued the latter who, however, very often possessed highly complex native cultures.

Colonialism often enough got away to a bad start; but in the long run it became benevolent; at its best, it

*See *The Aims of Education* by B.W. Monahan (K.R.P. Publications Ltd., 245 Cann Hall Road, London E11 3NL).

provides the technological substratum for advancing civilisation, while preserving the local cultural differentiations. But with the fruition of Communist strategy has come malevolent neo-colonialism where, by the imposition of non-viable 'independence', the physical resources of the colonial areas are to be internationalised in the service of World Government, while the peoples perish, as in Nigeria.

This situation is crucial for the survival of Western Civilisation. The Republic of South Africa, Rhodesia, and the Portuguese Overseas Territories are the last bastions for its defence. This is thoroughly understood by Dr. Franco Nogueira, the Portuguese Foreign Minister whose book, *The Third World*†, is an essay of profound importance. Alone among statesmen he has the courage to state the colonial problem as it truly exists: "It is in this context that one must understand the systematic campaign which presents the overseas provinces as if they were the most backward territories in Africa south of the Sahara; and the propaganda is so powerful and so great is the advantage of believing in it, that even the most responsible people refuse to look squarely at a reality that would belie an entire policy which, for survival, can only rest on myth, on deliberate fiction, and on the conscious distortion of the truth."

This truth is now so obvious to inspection that those who urge war on Rhodesia—as a stepping-stone to war on South Africa (plans for this have been published as a Carnegie Foundation study)—must be regarded as guilty men; and on this charge, as on others, they should be brought to account. The evidence of conspiracy to prevent the almost unimaginable flowering of Christian civilisation is now so palpable that only complicity or wilful and selfish blindness can account for the continuing participation of our leading politicians in the race to disaster.

The Application of Engineering Methods to Finance

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to the public are now £1,000. These ten depositors have business with each other and find it more convenient in many cases to write notes (cheques) to the banker, instructing him to adjust their several accounts in accordance with these business transactions, rather than to draw out cash and pay it over personally. After a little while, the banker notes that only about 10 per cent of his business is done in cash (in England it is only 0.7 of 1 per cent), the rest being merely book-keeping. At this point depositor No. 10, who is a manufacturer, receives a large order for his product. Before he can deliver, he realises that he will have to pay out, in wages, salaries, and other expenses, considerably more "money" than he has at command. In this difficulty he consults his banker, who, having in mind the situation just outlined, agrees to allow him to draw from his account not merely his own £100, but an "overdraft" of £100, making £200 in all, in consideration of repayment in, say, three months, of £102. This overdraft of £100 is a credit to the account of depositor No. 10, who can now draw £200.

The banker's liabilities to the public are now £1,100; none of the original depositors have had their credits of £100 each reduced by the transaction, nor were they consulted in regard to it; and it is absolutely correct to say that

£100 of new money has been created by a stroke of the banker's pen.

Depositor No. 10 having, happily, obtained his overdraft, pays it out to his employees in wages and salaries. These wages and salaries, together with the banker's interest, all go into costs. All costs go into the price the public pays for its goods, and consequently, when depositor No. 10 repays his banker with £102 obtained from the public in exchange for his goods, and the banker, after placing £2, created by himself, to his profit and loss account, sets the £100 received against the phantom credit previously created, and cancels both of them; there are £100 worth more goods in the world which are immobilised—of which no one, not even the banker, except potentially, has the money equivalent. A short mathematical proof of this process is given in an Appendix on page 4.

There is, I think, little question that the true objective of the industrial system is the production and distribution of goods and services. Assuming this to be so, an examination of the existing arrangements with a view to discovering the causes of their partial failure, is involved.

The application of engineering methods to the production of goods and services has enabled one human unit to produce considerably more goods and services than are necessary for his own use. The application of mechanical power and improved process and organisation can tend only to increase the output per man-hour. It should be obvious, therefore, that a system by which purchasing power is distributed mainly through the agency of wages conflicts sharply with the physical reality involved in the fact that a decreasing number of persons tend to be involved in the production of the necessary amount of goods and services.

Before leaving this portion of the subject, however, it may be desirable to indicate the effect of raising or lowering wages considered as a component in the cost of unit production.

The money distributed in the production of goods consists in wages and salaries. (Dividends are distributed subsequently to the sale of goods.) Since labour costs are not the only costs of production,

$$\text{Labour costs are } < \text{ prices,} \\ \frac{\text{costs}}{\text{prices}} \text{ is } < 1.$$

If wages, that is to say, labour costs, are reduced by an amount *x*, the ratio of purchasing power to prices is lessened,

$$\frac{\text{costs}-x}{\text{prices}-x} \text{ is } < \frac{\text{costs}}{\text{prices}}$$

We can deduce, therefore, that lessening the item of labour costs in the total factory cost of an article reduces the capacity of the wage-earning portion of the population to buy the total volume of goods produced, although for a total amount of wages distributed the amount of goods produced is obviously greater.

Since it is generally recognised that the average dividend of an industrial undertaking distributed to the shareholders is very small compared with the amount distributed in wages and salaries, probably not averaging more than 3 per cent, we may be led to suspect that the reduction of the ratio of

†Johnson: London.

direct labour costs to total costs involves a principle of fundamental importance. This is so. If we take a cross-section of the flow of purchasing power delivered to the buying public in the form of wages, salaries, and dividends, and at the same moment take a cross-section of the flow of prices generated in the industrial system, we shall find that the latter cross-section is always greater than the former. This may be put as follows. All industrial payments may be divided into two groups.

Group A.—All payments made to individuals (wages, salaries, and dividends).

Group B.—All payments made to other organisations (raw materials, repayment of bank loans, and other non-personal costs).

Now the rate of flow of purchasing power to individuals is represented by *A*, but since all payments go into prices, the rate of flow of prices cannot be less than *A* plus *B*. Since *A* will not purchase *A* plus *B*, a proportion of the product at least equivalent to *B* must be distributed by a form of purchasing power which is not comprised in the descriptions grouped under *A*.

The explanation of this apparent anomaly is complex, but is in the main due to the fact that the buyer of goods is at one and the same time paying for the goods and repaying to the banking system, via intermediate producers, the money which the industrial system borrowed from it but which the banking system created by means of a book-keeping transaction.

The repayment of bank loans in the industrial system may be considered as included in the balance of the payments made from one business organisation to another, that is to say, in *Group B*, as explained above.

On the assumption that the delivery of goods and services is the objective of the industrial system, it is obvious that the rate of flow of purchasing power should be equal to the rate of generation of prices. The existing financial arrangements make a crude effort to approximate this condition by issuing purchasing power to manufacturing organisations in the form of loans, which in turn the manufacturing organisations distribute in wages and salaries against future production. In other words, the existing financial system increasingly mortgages the future in order to sell the goods existing at present, the most recent and most obvious form of this practice being the instalment system of purchase. Since the financial system is in essence merely a book-keeping system, having for its proper objective something not very dissimilar to the "progress" department of a large factory, the defect in it which is disclosed by the preceding cursory examination is obviously capable of adjustment.

Bearing in mind the premise that the consumer should collectively have the financial means to exercise the full call on both the sum of actual production and the balance of potential production represented by unused plant and available labour and material, it is easy to see that under existing conditions prices ought to vary inversely as the rate of production. The difficulty involved in this is that producers would lose money, and to avoid this and to stimulate production some modification is necessary.

Reverting to the physical realities of the productive system, it can easily be seen that the true cost of a given programme of production is the consumption of all production over an equivalent period of time; that is to say, if *P*

equals production and *C* equals consumption, and *M* equals money distributed for a given programme of production, the true cost of this programme of production is not *M*, but

$$M \times \frac{\int_{T_1}^{T_2} \frac{dC}{dt} dt}{\int_{T_1}^{T_2} \frac{dP}{dt} dt} = M \times \frac{\text{mean consumption rate for selected period}}{\text{mean production rate for selected period}}$$

In other words, the true cost of a programme of production is in general not the money cost, but considerably less than the money cost, and a given programme of production can be distributed to the buying public only if sold at its true cost.

Many methods will suggest themselves for putting into operation the foregoing principles. Articles might be sold at cost *plus* profit as at present, and a rebate to the purchaser be made through the banking system, representing the difference between the apparent cost and the true cost. The source from which this rebate would be made would be exactly the same source from which at present the banking system creates money out of nothing, that is to say a book entry based on the security of a country considered as a producing mechanism. No inflation is involved in such a process. Inflation consists in an expansion of the figures of money available accompanied by a corresponding rise in prices. The objective in this case being a fall of prices to bring them collectively within the buying range of the general public, any rise of prices would merely result in the use of a smaller amount of credit.

It will be realised from the foregoing analysis that a considerable increase in the total purchasing power is necessary to obtain a sufficient effective demand upon the possibilities of the modern industrial system. Having obtained this initial increase in effective demand, the problem of the distribution of the increase assumes manageable proportions. Merely to endeavour to reallocate the initially deficient amount of purchasing power by taxation, as at present, can only result in a serious curtailment of production.

APPENDIX

Let Deposits	=	<i>D</i>
Let Loans	=	<i>L</i>
Let Cash in Hand	=	<i>C</i>
Let Capital	=	<i>K</i>

Then:

Assets	=	<i>L</i> + <i>C</i>
Liabilities	=	<i>D</i> + <i>K</i>

So that:

$$L + C = D + K$$

Differentiating with respect to time we have:

$$\frac{dL}{dt} + \frac{dC}{dt} = \frac{dD}{dt}, \quad K \text{ being fixed } \frac{dK}{dt} = 0$$

Assuming cash to be kept fixed $\frac{dC}{dt} = 0$

$$\text{Therefore } \frac{dL}{dt} = \frac{dD}{dt}$$