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Geneva, May 4th, 1927.

DOCUMENTATION

SCIENTIFIC MANAGEMENT IN EUROPE

GENEVA, 1926

International Economic Conference, 1927

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SCIENTIFIC MANAGEMENT IN EUROPE

I. DEFINITION AND AIMS

Scientific management is the science which studies the relations between the different factors in production, and especially those between the human and the mechanical factors. Its object is to obtain, by the rational utilisation of these various factors, the *optimum* output. At the present day it constitutes a separate branch of ordered study with a clearly defined scope.

Just as geography, in studying the relations between the human being and his physical surroundings, draws on various sciences, such as climatology, geology, and botany, so the science of management uses the results obtained from industrial technique, psychology, physiology, and economics. Like medicine, it does not merely enquire into the causes of the phenomena it studies; it is also a practical science. Its field of experience is extremely varied, and is continually changing with economic and social conditions, the state of technical progress, the development of occupations, and national or individual aptitudes. It deals with individual cases. On the basis of numerous daily observations, it draws up the rules and methods which it advocates. By means of a fuller knowledge of the factors of production, its aim is gradually to replace industrial empiricism by increasingly exact rules of conduct.

Scientific management owes its existence as a separate science to the work of Frederick W. Taylor, whose spirit of scientific investigation and tenacity of purpose enabled him not only to perfect equipment and improve processes, but also to devise new methods of directing and economising human effort. Since his day scientific management has considerably evolved, and is now no longer to be confused with what was originally known as "Taylorism". From the time of Taylor to that of Hoover great progress has been made in America in the study both of technical processes for improving output and of the means of obtaining a rational use of labour power. In Europe, especially since the war, similar efforts have been successfully made. Scientific management long ago overflowed the limits within which it was originally applied by Taylor, and its activities and doctrines now cover all departments of the factory, all forms of manufacture,

all forms of economic activity, banking, commerce, agriculture, and the administration of public services ¹.

But to-day, as in Taylor's time, the claim of scientific management to be considered as a separate science can only be understood if it is constantly borne in mind that its object is not the improvement of machinery, nor scientific laboratory work, nor psycho-physiological research, but rather the practical utilisation of the results of other sciences with a view to systematising and improving production.

It appears particularly necessary to give a clear definition of scientific management, seeing that its real nature and scope are still frequently misunderstood. It is too easily confounded with industrial efficiency, the elimination of waste, or other similar attempts to improve production, which are only particular aspects of scientific management properly understood. On the other hand, a tendency is sometimes shown to regard it as a means of solving all economic problems, without distinction. This is obviously impossible. But it is natural, in view of the growing interdependence of the factors of production and the increasing complexity of industrial problems, that a science which studies those problems in all their various aspects should more and more direct the activities of those who aim at economic reorganisation. Already there is in certain countries a tendency to call scientific management by the more appropriate name of rational organisation of production, and the various branches of the movement known in Germany as "industrial rationalisation" — standardisation, industrial concentration, mass production, and distribution — are already to a large extent borrowing the methods and profiting by the results of scientific management as defined above.

Understood in this sense, scientific management, in its practical and theoretical applications, may be sub-divided as follows:

TECHNIQUE

Production planning; choice of site and construction of buildings; arrangement of workshops, choice and lay out of equipment and raw materials, organisation and maintenance of store-rooms; transport within the factory; supply of materials and tools.

Research and planning offices; routing, use of card indexes, classification, use of statistics and charts.

Accountancy, costing; purchasing and sales departments; advertising.

¹ Mention may be made here of Henri Fayol's *doctrine administrative*, which has had considerable influence in France.

PSYCHO-PHYSIOLOGY

Psycho-Physiology of the Individual

- Time study (by stop-watch); motion study.
- Vocational selection; vocational education; study of the functions of management.
- Fatigue study: attention, monotony, absentmindedness.
- Study of optimum material, working conditions: improvement of equipment, lighting, heating, ventilation, general workshop hygiene, as affecting the human factor.
- Occupational diseases; safety.
- Welfare (housing, transport, co-operative restaurants).

Collective Psychology

- Study of the different systems of wages payment, profit sharing and co-partnership.
- Industrial relations (study of the various theories and their practical application).
- Personnel department, workers' representation.
- Study of methods of collaboration inside and outside the factory, with a view to improving output.

GENERAL ORGANISATION OF PRODUCTION

- Study of methods for stabilising production and employment.
- Standardisation (normalisation, unification, simplification).
- Elimination of waste.
- Horizontal and vertical combination: national and international industrial agreements, cartels, trusts, syndicates; action by Governments, by public services, by employers' and workers' organisations.
- Specialisation; mass production and distribution; study of the general problems of the distribution of raw materials, the organisation of markets, transport power, and labour supply.

Of course, each of the problems enumerated above may be considered from a point of view other than that of scientific management, and lies within the scope of scientific management only in so far as some question of analysing the various factors in production and harmonising their mutual relations arises.

II. THE MOVEMENT IN FAVOUR OF SCIENTIFIC MANAGEMENT IN EUROPE¹

It is not surprising that scientific management is usually regarded as a characteristic feature of contemporary American civilisation. Its development was facilitated by the rapid industrial growth of the United States and the relative scarcity of labour. The latter factor, involving improved machinery and high wages, compelled manufacturers to seek every possible means of bringing down the costs of production.

Since the war scientific management has also made rapid progress in Europe. There is an increasing tendency to apply its methods and doctrines to general economic problems. The number of technical instances of its application increases daily. The results of psycho-physiological research, which is specially advanced in Germany and Great Britain, are becoming more and more appreciated. The European movement is not a mere copy but a careful adaptation of the methods tested in the United States. It has made more than one original contribution, especially in the fields of industrial psychology and the general organisation of production. In Russia, Germany, and Czechoslovakia scientific management has become the guiding principle of the national economic system.

Public opinion in the principal European countries is becoming more and more inclined to accept the new methods. The employers, who some years ago tended to consider them from the narrow standpoint of their own undertaking, now recognise the importance of their effects on the economic conditions of the whole country; the approval of the technicians has universally been won; while the workers, who at first were taken by surprise, and frequently hostile, now recognise the advantages they may derive from a properly conducted application of scientific management methods.

In *Austria* the movement has been given a fresh impetus by the creation of a central committee ("Zentralverband für wirtschaftliches Schaffen"), on the initiative of the technicians. Hitherto the isolated and unco-ordinated action taken had related mainly to standardisation and the elimination of waste, and in another connection to the scientific distribution of labour. The interest taken among workers has been sufficient to give rise to the creation of a special section to study these questions in the *Arbeiterkammer*, a Vienna organisation of wage earners and salaried employees.

For some months past there has been in *Belgium* a national committee for the study of scientific management. Specialised institutions have already been

¹ Cf. Report by the INTERNATIONAL LABOUR OFFICE on *Scientific Management in Europe* (in preparation).

CORRIGENDA

I. — On page 8 substitute for the paragraph regarding Austria the following:

In Austria the movement is maintained by the efforts of the *Hauptverband der Industrie* on the one hand and the *Kammer für Arbeiter und Angestellte* on the other.

The central employers' organisation has succeeded in uniting under the direction of its technical services three committees which had previously worked independently, namely, the *Gesellschaft für Wärme-
wirtschaft*, the *Oesterreichischer Normenausschuss* and the *Ausschuss für
wirtschaftliche Betriebsführung*. As regards the workers, the *Arbeiterkammer*
has instituted a special service for the "science of labour" and has also
just established an *Arbeitsgemeinschaft für arbeitswissenschaftliche Betriebs-
rationalisierung*, for the purpose of studying the problems of scientific
management from the point of view of the "human factor".

Side by side with these bodies, which are maintained by the great orga-
nisations of masters and workers, Austria also has the *Taylorgesellschaft*,
the *Vereinigung österreichischer Betriebsorganisatoren* and the *Oesterreichische
Gesellschaft für Technik im Haushalt*.

The efforts which have been made for some months past to centralise
these activities in a single organisation have not so far met with success.

II. — Substitute the following for the footnote on page 8:

Cf. INTERNATIONAL LABOUR OFFICE: *L'Organisation scientifique du
Travail*, par Paul DEVINAT. Etudes et Documents, Série B, N° 17.
Geneva, 1927.

in existence for some time, in particular those connected with higher education, such as the Solvay Institute, the Charleroi Labour University, and the Universities of Ghent and Brussels. Practical applications of scientific management methods are comparatively numerous, especially in the engineering industry. There are associations of consulting engineers who place their services at the disposal of the heads of undertakings.

In *Czechoslovakia* there has been since the war an intensive campaign of research, instruction, and propaganda for the introduction and spread of rational organisation, on which the economic prosperity of the new State was considered by its leaders to depend. The Masaryk Academy of Labour, the centre of all this work, has already achieved appreciable results, which a national committee (upon which employers, workers, and technical experts are represented) has undertaken to make generally known. The changes advocated by the supporters of rational organisation have been carried out, particularly in the glass and paper industries, and also in agriculture, commerce, and public administration. The fullest and most successful application of these principles to be found in Europe to-day is perhaps that to be met with in Czechoslovakia in an important boot and shoe factory.

In *Finland* the rationalisation methods adopted up to the present have principally been directed to the administration of the railways and to agriculture.

In *France* the practical application of scientific organisation has spread more rapidly than research and education. Certain institutions such as the French Organisation Conference, the Society for the Encouragement of National Industry, the Michelin Committee, and associations of engineers aim at adapting American methods to the industrial conditions of the country. Further, Mr. Henri Mayol's "administrative doctrine" has found many advocates in France. A national committee to centralise these activities has just been set up. In view of the interest taken by the heads of undertakings and technicians in rational organisation, the movement may be expected to develop rapidly, in spite of the somewhat hostile attitude still adopted by labour.

It may be said that *Germany* holds the leading place in the movement. The "Reichskuratorium für Wirtschaftlichkeit", an office largely subsidised by the Government, but entirely independent in its work, centralises and directs the activities of a number of institutions for scientific organisation: the research laboratories attached to the technical and commercial colleges and the universities, occupational organisations, and associations of consulting engineers and technicians. Through the medium of research committees it also studies independently all questions relating to scientific organisation. By means of intensive propaganda, lectures, special courses, pamphlets, and the daily press, public opinion is familiarised with the new spirit, methods and practical measures, and there are very few

large undertakings which do not take them into account¹. Very few politicians, whatever their party, have not included the rationalisation of production in their programme. The workers' organisations themselves are taking more and more interest in these problems, and tend to admit that the rational organisation of production may secure important advantages to the working classes.

In *Great Britain*, perhaps more than in any other country, both the theory and practice of scientific organisation relate to the human factor, and often bear the stamp of "social welfare". The two principal centres of activity are the National Institute of Industrial Psychology and the Industrial Fatigue Research Board. In spite of the results obtained, labour opinion is more prejudiced against "Taylorism" than elsewhere, and employers have shown more indifference than on the Continent to technical methods of organisation. Nevertheless, the economic difficulties with which England is now faced are rapidly attracting public attention to American industrial processes, which suggests that in future there will be a wider adoption of scientific methods of organisation of production.

In *Italy* isolated research and remarkable practical applications of scientific organisation are no novelty. All these activities were recently grouped and given a considerable impetus by the creation of a central body, the "Ente Nazionale Italiano per l'Organizzazione Scientifica del Lavoro" (ENIOS). The unhesitating collaboration of occupational organisations, especially employers' associations, and the support of the Government, which intends to set an example by a systematic application in all the State industrial services, are enabling ENIOS to undertake the rapid introduction of the new methods in Italian industry. Instruction in them is spreading rapidly.

In the *Netherlands* the work of research and propaganda is directed by a central "Efficiency Institute". The most characteristic feature of the movement is the systematic introduction in municipal and State administration of methods of rational organisation, with the assistance of consulting engineers.

The development of rational methods of organisation in *Poland* is naturally of recent date. The most active of the special institutions, the Warsaw Institute for Scientific Management, founded in 1925, carries on research work. The practical side of the work is directed by associations of organising engineers. An enquiry into waste in industry has attracted public attention to these problems, and the Government established a special industrial organisation department in the Ministry of Labour some time ago.

From the outset *Soviet Russia* has regarded the introduction of the new methods as the official basis of its changed economic system. A special Ministry

¹ The preparation of work, routing, the scientific determination of the cost of production, and psycho-technical methods of vocational selection and training are very widely adopted in the engineering, electrical and textile industries, etc., and in State undertakings such as the railways and postal services.

was set up to direct the movement, known as the SOVNOT, to which are affiliated nearly a hundred institutions for research, education, and practical application, scattered throughout the country. Scientific organisation is being introduced throughout the administrative machinery of the State, in the railways, munitions industries, agriculture, and banking, not to mention industrial undertakings. It is not without interest to note that Russia has taken active steps to secure the co-operation of German specialists, and that partial agreements in regard to standardisation have been concluded between the two countries.

In *Spain* the movement for scientific organisation is headed by technicians, in particular the Federation of Associations of Civil Engineers on the one hand, and by vocational guidance experts on the other. A national committee is in process of formation.

In *Sweden* a special Committee for Scientific Organisation has been established by the Federation of Swedish Industries. This committee, assisted by specialist engineers, places its services at the disposal of any member of the Federation who applies for its assistance. Hitherto the methods of standardisation have obtained the most favourable reception.

In *Switzerland* the movement in favour of scientific organisation is supported by associations of manufacturers and traders, the most active of which is the SFUSA ("Swiss Friends of the U.S.A.").

This short summary brings out the variety of the steps taken in the different European countries. The part played by technicians, scientists, employers, workers, economists, and politicians increases daily. The Governments are beginning to encourage them. In future the movement will be supported not only by those who expect it to produce material advantages, whether now or later, but also by those who understand its social importance and economic advantages.

Already, from the international standpoint, it has led to an important attempt at concentration. Two international congresses, held, one at Prague in 1924, and the other at Brussels in 1925, resulted in the creation of an International Committee for Scientific Organisation¹ which at present covers the majority of the central institutions of the industrial States. Its main purpose is to hold

¹ The International Committee for Scientific Organisation, set up at Prague in 1924, and enlarged at Brussels in 1925, at present includes representatives of the national organisations of the following countries: Belgium, Bulgaria, Czechoslovakia, France, Italy, Poland, Roumania, the Serb-Croat-Slovene Kingdom, and the United States. Moreover, it is in constant touch with the Austrian, British, Danish, Dutch, German, Japanese, Russian, Spanish, Swedish, and Swiss organisations. The President is Mr. F. Mauro, the president of ENIOS, and the secretary is Mr. Verunac, of the Masaryk Academy of Labour.

periodical international congresses, which are to serve as a means for useful discussion and a fruitful exchange of opinions, and in a general way to facilitate the international communication and circulation of all information relating to scientific management.

III. INTERNATIONAL ASPECTS OF SCIENTIFIC MANAGEMENT

It has been shown how scientific management, imported from the United States, has taken root and developed in the various industrial States of Europe. This brief survey gives an impression of variety rather than of unity. It is natural that the degree of development of the movement must differ with the country, since by its very essence scientific management depends not only on technical conditions in the land to which it is transplanted, the degree of industrialisation and the level of mechanical progress, but also on the psychological predispositions of the human factor and especially on a certain ability to profit by the results of economic experience.

In spite, however, of the variety which characterises the practical applications, it should not be forgotten that in all cases scientific management involves an ever higher degree of exactitude in working methods¹ and that, allowing for the necessary adaptation to circumstances and national temperament, it tends to become a powerful means of creating uniformity in the conditions of industrial production.

A need of co-ordinating the efforts of the different countries has been felt, and this is the object of the International Committee for Scientific Organisation. It is not surprising that the initiative in setting it up was taken by private organisations, for this is a matter of great importance for technicians and manufacturers who wish to obtain exact information on the experience of their competitors in other countries. They need accurate and honest information on which to base

¹ Nowhere have these been better defined than by Mr. Henri LE CHATELIER in his preface to the work of Mr. NUSSBAUMER: *L'Organisation scientifique des usines*. He lays stress on the fact that the scientific method underlying Taylor's researches differs only in one point from the methods employed by the scientist in his laboratory: "Scientific management in industrial production must pay, that is to say, must yield more than it costs."

In his opinion, scientific method as applied to industry consists essentially in the observation of the following seven rules: belief in determinism; application of the principle of sub-division; selection of the object to be worked on; action always to be preceded by reflection; material preparation of the means of working; respect during the work itself of two principles: always to comply with the instructions on the instruction card, and in making experiments to refrain as far as possible from altering more than one of the factors studied; finally, to check the results obtained.

Mr. Le Chatelier concludes: "All these rules of scientific method are common-sense principles. It is useful, however, to codify them and express them with precision. . . . An effort of will and attention is needed to recognise the necessity for the principles of scientific method and for complying with them effectively. Taylor has rendered a great service by showing by means of indisputable examples the considerable advantage to which the respect for these rules may lead. But it is not sufficient to believe in their utility; above all, it is necessary to know how to apply them in each individual case."

their judgments. In industry, every false step has to be paid for. Hitherto, the lack of serious information has paralysed many manufacturers in their desire to apply the methods of scientific organisation. Similarly, the failure to examine critically the advisability of using them, or a too servile imitation of methods which have proved successful abroad, may lead to failure. The adaptation of these methods demands very advanced technical and psychological knowledge, and this cannot be acquired without free and unreserved interchange between countries of information which can be used to perfect methods and theories and secure the spreading of knowledge in regard to the results of practical experiments. To satisfy these needs a body for the centralisation and critical examination of information for the use of manufacturers and technicians in all countries has recently been created ¹.

It appears that the time has also come for the Governments to pay more attention to the international aspects of scientific management. In the first place there are the social aspects. If scientific management tends to economise and improve the distribution of human effort, if, by thus securing the putting of the right man in the right place, it causes the reduction of fatigue, the improvement of health, and an increased feeling of professional dignity, and if, by establishing new systems of wage payment, it tends to satisfy the claims of justice, its universal social value needs no demonstration. Certain Governments have realised the full importance of scientific organisation and are much interested in its possible effects on the welfare and outlook of the workers. In Russia, Germany, and Czechoslovakia, for instance, the national research institutes are generously supported. Other Governments propose to set up special services in their departments of labour or industry. From a wider standpoint, the International Labour Office has been instructed to study these problems of scientific organisation which particularly affect the human factor. This in itself means that the Governments are associated in its research work.

The economic aspects are no less important from the point of view of the Governments than the social. It is obviously impossible to consider internationally all the problems with which scientific management has to deal. They are not all equally urgent, but even a partial solution of some of them may help to strengthen European equilibrium and cannot, therefore, be a matter of indifference to the Governments.

To take first the most practical aspect: the State industrial services, like public administrative institutions, are as interested as private undertakings in noting and profiting by the experience of other countries. The Governments might in this respect support, with advantage, the private efforts now being made to start an international institution for the exchange of information.

¹ After negotiations lasting for about twelve months, the International Labour Office, the "XXth Century Fund" of Boston, Mass., and the International Committee for Scientific Organisation have decided to establish jointly, at Geneva, an International Management Institution. The constituent meeting of this new body was held on 31 January 1927.

There is a general recognition that scientific management is one of the most important factors in international competition, though the time may not yet have arrived for it to stabilise and regulate production on an international basis, and though it may not, as some observers have suggested, play in the economic situation of the future a rôle analogous to that assumed by free trade in the past. Any country which is markedly in advance in the matter of scientific organisation is undoubtedly in a position of advantage as compared with its industrial rivals. This fact may be proved easily not only by reference to the United States, but also, among European countries, by the example of Germany. Countries such as Italy and Russia regard scientific management as a means of compensating for certain natural disadvantages or of restoring their temporarily lost prosperity. This argument, based on competition, has proved in certain countries an excellent means of propaganda for the promoters of scientific organisation.

It would be dangerous if the conception of scientific organisation were inspired by a narrow economic nationalism, and especially if the efforts to improve output made in each country were concealed in order that it might be alone in profiting by them. The pooling of results on an international basis is as necessary for European economic revival as the stabilisation of the exchanges and the gradual abolition of customs barriers. Scientific management should not be regarded as a weapon of economic competition, but as the field *par excellence* for international co-operation. This is perhaps more a matter for education and propaganda than direct intervention on the part of the Governments.

It is easier to define their collaboration in questions of standardisation. Whether this is taken to mean the simplification or standardisation of nomenclature, abbreviations, symbols, systems of weights and measures, customs and methods of purchase, sale and delivery, the limitation of the number of different types of manufactured goods, or the reduction of unmounted or spare parts to a single type, it is patent that under improved economic conditions, in which international exchange is to be encouraged, it is indispensable to settle these questions on international principles. For standardisation carried out exclusively in the national field may become a dangerous weapon of economic competition. It may constitute a concealed form of protectionism, and may prove as serious an obstacle to international exchange, if not even a greater one, than high customs tariffs.

The realisation of this danger has led to the appointment of an International Standardisation Commission. The Governments might do much to encourage its work by adopting a policy of active co-operation. In point of fact their active participation in an international standardisation policy is made difficult by the differences in the attitude adopted in their respective countries. Some, such as the United States Government, take a direct part in the determination of national standards. Others, and this is the usual case in Europe, prefer to leave this responsibility to private institutions. But whatever their particular attitude, it is desirable that they should be convinced of the serious disadvantages of the

establishment of different standards in the different countries, and that they should assist in drawing up international standards to the common advantage.

There are other economic aspects of scientific management which will no doubt deserve the attention of the Governments in the international field in the near future. Scientific organisation, in so far as it affects the general organisation of production, claims an important place in the solution of the great problems of the distribution of raw materials and labour, of markets and industrial agreements. Such a solution, while universally desired, does not yet appear sufficiently near at hand to justify any attempt to determine exactly how far the Governments are likely to be guided in their actions by the principles and doctrines of scientific management.

In conclusion it may be said that the need for Government intervention in scientific management questions, both nationally and internationally, in regard both to research and to practical application, and whether by way of encouraging private efforts or in the form of organised action for the benefit of the community, becomes daily more apparent.

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