



Management Science

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

Communications to the Editor

To cite this article:

(1955) Communications to the Editor. Management Science 1(3-4):272-281. <https://doi.org/10.1287/mnsc.1.3-4.272>

Full terms and conditions of use: <https://pubsonline.informs.org/Publications/Librarians-Portal/PubsOnLine-Terms-and-Conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

© 1955 INFORMS

Please scroll down for article—it is on subsequent pages



With 12,500 members from nearly 90 countries, INFORMS is the largest international association of operations research (O.R.) and analytics professionals and students. INFORMS provides unique networking and learning opportunities for individual professionals, and organizations of all types and sizes, to better understand and use O.R. and analytics tools and methods to transform strategic visions and achieve better outcomes. For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

COMMUNICATIONS TO THE EDITOR

Dear Sir: I wish to raise here certain questions about the objectives of the Institute of Management Sciences (TIMS).

TIMS has attained maturity status within a surprisingly short period of time. Evidence for this may be found in the large increase in membership, the success of the first annual meeting and the initial issue of its own professional journal. Those who conceived TIMS and started it on its way should have every reason to be proud of their accomplishments.

However, it would be premature to assume that these achievements will assure the future progress of TIMS. As a matter of fact, they have contributed in emphasizing the importance of a number of problems which have existed since the very beginnings of TIMS. It may be said that TIMS has prospered in spite of these problems. It was possible to put them into storage, so to speak, for a while. But their discussion and eventual solution is urgent, it cannot and should not be postponed any longer.

The present letter will be primarily concerned with these problems. It will examine the aims of TIMS as well as its policies and prospects. It will attempt to determine those issues which may be considered to be within the legitimate scope of both Management Sciences and TIMS. It will examine claims of other professional activities in related fields and make suggestions as to how to eliminate or at least minimize overlapping and duplication of efforts.

TIMS has a proper and peculiar area of activity, in the opinion of the writer. But it is necessary to define it much more clearly than has been done as yet. Its objectives, both short term and long term, will have to be determined as well as the specific tasks it should be particularly equipped to undertake.

The conclusions reached here may not satisfy some of the most ardent supporters of TIMS. They may be reassured in realizing that the present analysis should be taken merely as a first step into an almost uncharted field. Much further study, analysis and discussion will be required until solutions will be found which should be widely accepted. But as befits a scientific organization, though discussions and arguments may be sometimes heated and vigorous, they should not be influenced by emotions and personal preferences. For there is the one uniform and unifying goal: to further the future growth of TIMS.

No clear or precise definition of the objectives of TIMS is available at this time. Pronouncements in the constitution and in some supplementary material released by TIMS in a statement outlining its "organization, background and objectives" are very broad and subject to different interpretations. They reflect efforts to compromise a variety of different and not necessarily consistent positions. A new start may have to be made to accomplish the desired end.

However, the question may be raised whether it would not be preferable to abandon these efforts temporarily and, instead concentrate on developing a group of problems and tasks which should be the more immediate concern of TIMS. Results over a period of time may be instrumental in determining more

clearly the proper and most promising area for TIMS' future efforts which then could be incorporated into a formal definition.

Any fruitful discussion of a program for TIMS must be based on a working concept of Management Science and Scientific Management. Two papers published in "Management Science" have made significant contributions toward that end. They have outlined the broad aims of Management Sciences and their proper place within the general scientific structure.^{1, 2}

The article by Smiddy and Naum has, in addition, presented an exhaustive and stimulating survey of the evolution of Scientific Management particularly during the last half-century. Peter Drucker, on the other hand, has emphasized the philosophical and logical foundations and objectives of Management Sciences from the viewpoint of those they claim to serve, namely, the managers.

The present writer, therefore, will deal with the conceptual problems only to the extent as it may be required to support his analysis of the objectives of TIMS. He will concentrate on filling in some of the spaces which have been left wide open in the high-level structures set up by his predecessors.

Lawrence A. Appley, the president of the American Management Association, states that the term "scientific" implies the following concepts³:

1. A specific body of knowledge (he also calls it an organized body of knowledge)
2. Possession of certain necessary skills, and
3. An orderly disciplined approach.

A combination of these concepts with that of management in the early years of this century reflected the philosophy of F. W. Taylor that an orderly conscious approach to the work of managers was greatly superior to the then common trial and error, hit and miss approach.

Many supporters of TIMS will feel that this concept is far too broad (Appley holds that it is too narrow for failure to consider the human element). Their concept of "scientific" and "scientific method" is primarily concerned with techniques of research which have proven to be successful in the natural sciences and whose usefulness for the Management Sciences is, therefore, taken for granted.

This idea of applying research techniques of the natural sciences upon problems of the social sciences, to which the Management Sciences belong, is not new. Indeed, it has been debated for several hundred years and reflected the astounding accomplishments of those techniques, particularly mathematical ones, in the natural sciences since the times of Descartes and Newton.⁴

There has been agreement "in principle" that mathematical and natural

¹ Harold F. Smiddy and Lionel Naum, "Evaluation of a 'Science of Managing' in America," *Management Science*, Vol. I, No. 1.

² Peter F. Drucker, "The 'Management Sciences' and the Manager," *Management Science*, Vol. I, No. 2.

³ *Management News*, August 1954.

⁴ E. Strauss, "Sir William Petty, *Portrait of A Genius*," The Bodley Head, London 1954.

science research techniques cannot be used indiscriminately for research in the social sciences. However, the impetus of the former was so great that those findings were disregarded time and again and the idea was widely promoted and accepted that only the research methods of the natural sciences could qualify as "scientific". Whoever would do research in any field that would be accepted as scientific had to work with those methods. A most interesting analysis of the related problems in their effort on economic research was offered by Professor Gregor Sebba of the University of Georgia.⁵

It should be an important objective of TIMS to sponsor research into the proper use of "scientific techniques" in the area of Management Sciences. There is probably no more urgent topic than this in view of the existing confusion regarding the use of mathematical techniques for research on management problems. There are a number of professions working under the assumption that mathematics has to have an exclusive or at least leading part for work in the Management Sciences. These claims need to be carefully investigated and no other organization is better suited to do that job than TIMS. Again, this may not appeal to many members of TIMS but this fact certainly does not reduce the need for thorough and careful analysis, the results of which would provide a wide area of agreement and a starting point for further studies.

Since Frederick W. Taylor is generally recognized as the father of Scientific Management, his concepts shall be briefly reviewed.^{5a} They can be derived from his writings and the vast literature to which they gave rise.

In his paper on the "Principles of Scientific Management",⁶ Taylor emphasizes the duty of management for "gathering together all of the traditional knowledge which in the past has been possessed by the workmen and then of classifying, tabulating and reducing this knowledge to rates, laws and formulae which are immensely helpful to the workmen in doing their daily work." Development of this kind of information is the first of four new duties of plant management in striving for scientific management, according to Taylor. The three others are: Scientific training of workers; cooperation of management and labor to make sure that the work is done in accordance with the principles of scientific management; an almost equal division of work and responsibility between management and workers whereas in the past almost all the work and the greater part of the responsibility were thrown upon the men.

Thus it appears that Taylor's concept of scientific management was much narrower than that of Management Sciences as now understood. Taylor's original concept is indicated by the title of his famous earlier paper on "Shop Manage-

⁵ Gregor Sebba, "The Development of the Concepts of Mechanism and Model in Physical Science and Economic Thought," *American Economic Review*, May 1953 (proceedings of 1952 Annual Meeting) also Felix Kaufmann, *Methodology of the Social Sciences*, Oxford University Press, New York 1944.

^{5a} A more detailed survey will be found in the article by Smiddy and Naum referred to above.

⁶ Frederick W. Taylor, *The Principles of Scientific Management*, Harper & Brothers, New York 1948 (Reprint Volume).

ment". His interest was in production, in techniques for improving and increasing output through better use of the workers' time and effort.

However, this limited concept was gradually broadened by his associates and successors who expanded it into other managerial activities beyond what we now use to call "Production Management and Control".

It will be necessary to avoid misunderstandings to determine how the various concepts of Scientific Management can be best fitted into the broader concept of Management Sciences. This is once more a task which should be undertaken by TIMS. This clarification work will be important in view of the many experts particularly in the engineering and production fields who have been indoctrinated with the concept of Scientific Management and who are now wondering how they can reconcile those ideas with the newer ones of Management Sciences.

Operations Research is a more recently developed technique of scientific research which seems to have much in common with Management Science. The description of Management Science in the literature of TIMS can be applied on Operations Research without much change. Both sciences lack an agreed definition and probably for similar reasons.⁷ However, there is substantial agreement on a number of basic concepts of Operations Research such as use of the scientific method and stress on mathematical-statistical techniques. Moreover, there is considerable emphasis on teamwork as an indispensable requirement although the fundamental significance of this prerequisite is not clear, for it appears to reflect primarily a practical need for diversified knowledge and background which no individual expert can be expected to possess.

Determination of the proper relationship and dividing lines between Operations Research and Management Sciences appears to be particularly urgent in view of the fact that actual misunderstandings have already become apparent in this very area. Thus we have here another significant task laid out for TIMS of initiating research work which will lead to agreement and clarification. It seems that the concept of Management Science is much broader than that of Operations Research; thus the latter would have to be allotted its proper area within the framework of the former.

Descriptions of the techniques of Operations Research tend to emphasize the importance of the construction of *scientific models* as a primary tool of research. The same may be accepted as correct for Management Science as well.⁸ However, the causes for success of model building in the natural sciences do not necessarily extend to the social sciences. The dangers of taking this success for granted have become clearly apparent in economics where models have been so widely used. For a recent example, reference may be made to Colin Clark's eight basic equations which were supposed to represent a comprehensive model of contemporary economic systems. Based on this model, Clark made his abortive predictions

⁷ Robert F. Rinehart, "Threats to the Growth of Operations Research in Business and Industry," *Journal of the Operations Research Society of America*, August 1954.

⁸ M. L. Hurni, "Observations on Operations Research," *Journal of the Operations Research Society of America*, August 1954.

about the future of the American economy which aroused so much interest in 1954. Numerous other, well known cases can be listed to indicate the dangers inherent in the more indiscriminate use of models in economics and other social sciences.

Particular attention should be given to the assumptions implied (consciously or unconsciously) in the construction of mathematical models. Obviously, the selection of a particular kind of assumption cannot fail to influence decisively the results of the mathematical operations and their interpretation. The need to keep these assumptions in accordance with realistic facts and conditions is often minimized in favor of a set-up which will facilitate the solution of the mathematical problem as such.

This indicates the necessity for a thorough study of the conditions and implications of model building in the Management Sciences and its associated disciplines. Again TIMS seems to be the proper agency to undertake such a study which would have to determine the circumstances under which models can be used most advantageously as well as indicate the essential precautions to avoid failures and disappointments.

Another very significant issue arises in connection with the introduction of the *probability concept* into the field of Management Science. Some writers have put special emphasis on this tool of research in view of its success in other areas including those of production control such as quality control. But not enough has been heard about the limitations of this concept when it is applied to the solution of management problems.

Sampling is the most widely used application of probability on business problems. Results have been exceedingly encouraging in many instances. However, the value of the results depends mainly on the proper selection of the size and type of the sample. Not infrequently, the complexities of a problem would require a size and kind of sample which cannot be readily provided for in view of the expense involved. Then the sample may be cut to fit the available funds though the conclusions offered do not sufficiently take into consideration the inadequate foundation upon which they have to rely.

There is a bright future for the application of sampling techniques in many areas of management. However, it will be essential to explore thoroughly the peculiar conditions of business and managerial decision making as well as the methods of collecting and processing data as a prerequisite for developing techniques for sampling procedures which will provide satisfactory results. TIMS should undertake this job of surveying existing sampling techniques and of determining the proper methods which will lead to satisfactory results and further expansion of these applications on business and management problems.

Such a study will lead directly into one of the *usefulness and reliability of data* which provide the basic material for all kinds of quantitative studies in the Management Sciences. There are clear indications that the importance and seriousness of this problem is not properly appreciated by those experts who use these data all the time but who are not sufficiently familiar with the techniques,

assumptions and limitations used in their accumulation. This is equally true for scientists, mathematicians, engineers, financial analysts and other specialists.

Only in recent years has some attention been given to the often quite superficial and arbitrary methods which are used in computing accounting and particularly cost data. The same is true for many statistical series as well. Far too often they are used by research workers without much investigation into their applicability for specific research purposes. Certainly those very same experts would exercise utmost care in evaluating data from their own field of specialization where they are familiar with the peculiar problems involved.

As long as accounting and statistical data were used and interpreted primarily by experts in the same fields, these inadequacies though unfortunate did not do too much harm since they were well known to those working with them. But the number and background of those using these data has increased steadily and thus the problem has become much more serious and its effects much more far-reaching.

In time, there will certainly be a re-appraisal of the present methods of data accumulation and improvements will be made with a view to make them more useful for "scientific" methods of research. But progress may be slow and considerable harm may be done in the meantime unless the true facts become more widely known. Moreover, those working toward improving present inadequate methods will need some help and encouragement from the principal users of the data. This opens up another wide and important field for TIMS to provide for appropriate studies and suitable proposals based on those studies.

Many of the problems which are within the scope of Management Science, whichever definition may be finally agreed upon, are not new by any means. They have been studied and often solved in the past. Management Science and related techniques claim that they offer improved tools and methods for solving those old problems as well as new ones which could not be solved with methods available at the time but had to be dealt with by estimates and judgment.

To be generally acceptable to management, the new methods will have to prove that they are not only superior in a technical sense but in a business sense as well. It is not enough to show that the results are more accurate and reliable, they must be more significant from a business view point as well. And this in many instances will mean that higher costs will have to be justified by savings and/or higher profits.

If data which are inadequate as such give useful results, business men will be reluctant to exchange them for more accurate but more expensive methods. Often accuracy of a result is jeopardized by the inaccuracy of the underlying data. Therefore, the more accurate method is of no avail as long as the quality of those data is not improved.

To gain the confidence of management for the new improved methods, claims of experts which are often exaggerated will have to be tested in the light of management requirements and cost-profit relationships. This will provide another

urgent task for TIMS to set up the proper organization which can render this service to management which in turn would benefit the technical experts as well.

The discussion has now been carried to a point where it will be feasible to draw some useful conclusions.

Previous writers have laid out a wide field for Management Science. This has been implemented here by enumerating a number of problems which fall within that wider area but are in need of solution at the present time. These problems indicate that there is a peculiar area of activity for Management Science which does not interfere with the work of other neighboring disciplines. These are primarily fundamental problems which are not taken up by other disciplines but are essential for successful work by those.

Attention has been called to some of those disciplines which are closely related to Management Science almost to a point where they may sometimes be considered identical with Management Science. Professor Rinehard has expressed his anxiety regarding a possible conflict of interest between Operations Research and Management Science.⁷ But a similar situation exists with regard to Econometrics and to an extent even for Scientific Management. In fact, the same writers contribute to the professional publications of those disciplines. Most of the papers delivered at the first annual meeting of TIMS could have been read just as well at a meeting of the Econometric Society or the Operations Research Society of America.

This situation has caused a widely held feeling that TIMS will be just an intruder or uncalled-for competitor in areas which other organizations believe they are serving already quite adequately. This is a real not an imaginary danger which must be faced by those who believe in the future of TIMS.

The writer has a strong feeling that those who worked so hard and successfully to organize TIMS were on the right track. However, it appears that they were led more by broad feelings than by logical reasoning (though this may seem strange with a view to the individuals concerned). They knew (in the sense of having faith) that there was a need for something not yet in existence but they failed to develop a clear and distinct picture of what they intended to accomplish.

There is no more important problem for TIMS than an early and clearcut solution of this dilemma. Undoubtedly, some eager practitioners will dismiss any thought of discussing fundamental problems as a waste of time and effort, as purely theoretical and academic. They will insist that the need is for going ahead and dealing with practical problems of business and management. However, they are badly mistaken. For you cannot deal with the fundamentals by simply disregarding them. They will persist and will continue to disturb the future of TIMS and its relations with related disciplines and organizations.

Therefore, the problems must be faced squarely by the leaders and supporters of TIMS. There ought to be a broad and full discussion of the objectives and aims of TIMS for the purpose of developing and reaching agreement on a con-

sistent policy for the future. There should be no attempt to cover up differences and lack of clear thinking by using ambiguous formulas which appear to give something to everyone.

This final section of the paper proposes to offer a number of suggestions as a contribution toward the impending "great debate" on the future policies of TIMS. In conjunction with the broader observations of previous writers they should offer a suitable starting point for fruitful discussions.

1. All consideration of the future of Management Science and TIMS must begin with the needs of those whom they are supposed to serve namely business management. There must be a good deal of "market research" by those who now often appear to take the attitude that "father knows best". They try to do research in and work with problems that appeal to them and take it for granted that the same will be true for their customers too. Many businessmen who took that patronizing attitude have failed.

Therefore, a most important job for Management Science and TIMS is to explore what kind of information management really needs and then try to provide it in a manner which will be most useful to management. It is essential that results shall be presented in a form which management can understand. They must also be made to grasp the fundamentals of the research techniques themselves. If they cannot follow the way how the results have been arrived at, they will be most reluctant to rely on them for their decision making as they are expected to do.

2. Following this line of reasoning, it will be easier to work out the proper area where Management Sciences can operate most successfully. It will be an important part of their activities to analyze and appraise new techniques which were useful in the natural sciences with a view to their application for research on management problems. With that stamp of approval, it will be up to the specialized disciplines like Operations Research to work on the problems themselves. In this way duplication and overlapping will be avoided. Management Science will be a sort of holding company with the various techniques serving as its subsidiaries.

3. Once the work of Management Sciences has been clarified, the job laid out for TIMS is clearly visible.

First of all, it will have to set up the organization to support the activities of the Management Sciences. This will include both the financial and research aspects of those activities. TIMS will have to promote the work of the Management Sciences among business men, it will have to afford a meeting place for discussions and exchange of opinions. It will assign research projects and make possible the publication of research papers. A number of areas and problems which TIMS might tackle in the near future were discussed earlier in this paper. The list is not inclusive by any means and new problems will arise all the time as more experience is gained from practical applications.

Another important task for TIMS will be to serve as a liaison between mana-

gers and scientists as well as other professional organizations in the field. In all its activities, it should strive to maintain a balance between these two principal groups. This will include the selection of officers and members of various committees as well as meetings and publications. Management executives should be encouraged to deliver papers at meetings and have their experiences published in the TIMS journal.

In this way, a system of communications will be established which is lacking now and which should be of great benefit to all concerned. Scientists will get a better understanding of management problems and managers will become better acquainted with the scientific point of view. One measure which should be of greatest value would be the establishment of an organization which would help managers to appraise the prospects of individual research proposals submitted to them. If men of recognized reputation among both scientists and managers serve that organization, its opinions should command widest acceptance. They should help to encourage valuable but unusual and untested projects. On the other hand, they should protect business against vigorous promotions where chances for accomplishments appear to be small or non-existent.

Sincerely,
Ernest H. Weinwurm
De Paul University
Chicago, Ill.

It was with considerable interest that I reviewed the application of higher mathematics to the problem of portfolio proportions, as discussed by Mr. A. D. Martin, Jr. in the January issue of *Management Science*, as well as a similar discussion by Messrs. J. Fred Weston and William Beranek in the May issue of *The Analysts Journal*.

Unfortunately, the methods outlined seem to me to be closely akin to the practice frequently observed of carrying calculations out to the fourth decimal place despite the fact that assumptions underlying the calculations have a margin of error of plus or minus 50 or more per cent. That is, Mr. Martin's method requires the determination of two things with respect to each candidate for investment:

1. The expected return from the security via income plus capital gains.
2. The probability that this return will be realized.

The fly in the ointment is, of course, the problem of how to make the basic assumptions. Along with many other portfolio managers we have spent considerable time in trying to work out bases on which to make predictions of gains that may reasonably be expected in the future via dividends plus capital gains on individual stocks. In our case these calculations have so far been limited to certain comparisons within the bank and electric utility fields where there is a fair degree of predictability. So far, however, we haven't determined how to

apply a similar approach to other stocks, nor to comparisons of bank stocks vs. utility stocks.

I would be very much interested to see the results of any work Mr. Martin may do along this line since until reasonable assumptions can be made I do not see how his mathematical method can be put to a real test.

Sincerely,

D. A. Edwards

The Chesapeake and Ohio Railway Company

Copyright 1955, by INFORMS, all rights reserved. Copyright of Management Science is the property of INFORMS: Institute for Operations Research and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.