

THE SCIENTIFIC STUDY OF MANAGEMENT

By

DR. GUNAPALA NANAYAKKARA

B. P. A. (Vidyo.), M. P. A. (York), Ph. D. (Carleton), Director of Postgraduate Studies in Management and Head, Department of Public Administration, University of Sri Jayewardenepura.

1. Introduction

Managerial science is an attempt at understanding and explaining managerial phenomena through continuous and systematic confrontation between expectations and empirical observations. The term "managerial science" is used here evidently in a broader sense than the connotations currently added to the term "management science" embracing only the statistical and mathematical applications in managerial phenomena. Had this current usage not been there, the term "management science" would have been the ideal one for our subject. Attempt to subsume a newer subject, though fundamental to all other treatments of the discipline of management, under a somewhat distorted rubric, I fear, may lead to a wrong perception of the subject in the first place. The term managerial science is no better than "management science" except for its rare exploitation by management "scientists".

The managerial scientist and his counterpart, the natural scientist, both expect, observe, and confront their expectations with their empirical observations. Though there is too little in common in their objects of research and the context of their expectations and observations, there seems nothing to prevent them having a common claim that they both must follow the same path toward empirical knowledge.

In this paper, I will examine the peculiar nature of managerial science within the discipline of management. I will not attempt at defining the boundaries of the discipline of management, but it is important to impress upon the variety of concerns involved in this discipline. If one were to distinguish it as a different branch of science by looking at the entities with which the latter is identified one would see that management is primarily interested in the entity called "organization". Related to this there are, of course, other constituent entities, i.e. the individuals and groups as well as peripheral entities such as the "environment" of organization. The former, micro, entities (such as individual) form one boundary which is closer the discipline of psychology which is in the large category of behavioural sciences. The other boundary, which is on the side of more abstract and diffused, intercepts entities such as political and economic aspects of society, which are the main

concerns of political science and economics. Thus, management enters the arena of social sciences. Management has interest in even further abstract entities such as cultures and societies which are the primary concerns of the discipline of anthropology. Broadly speaking, management as a distinct discipline falls in between behavioural sciences and social sciences with a bent toward the former. One could, very often, label Management as a behavioural science, but it should not forget that the field has interest in entities of the higher order of abstraction, such as cultures. Thus, to the extent that management is interested in more abstract, and therefore, more complex entities the scientific character of the discipline is seemingly reduced. On the other hand, the more the focus on less complex entities such as individual, the higher the opportunities for the discipline to emerge as a "science".

It is rather important that the term "management science" is used to identify the methodological content of the discipline such as mathematical and statistical applications in management. The methodological sciences such as mathematics, statistics, and logic are used in all the sciences — social, behavioural, and physical. It is not only misleading, but also unhealthy for a discipline to equate its scientific character to the methodological component alone. The scientific character of the discipline has to be defined in terms of the methodology of philosophy of science, as it has been done in other disciplines. With the purpose of illuminating on managerial science, I would discuss in this paper some issues pertaining to the methodology of philosophy of science.

2. Management Science, Reality and Idealism

In their attempt at justifying their scientific status, management scientists tend to claim that they are dealing with managerial reality rather than management ideals. The term "realism" or "idealism" is an ambiguous criterion by which to differentiate management science from the rest. No matter how idealist a management writer is, we still could not expect him to build up a management system for angels. Similarly, no matter how empiricist a management scientist is, his main objective is not to build bigger and better data banks. Management Scientists (and managerial scientists) must not only use their imagination to go beyond crude observations of things or relations, but also they are frequently called upon to formulate policy recommendations (both in public and private organizational contexts) to make the present world a better place to live.

Like other scientists, the managerial scientist expects and all his expectations about certain managerial phenomena are organized into a framework which is an idealization of reality like Weber's ideal model, or Kuhn's "paradigm". An expectation framework in management, as in other sciences, is a more or less useful instrument to simplify the complexity of reality for the observer to go beyond the apparent uniqueness of things. For example, system framework helps us to expect a boundary around every organization, control mechanisms within organization, and some kind of feedback mechanism

between an organization and its environment. If these expectations are real things, systems theory will not have any problem pointing out the boundary, the control mechanism, and the feedback mechanism, etc. However, these concepts are mental constructs which a researcher must impose on managerial reality in order to make the latter comprehensible. Those who accept systems framework will find that such an imposition of the mind on the empirical world is tolerable.

Idealization or model-building is the fundamental activity of the managerial scientist because for a given set of managerial phenomena there are an infinite number of ways to abstract them in the process of categorization, conceptualization, generalization, and theorization. For example, in management, man can be "expected" to behave like a rational chess player trying to maximize his organizational payoff at a minimum cost. Or he can be reviewed as a wolf always ready to jump on some defenseless victim. Or he can be compared to a sophisticated rat running through a maze and trying to learn how to get rewards and avoid punishments. Or he can be considered as a hydraulic pump moving some kind of liquid between three tanks of limited volume. Or he can be seen as a very energetic individual with this power in his hands trying to fill in every vacuum which exists in the world. Obviously, these different images of man have nothing to do with reality. Human beings are neither rational chess players, not wolves nor rats, nor fuel pumps, nor vacuum-filling specialists. But to reject any one of these expectations simply on the basis of ethical or aesthetical values is to miss the point. Undoubtedly, man as a chess player is the most flattering image. And in the search for an understanding of his behaviour in organizations, that image of man might be at least as useful as the "idealization" of man as a hectic rat or a sexual pump. Thus the game theory viewing man as a chess player, behaviourism (man as a rat), cybernetics (man as a telephone system), etc. have made significant contributions to the understanding of human nature by often, dehumanizing it.

Obviously realism is not the criterion by which to evaluate different approaches or expectation frameworks. Their usefulness in understanding a managerial phenomenon is much important than their representativeness of reality. In fact, the closer one tries to get to reality, the more deepy one gets down to the level of uniqueness of each organizational event. Thus if realism were the criterion of evaluation, managerial science would not be different from management news reportage.

If usefulness rather than realism is the criterion one has to specify the context of usefulness—usefulness for what purpose? An expectation framework may be useful in understanding one aspect but not all other aspects of the organizational life. Maslow's Hierarchy of Needs is useful in understanding employee motivation but appears to be useless, for example, in understanding the life cycle of a product or service. For the same reason, it would not be

appropriate to study organizational structures within Blake & Mouton's Managerial Grid, neither would it be fair to expect a Marxist to give an adequate explanation of the outcome of an election in a stable democratic regime. Even though simplification of reality is indispensable for understanding, one should not confuse simplification and reductionism. Yet the tendency to have a unidimensional view of management is not uncommon in managerial science. For example, students of policy analysis tend to over-emphasize the role of policy structures/policy makers while those in OB tend to see interpersonal relations as the key to success. Obviously, simplification for the sake of understanding does not necessarily mean an unbalanced view of management. While natural scientists are relatively free in their theorization, managerial scientists cannot afford to lose their sense of perspective. Matter can be studied in a test tube, and management must be viewed in its entirety.

3. The Scientific Status of Managerial Science

Every scientist tries to abstract. Scientific achievements depend on successful abstractions. Among other things, successful abstractions require two conditions (1) the possibility of classifying objects of investigation into more or less pure categories (e.g.) constant force, perfect vacuum, pure water, etc.) and (2) the possibility of isolating them from "irrelevant" effects of the environment. When these two conditions are met, one has a *closed system of investigation*. Any closed system of investigation includes only relevant variables. For example, in an investigation of the law of gravity, a physicist must create a closed system which includes only various falling objects and the force of gravity of the earth. Similarly, to synthesize water, the chemist must set up a closed system which includes only hydrogen, oxygen, and an electric spark.

Admittedly, no system of investigation can be rendered perfectly closed. A system is adequately closed if the effects of irrelevant variables are reduced to an insignificant level, or remain practically constant throughout the process of investigation. Thus, the solar system is a "closed" system because the effects of cosmic forces are insignificant or constant in comparison with the scale of the planetary movements and the mass of the sun.

In general, the more closed a system of investigation, the more exact the law derived from it. A law stating the relationship between two or more variables always implies that the discovered relationship holds true only when all the conditions of the closed system are satisfied, that is, all other factors (irrelevant variables) which are not explicitly included in the expectation framework are kept "constant". "Everything being equal" is another way of stating the requirement of a closed, or adequately closed, system of investigation.

On the contrary, the more open a system of investigation, the greater the difficulty of keeping irrelevant factors from contaminating the scientist's observation. These external and generally unknown factors are the main source of error that the scientist must take into consideration. Their combined effects—the so-called random error—add another dimension to a scientific explanation. For this reason, all scientific laws derived from an open system of investigation must be stated in probabilistic terms. For example, botanists and biologists cannot exactly control the process of generation and decay of each cell ; their laboratories and greenhouses can only approximate a closed system of investigation which can “keep constant” only few irrelevant variables, hence, their findings cannot be expressed with the exactitude of mathematics. Their probabilistic laws cannot be applicable to a particular seed or a particular rat because in a single case the law of the average might not have a chance to cancel out the contradictory effects of all irrelevant variables.

In every scientific investigation, a *conceptual closure* must be made by limiting the number of variables to be included in the hypothesis—the relevant variables. In the physical sciences the scientist's conceptual closure is more or less realized by the physical closure of his test tube, a closure which helps to keep irrelevant variables out without affecting those relevant variables under investigation. This methodological advantage is missing in the social sciences, especially in managerial science. Needless to expound the truism that the organizational man cannot be studied in a “test-tube” because no laboratory environment can reproduce an organizational system which is inherently open. While physical closure is impossible in an organizational investigation, even conceptual closure is frequently questionable. Management is a multidimensional phenomenon; each dimension cannot be studied in complete isolation from all others. Thus, when a managerial scientist limits his investigation to a number of relevant variables, one may question whether the segment of management reality left outside his system of investigation is really irrelevant especially when the criterion of relevance depends on his training and theoretical inclination rather than on the nature of management itself. For example, one cannot study pressure group politics in isolation from the administrative structure even though the bureaucracy has been traditionally believed to be a politically neutral instrument in the governmental process. In short, the managerial scientist must always operate within a hopelessly open system of investigation. One may be tempted to hope that with better theory and more sophisticated methodology, some day managerial science will have an adequately closed system of investigation. However, given the nature of management I am not sure whether it is realistic to maintain such a hope. In the following discussion, we will consider some facets of organizational life which do not lend themselves easily to systematic closure.

(a) Cause and Reason :

There is a cause behind the movement of matter or the behaviour of a human being. Human action does not only have a cause but also a "reason". Man is frequently said to be "rational" in the sense that his acts are purpose oriented. Furthermore, man constantly assigns meanings or reasons to his conscious acts. It is this basic nature of man which completely differentiates the human behavioural sciences from the natural sciences. The "reason factor" is much more important in managerial science than in any other social science because managerial action is concerned with systematic integration of various resource inputs into goods/services as required by society.

A cause is not necessarily the same as a reason. An expressed *reason* (conscious) might be a *rationalization* of an unconscious or repressed feeling (a cause). Furthermore, a reason might not be the same as a public *justification* of a private motive that a person consciously does not want to reveal. Thus, in studying management the managerial scientist must investigate both causes and reasons. When is a politician's public statement to be considered as a true expression of his reason or a Machievalian attempt at manipulating public opinion? When can a scientist conclude that an actor's expressed reason is a rationalization of causes unknown to the actor himself? The credibility gap might be a convenient—but treacherous - empirical criterion for an observer to decide whether a public utterance is a statement of reason or a justification. "Common sense" might be a useful non-empirical guideline for a behavioural scientist to decide when to take and when not to take the observed actor's words at face value. However, it is still a difficult task for a third person to decide whether the observed actor's words or the observing scientist's interpretations are the correct ones.

The above problem is related to a larger methodological and theoretical issue of subject-object conflict. For a physical scientist, this subject-object tension never arises. A rat is a rat, the scientist is not interested in its thinking. In fact, its behaviour can be adequately interpreted within the intellectual framework of the scientist. When a rat runs to a piece of cheese, one does not need to be interested in the rat's reason why it is doing so. On the contrary, in the social sciences, the subject-object issue is a highly controversial one. Methodologically, as pointed out earlier, it is the conflict between the observed actor's words and the observing scientist's interpretations. Theoretically, it is the conflict between different conceptions of man. It arises because of the possible discrepancy between the conscious and the unconscious, between the manifest function and the latent one, between the formal structure and the informal one. Freudian psychologists, and, to some extent, functionalist sociologists do not trust the observed actors,

while ego psychologists and institutionalists have more faith in the actor's expressed opinions. Ultimately, this subject-object conflict can be reduced to the fundamental philosophical question whether man knows what he is doing or not.

The behaviourists have found an easy way out of this controversy by rejecting both the observed actor's words and the observer's interpretations. With behaviourism (which is different from behaviouralism), everything inside the mind (the so-called black box) is irrelevant. Only observed behaviour divested from all interpretations is the valid data. The main question posed by the behaviourist is what kind of stimulus will lead to what kind of response. The only assumption required is that every actor tries to seek rewards and to avoid punishments. This S-R approach is extremely convenient in studying any behaviour the meaning of which is explicit and unambiguous. The act of a rat pushing a red button is easy to understand: the rat wants rewards and by pushing that button it gets a piece of cheese (a reward) from the automatic feeder. But for complex behaviour, the behaviourist solution is inadequate. A citizen casting a ballot or cheering a leader cannot be confined easily within the S.R. framework of reward-seeking (what kind of rewards? and punishment avoidance (what kind of punishment?). A pain for an individual (punishment) is a pleasure for another (reward). In other words, whenever the basic notions of punishment and rewards cannot be empirically defined in an unambiguous manner, the S.R. approach breaks down. Furthermore, the problem is that man pursues several goals at the same time; that these goals can be rarely ordered in a consistent manner according to some scale of priority, that there are numerous ways of attaining a goal that the goal-mean relationship cannot be easily analyzed. Because of this complexity, the act of any observed actor must be "meaningfully" interpreted by the observing scientist. For this reason, the behaviourist solution to the problem of subject-object conflict is adequate only in simple behaviour contexts where the conflict is after all non-existent or not serious.

Since there are two modes of assigning meanings of an act, which one is more appropriate? Can we explain the popularity of Mr. J. R. Jayewardene in Freudian terms because he has a stern father image (the observing scientist's interpretation), or in terms of his populist policy which was attractive to the Sri Lankan voters in the late 1970's (the observed actor's reason?) In general, should the observer remain detached in order to keep his interpretations from being uncontaminated with the emotions of the observed, or should he become deeply involved in the life of the observed actor in order to fully capture his feelings? More specifically, is a Sri Lankan born managerial scientist a better observer of Sri Lankan organizations than a foreign-born managerial scientist? The obvious answer is that the observer must be detached

and involved at the same time; an outsider cannot discern the subtleties of a culture, and an insider might be too deeply involved in it to be "objective". Certainly, this detachment and involvement position is easy to advocate but difficult to maintain. As a way out of this impasse, Mannheim expresses his faith in the marginal man as the guardian of scientific objectivity in the social sciences.

In short, the tension between causes and reasons, between reasons and rationalization, between private opinions and public justifications, etc. can never be satisfactorily solved. A distorted view of organizations will certainly occur if the inquiry is arbitrarily limited to one level. At least, the interactions between these two levels constitute a serious obstacle to any attempt at setting a closed or approximately closed, system of investigation of human behaviour.

(b) *The Individual and the Organization :*

Most, if not all, organizational conflicts result from the tension between individuals' needs and organizational demands, between followers and leaders, between personal views and organizational norms; in short, between the parts and the whole. In organizational life, we know that the parts determine the whole, and the whole affects the parts. Man can develop his full potential in organizations but this does mean that he can be reduced to a simple cog in that social machine. To infer from the properties of the whole (organization) to the properties of its parts (individuals) is to commit the "fallacy of division" better known as "ecological fallacy". Thus, it is not fair to Karl Marx if one tries to apply his theory of dialectical materialism in order to understand an individual case. On the other hand, though society is composed of individuals, this does not mean that the characteristic of the society can be derived from the averaged attitudes of its citizens. To do so to commit the "fallacy of composition." For example, if a political system is found stable, it does not necessarily mean that the average citizen has a stable personality. Similarly, if the average citizen is found to be democratic-minded, this individual characteristic does not necessarily lead to a democratic regime. Both holistic reduction (i.e. the society determines individuals' behaviour) or individualistic reduction (i.e. individuals characteristics determine the nature of their society) are not by themselves appropriate in the study of man because society cannot be separated from its members, nor its members from each other.

The danger of fallacious inference is serious in the social sciences. The philosophical debate on the issue of public interest versus individual interest or collectivism versus individualism highlights the fundamental dimension of social organizations. Not surprisingly, it also points out one of the most crucial methodological problems for the managerial

scientist. It is difficult indeed for a management researcher to cover both the macro and micro levels at the same time. Yet he cannot legitimately use the methodological device of studying organizations at one level while "keeping constant" the other level.

For a physical scientist, normally there is no problem of generalizing about a whole (e.g. a rock) from its parts (e.g. a few molecules). Even when the whole (e.g. a molecule of water) is completely different from simple aggregate of its parts (e.g. hydrogen and oxygen), there is no danger of premature closure when the scientist decides to focus his observation either on the whole or its parts. Once he has chosen a level of analysis, it is theoretically and methodologically legitimate to disregard the effect(s) of the other level on his observation. For example, a hydraulic engineer studying the pressure of water does not need to worry about the state of the atomic elements of water as a source of error in his measurement. In the animal world, in a group of monkeys or a society of bees, there is some interaction between the collectivity and its individual members. But these interactions are limited and quickly stabilized, and their effects on the whole or on its parts are unambiguous and highly predictable. Evidently, the same thingking cannot be said about man. No citizen has ever signed a "social contract" with other citizens to set up a political system. Everyone was born into a political system. By the same token, no citizen has to rigidly comply to the "social contract" he as never signed. In other words, a citizen does not behave like a lonely wolf or a gregarious bee. Every employee has some influence on the organization system (the micro effect) ; and every organization system, no matter how democratic it is, imposes some restraint on each employee's behaviour (the macro effect). Because of the constant interaction between these two effects, managerial scientists are to find a satisfactory method of dealing with the micro-macro problem a problem which can be easily translated into ideological terms of individualism versus collectivism. Unless such a method is found, a managerial scientist must chose one level of analysis at the expense of the other. In doing so, he implicitly takes a position on the individualism collectivism continuum, i.e., an ideological preference which cannot be theoretically or methodologically justified.

(c) *The Time Dimension :*

Human beings are time-oriented creatures. In the human mind, the past, present, and future form a time matrix which cannot be easily unravelled. What people have experienced in the past influences their present behaviour, and what they are doing now will close off (or open up) a number of options in the future. The time element is extremely important in management. Every managerial act involves a decision based on what has happened in the past and on some expecta-

tion about the future. Management is essentially dynamic. To face this problem, contemporary managerial scientists are trying to discover a special calculus in order to adequately include the time element in their investigations. The panel technique (i.e. the same group of individuals repeatedly at different points in time) is a partial answer to the problem. However, few managerial scientists have the time and money to use this technique. Most management studies are limited to a point in time, or a short span of time, because of the lack of data or because of the difficulty involved in interpreting historical aggregate indices. Managerial science is generally ahistorical while the behaviour of managerial man is embedded in his memory of the past and his expectation in the future.

The problem in dealing with the time element is much less serious when one studies matter which decays very slowly and in a predictable manner, or animals which have only a crude memory and no capability of planning for the future. However, when one studies organizational man, any attempt to close off a portion of the time dimension for the sake of methodological convenience is highly questionable. A scientific expectation about a coming conflict may cause a real conflict to validate the scientist's expectation. This self-fulfilling prophecy phenomenon occurs frequently in organizations. If an organization is mistrusted long enough by other organizations its leaders will behave exactly as expected. Fear tends to generate fear. In politics, for example, the Marxist's and Capitalist's prediction of a bi-polar world had helped to create and maintain a bi-polar system of cold war for several decades. On the other hand, man also, negatively reacts to predictions (self-defeating prophecy phenomenon). In 1970, Mr. Wilson was defeated in a general election in England partly because pollsters kept predicting that his Labour Party would get the majority of the seats in the House of Commons; all these scientifically calculated predictions had the effect of creating a feeling of complacency among labour voters who did not bother themselves to go out to vote on the election day. Similarly, the Western systems in reacting to Karl Marx's prediction of the coming proletarian revolution have adopted the Keynesian economic policy which has so far helped to maintain the Western democracy by more or less radically changing the nature of the free enterprise system.

The self-fulfilling and self-defeating phenomena are part of the dynamic interaction between knowledge and action, a characteristic of man which makes any scientific study of his behaviour extremely difficult. As K. Popper and E. Meehan have cogently argued, scientific prediction about man is impossible so long as human behaviour greatly depends on human knowledge which is ever expanding and changing. Consequently, any generalization about man must always be qualified by the statement "everything being static". Since everything is neither

equal nor static in the context of an open system of investigation, the qualification becomes meaningless. The logical implication is that every generalization about human behaviour cannot be empirically tested because the condition "everything being equal" or "everything being static" can never be realized. This condition is met only in absolutely closed system of investigation. For this reason, some philosophers of science have taken a purist view by claiming that no scientific law can be really tested. One needs not go to such extreme. From a comparative viewpoint all we can say is that managerial science is an entirely open system, and the more open a system of investigation the more difficult to realize the "everything-being-equal" condition.

(d) Man as a Creator

Finally, the greatest obstacle for the managerial scientist in his attempt to set up a closed system of investigation is the fact that man is a creature and a creator at the same time. Matter reacts, and animal adjusts, but man through his acts creates his own physical, social and even biological environment. For the physical scientist, the environment is constant, or can be made constant to facilitate his observation. The constancy of the world outside his closed or approximately closed system of investigation makes it possible for him to derive timeless and spaceless laws regulating natural phenomena.

For the managerial scientist studying a highly creative being who is constantly manipulating his environment while striving for his illusive ideal, the environment is always in a state of flux, and any attempt to keep it "constant" is an impossible task. In fact, the environment of man consists of both the Real and the Ideal. The Real could be regulated and manipulated and put in a closed system of investigation. But the Ideal can never be handled in such an empirical manner without losing its ideal character. A new thought can radically change the human context, hence human behaviour. Thus division of labour based on specialization opened up a new human context in organizations and hence human behaviour. In an organizational context, the impact of trade unions on "human relations" has been equally magnificent.

Furthermore, the malleability and creativity of man constitute a formidable challenge to the managerial scientist. They are in the domain of the potential but science is limited to the actual and the concrete. That is why scientific law about man could be invalidated by human development. The survival-of-the-fittest law has been challenged by socialism in both societal and organizational contexts.

Now if man ceases to be creative if he stops his search for the “new organization”, if ideology is dead for ever, if the dynamics of man is replaced by some thing static, only then can a true science of management be fully developed and become as exact as the time-and-motion study. In this case, leadership will no longer be necessary and must be replaced by management engineering for the sake of efficiency and economy. In other words, if the Ideal is replaced by the Real management critics will be replaced by Taylorist experts, and a true human organization will finally be realized on earth. On the contrary, philosophers are still influential, critics still have a role to play, the “scientific” status of managerial science is in doubt. The reason is that we do not know when the people will follow the normative laws of the philosopher, and when they will submit themselves to the empirical laws of the scientist. Certainly, this is an empirical question which has not been adequately answered by contemporary managerial scientists.

4. Conclusion

Managerial science is similar to all other sciences in the sense that the managerial scientist tries to understand managerial phenomena by means of a system of consistent and specific expectations to be confronted with the real world. On the other hand, managerial science like all social sciences dealing with human behaviour can never attain the scientific status of the physical sciences because human behaviour cannot be investigated in a closed, or approximately closed, system. The human is open, and its openness challenges the scientist’s attempt to discover universal laws regulating human behaviour. This fundamental characteristic of the human context does not mean that temporary and probabilistic generalizations about man are impossible. Managerial scientists have indeed successfully discovered and empirically tested numerous regular patterns of organizational life. Trend analysis and comparative studies have as long as the whole world and the whole time scale constitute a managerial scientist’s laboratory, he must constantly face the danger of premature closure and spurious findings.

In spite of the above methodological shortcoming one should not reject managerial science as a hopeless intellectual exercise on the ground that managerial science cannot be made as exact and definite as the physical sciences. Such a rejection is an extreme act of premature closure based on the assumption that total ignorance is better than partial knowledge. Undoubtedly the challenge is formidable, but one should accept challenge instead of running away from it. Who knows what will be the outcome of the present collective search for understanding organizational phenomena.

The challenge should be met simultaneously on several fronts. First of all, theoretical thinking must be continuously improved to reduce inevitable distortions due to the lack of a closed, or approximately closed, system of investigation. A good theory is less likely to exclude important variables,

hence less conducive to spurious conclusions. Secondly, some house cleaning effort must be made to explain contradictory findings and to assess the present stock of knowledge in the discipline. Every science must be considered as a collective effort. The finding of one scientist must somehow be integrated in the findings of all others. Unfortunately, this is not the case in managerial science. Thirdly, constant efforts must be made to improve the techniques of research design and methods of data collection. At the present time the object-subject tension, and the micro-macro interaction have not been adequately solved. Furthermore, a special tool-- a social calculus -- must be created to investigate the dynamic nature of organizations. We know the feedback process is important in management, yet all we have been able to do so far is to formulate speculations with little reference to the empirical world. For the last two decades, the techniques of causal analysis have considerably improved. Yet, there is still ample room for methodological experimentation. Better ways of replicating organizational reality in simulation and laboratory experiments must be found.

Obviously, all these challenges cannot be met by empiricism alone. A good empirical researcher is the one who is gifted with a high level of theoretical and methodological imagination (e.g., Durkheim), and not the one who has access to a well-stocked data bank and a highly sophisticated computer. The reputation of Aristotle, Weber, Karl Marx . . . does not depend on all these electronic wonders.

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