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# Examining How Management Research Learns from Research in the Physical Sciences

Amiruddin Ahamat

**Abstract—** This paper examined the views in which how management research can learn from the research in physical sciences. The discussions evolved on the understanding of scientific knowledge science in the area of sciences and relation to the study in management research. Management research might not be scientific as in physical sciences such as physics, chemistry or astronomy because the former are inter-related with human behavior and whereas the latter investigates physical objects (non-living objects). The following discussion explored the distinction between management and physical science researches. Synthesizing this discussion, it is depicted that the concept of science has been differently interpreted by various physical sciences are schools of thoughts. It is recommended here that one of the ways to progress management inquiry or research, is to challenge the traditional methodologies and to use scientific approach in observing, measuring, analyzing, and concluding management phenomena. Hence, this reflects from learning of the physical science research.

**Index Terms—** management research, physical science, scientific, scientific knowledge

## I. THE CONCEPT OF SCIENTIFIC IN THE HISTORY OF SCIENCE

The difference that suggests science as special is that it is derived from facts, rather than being based on personal opinion. The great success in the physical sciences of physics over the last three hundred years is associated to the application of 'scientific methods'. Chalmers (1999) [1] argued that this raises two fundamental issues; what is this scientific method that is considered a key to success (especially in the area of physics) and is it legitimate to transfer that method from physics to other disciplines. Science has largely been associated by different philosophers with discovery of facts (Davies, 1968) [2]. Facts are seen as basic

building blocks of science. Facts are enacted through observation.

Nevertheless, some major philosophical streams like empiricists and logical positivists gave importance to the facts as important elements of the scientific inquiry. Comte (1855) [3] for an example introduced the idea of logic in science and emphasized much on the logical relationship between facts and scientific knowledge. Thus, it is suggested that facts embedded by logic may lead to scientific inquiry. As indicated by Chalmers (2000) [1], scientific knowledge derived from facts and understood inductively has problems, firstly: generalization (generalization from facts about the observable world can only show the generalization about the observable world). The best example quoted is all swans were believed to be white before the discovery of the black swan. The next problem is assuming that a pattern of events in the future will occur as it always has in the past and for an example: the laws of physics will hold as they have always been viewed to hold.

## II. THE DIFFERENCE BETWEEN MANAGEMENT & PHYSICAL SCIENCE RESEARCHES

Management research might not be scientific as in physical sciences such as physics, chemistry or astronomy because the former are inter-related with human behavior and whereas the latter investigates physical objects (non-living objects). Laing (1967) [4] indicated that there is an ontological discontinuity between human beings and it beings, thus persons are distinguished from things in that persons experience the world, whereas things behave in the world. The traditional assumptions of science are that researchers should be objective and maintain complete independence to validate the research findings (Smith et al, 1991) [5]. It is challenging for management researchers to maintain independence because of the researchers' personal interpretation and explanation of the phenomena. Some researchers, particularly action researchers believe that any social phenomena are continually changing rather than static, thus the action researcher and the researcher are the actor and part of the changing process itself. The understanding is that they are not passive recipients of changes. They believe that the objective of the action researcher is to change the

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system, so people will be affected and involved in changing the system and involved in the research process itself (Smith et al, 1991) [5]. This means that the researcher and the research object are inter-related and embedded within the research process.

For the research approach and choice of which comes first theory or data (deduction or induction). Applying the deductive approach to management research is not problematic but it requires that management research follows the same methodology used by the physical scientist (e.g. physicists, engineering) where the knowledge constructed should involve casual analysis and hypothesis testing A causes B, and also entails that management research treat their subject matter (social phenomena) same as physical science (Gill and Johnson, 2003) [6]. Management researchers were critical of the deductive approach that explained the cause-effects between particular elements without understanding the holistic way on how humans interpret and inter-relate within the social phenomena. Social science or management research prefers the interpretivist approach (the grounded theory) which was first formulated by Glaser and Strauss (1978) [7].

In terms of methodology of research, management researchers are more likely to work with qualitative data and to use a variety of methods to collect this data in order to understand the phenomenon (Saunders et. al, 2003) [8]. The process may involve observation, questionnaires and interviews. However, physical science considers this approach as biased as it relies on personal opinions and beliefs and not on hard facts. This has lead to the approach of experiments in the field of physical sciences. Experiments are one of the key elements of scientific method, especially in physical science (e.g. chemistry, engineering). The role and function of experiment is to verify a hypothesis or to gather data for establishing a theory; they are normally done in a laboratory where the researcher has a great deal of control and manipulation of variables, and can test and falsify experiments depending on sample size and assumptions of equivalence. This suggests that most of the time it makes the experiment easy to be replicated by another researcher.

However, in the context of management research, Smith et al, (1991) [5] argued that experiments are challenging and not easy to be replicated because human behaviours and opinions change with time. Gigch, (2002) [9] in his study tries to further elaborate these two concepts of knowledge between physical sciences and social sciences researches. The study distinguished the two different characteristics of knowledge between the two domains. The table below, Table 1.0 depicts the characteristics and differences of knowledge in physical and social sciences.

TABLE 1  
CHARACTERISTICS OF KNOWLEDGE IN PHYSICAL  
AND SOCIAL SCIENCE DOMAIN

	<b>Physical Science Domain</b>	<b>Social Science Domain</b>
Characteristics and properties of domains	Closed systems without behavioral characteristics Non-purposeful or goal-seeking	Open systems with biological and behavioral characteristics Purposeful and goal-seeking
Sources of knowledge and representation	Mathematical theories and models Empirical inferences and results	Four levels of formalization Heuristic modeling Empirical inferences and results <i>Objectification:</i> “Efforts to free knower from practices which produce him”
Concept of reality and knowability	<i>Objectivity:</i> External world independent from observer Complementarity principle: waves OR particles Equivalent but not simultaneously descriptions of observable events	<i>Subjectification:</i> “Search of evidence dominated by power” Act of knowing: No external reality separate from knower
Description, Causality and prediction	Logical relationship between premises and conclusions Only statistical links between causes and effects	Overt refusal of an objective truth
Measurement and precision	Uncertainty principle	Statistical links between causes and effects
Complexity	Length of schema to encompass regularities	Sciences of complexity Sciences of design
Truth value and guarantor	Value of metalogic	Judgments may be value-laden and create an obligation Importance of consequences on recipients

Contents cited and merged from source of Gigch, J.P.V (2002) [9], Systems Research and Behavioral Science System Res.19, 199-209 and 551-562.

Table 1.0 distinctly indicates that in terms of knowledge characteristics and properties of domain, social science in specific management research engages in open systems with biological and behavioral characteristics. The role is intended for purposeful and goal-seeking objectives whereby in the context of physical sciences, it adopts closed systems without behavioral characteristics and non-purposeful or goal-seeking objectives. Whilst in the context of sources of knowledge and

representation, physical sciences use mathematical theories and models with empirical inferences and results. On the other hand, the social sciences area, it uses four levels of formalization and this includes heuristic modeling, empirical inferences and results. The above tables of analysis justified that there are ways that management research could learn from physical science research.

### III. WAYS MANAGEMENT RESEARCH LEARN FROM PHYSICAL SCIENCE RESEARCH

This part focuses on the way management research learns from physical science research. Checkland, (1981) [10] argues that the management of science is neither natural science nor social science but both influence it. This suggests that management research is inter-disciplinary in nature. The majority of management research methods books are derived from disciplines such as sociology, education and psychology (Smith et al, 1991) [5]. Moreover, most theories used in the field of management research utilize multi-disciplinary approaches and the contribution is significant to management research but insufficient to guide the researcher in management field. Managers require both thought and action, they think that the research methods need to incorporate within them the potential for taking action, or take account of the practical consequences that will probably be the result (Smith et al, 1991) [5].

From the history of science to the present day, what is regarded as scientific is the process of knowledge acquisition based on the testing of hypotheses or falsifying them and this suggests being problematic for social science. Thus, there is a research strategy, which is action research and can be scientific in a way of entering a real world situation, improve it and acquire knowledge (Checkland and Holwell, 1997) [11]. Management research philosophers such as Checkland and Holwell (1997) [11] argue, to advance the management knowledge on scientific foundations, academician and industrial practitioners must follow the systems approach. There should also be planned and careful interventions and study of the whole, in a systemic as opposed to systematic way, which would generate methods that would advance the management science (Churchman, 1969) [12]. The approach of system thinking is seen to be an approach to problem solving that view “problems” as parts of a comprehensive system. It is a framework that is embedded in the view that the components of parts and system can be better understood in relationship with each other and with other systems. It emphasizes that change in one area of the system can affect the system at large (Checkland, 1981) [10]. Thus, it is suggested that any entity in the system inter-relate with other objects and shape the result of the whole processes.

Methodology is the science of method (Checkland, 1981) [10] which suggests that not only applying methods but thinking about the process as we may change and improve the methods used. Understanding from physical science research, the methods of system thinking are entirely different than natural science and social science. In the context of system thinking, the researcher is connected into real world action and subsequently changing the reality. Checkland, (1981) [10], proposes that the soft system methodology to engage in problems where there is high social, political and human activity involved. As argued in many management literatures, the traditional organizational methods, or traditional science methods, cannot engage the complexity of the real social phenomena in the organizations. Thus, it was proposed that by analyzing organizational problems in pieces instead of the whole to fit one of the traditional methods of research, the real problems are falsified.

The study of science is study of its methods and science and systems are not contradictory to each other (Checkland, 1981) [10]. The systems advocates stress much on the methods of inquiry. By learning and evaluating from physical science research, the management research could complement their approaches to be more holistic. System practitioners broaden its scope to include the concept of “action research” is one context or strategy which management research could be regarded as scientific. The process focuses and emphasizes the purpose of the research: the management of change, it does not only describe, understand and explain the world but also to change it (Coghlan and Brannick, 2001) [13].

The second factors relate to the involvement of practitioners and researchers. The process starts with an initial idea for a change intervention (objective) then fact-finding and analysis about the change intervention then generates a plan and decision to be taken (Saunders et al, 2003) [8]. The effect of intervention is monitored and evaluated in the aim of having good judgment that action has produced the expected consequences or not (Gill and Johnson, 2002) [6]. Therefore, from the intervention and contemplated evaluation, action researchers intend not only to contribute to the existing knowledge (the aim of science) but also help rectify problematic and real situations, which have happened in an organization. The science of action research stresses upon intervening in real-life social situations so that to solve the practical problem over a period of time in a style that emphasizes progressive learning and developmental changes. Marrow (1969) [14] and Argyris, (1985) [15] recommended the idea of studying things through changing them and then examining the effects of these changes so that not only the structured testing of hypotheses is not sacrificed but also the relationship to practice is not lost. However, this idea is still being challenged in the research and methodology areas.

#### IV. CONCLUSION

Synthesizing this discussion, it is depicted that the concept of science has been differently interpreted by various schools of thoughts. Furthermore, it is also undeniable that there is no consensus on the definition of science, however, the account of science presented by Kuhn (1970) [16], although not free of criticisms, is widely accepted in both management research and physical sciences. Thus, this paper concluded that although management researches and physical sciences are different in various aspects, there are still ways that management research could learn from physical sciences. The issues of the real world in organizations can be approached via systems thinking. It is recommended here that one of the ways to progress management inquiry or research, is to challenge the traditional methodologies and to use scientific approach in observing, measuring, analyzing, and concluding management phenomena. Thus, this reflects from learning of the physical science research.

#### AUTHOR'S PROFILE

Amiruddin is a passionate entrepreneurship educator and completed his MBA in Technology Entrepreneurship from University of Technology Malaysia in 2001. In 2013, Amiruddin finished his PhD thesis from the reputable School of Management, University of Sheffield, United Kingdom. His research focuses on entrepreneurial opportunity creation in technology based industry.

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Dr. Ahamat serves in various committees among them includes being a Member of Assessment Panel for Malaysian Quality Assurance (MQA) Agency overseeing quality assurance in the higher education institutions in Malaysia.

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