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Developing a general scientific methodology on tenets from Mario Bunges philosophy

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Abstract
Purpose – The purpose of this paper is to present a general scientific methodology on tenets from Mario Bunge's philosophy.
Design/methodology/approach – Systemic thinking and conceptual generalisation.
Findings – A general scientific methodology based on tenets from Mario Bunge's philosophy of social science.
Research limitations/implications – Using quantitative methods to conduct a research to test Asplunds motivation theory and North's action theory.
Practical implications – How to conduct a research based on a systemic perspective.
Social implications – An advantage of linking a systemic perspective to organisational psychology studies is that it may result in new ways of looking at old problems and bring new perspectives to the methods used. One explanation may be the fact that while researchers within various organisational psychology subject fields are largely specialists, the systemic perspective is oriented towards general scientific methodology.
Originality/value – The authors have not seen anybody who have tried to apply systemic thinking as a general methodology for research.
Keywords Methodology, Systemic thinking, General scientific methodology, Mario Bunge
Paper type Conceptual paper

Introduction
Our aim in writing this paper has been the wish to help social scientists who study social systems from a systemic point of view. It is to position systemic thinking in the form of a general scientific methodology this paper has as its main purpose, and this is also the contribution of the paper. The purpose is also to facilitate the work of researchers studying problems/phenomena in social systems from a systemic point of view (Johannessen and Olaisen, 2005a, b)

Our basis for the study is Bunge's systemic philosophy (Bunge, 1977, 1983a, b, 1985a, b, 1996). Mario Bunge is today one of the few system philosophers still active, to base his philosophy on a systemic foundation. One of the other few is Nicholas Rescher, whose conceptual idealism forms an interesting antonym to Bunge's thinking.

The core of systemic thinking is to acquire insight into connections and patterns, and it provides an alternative to both individualism and holism (Bunge, 1996, p. 44).

Understanding, explanation and predication (wherever possible) will, as far as systemic thinking is concerned, always be oriented towards deeper contexts and therefore the construction of new patterns. It is the pattern which combines (Bateson, 1972) systemic thinkers always are looking for dealing with scientific problems/ phenomena. It is the construction and synthesis that constitute the search object. The analysis is purely a tool in order to reach it. If the analysis is given precedence, the

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construction and synthesis will lag behind. Science is for systemic thinking a moral project (Johannessen, 1997b). If science is not constructed as a moral project, it will not only lose its legitimacy, but also its direction, which is the search for truth, and can thus be a means to achieve unethical goals.

The systemic approach is based on a system-theoretical ontology, where the world is seen as a system consisting of subsystems, and an epistemology combining realism and rationalism. The aim of the systemic approach is to understand, predict and control. The methods include analysis as well as synthesis, generalisation and systematisation (Johannessen, 1996, 1997a, b, c).

The systemic position makes a distinction between the epistemological sphere (Bunge, 1985a, b), the ontological sphere (Bunge, 1983a, b), the axiological sphere (Bunge, , 1996) and the ethical sphere.

The conceptions held by a neutral observer on social systems would influence his acts, even if his conceptions are wrong or true. Systemic investigations therefore start "from individuals embedded in a society that pre-exists them and watch how their actions affect society and alter it" (Bunge, 1996, p. 241). The study of social systems from a systemic perspective for this reason always include the triad: actors, observers, social systems. The observer tries to disclose the objective composition, environment and structure (CES) of a social system, then the subjective notion the actors have of CES. Furthermore we are interested in the mental models actors have of the social system, and the mental models we as observers have of the same system. It is then both subjective and objective aspects that need to be studied. When studying changes in the social system, which is the subject matter of cybernetics, we must from a systemic point of view investigate the social mechanisms influencing the changes. It is the internal and external social mechanisms that need to be disclosed within the political, economical, the cultural and the social partial system, in addition to the relations between the partial systems.

The first decision a researcher must take is to determine what is to be studied, i.e. the unit of analysis (individual, group, organisation, society, i.e.). But any analysis is part of or embedded in a larger system. Therefore it is important in systemic thinking always to see the unit of analysis in the light of a larger system which it is part of, in order to understand the function, role, etc., it has in the larger system. Then it must be investigated how the unit of analysis is embedded in the system level underneath, in order to understand which function, role, etc., the analysis has in relation to this system.

The problem question of the paper is: How can we develop a general scientific methodology, on tenets from Mario Bunges philosophy?

Five research questions have been developed in order to attempt to answer the problem question:

RQ1. What demands must a general scientific methodology meet?

RQ2. What assumptions are a general scientific methodology based on?

RQ3. How are problems and problem questions developed in a general scientific methodology?

RQ4. How does a general scientific methodology relate to hypotheses in scientific studies?

RQ5. How does a general scientific methodology relate to theory in scientific studies?

The above description is summarised in Figure 1, which also shows how the paper is organised.

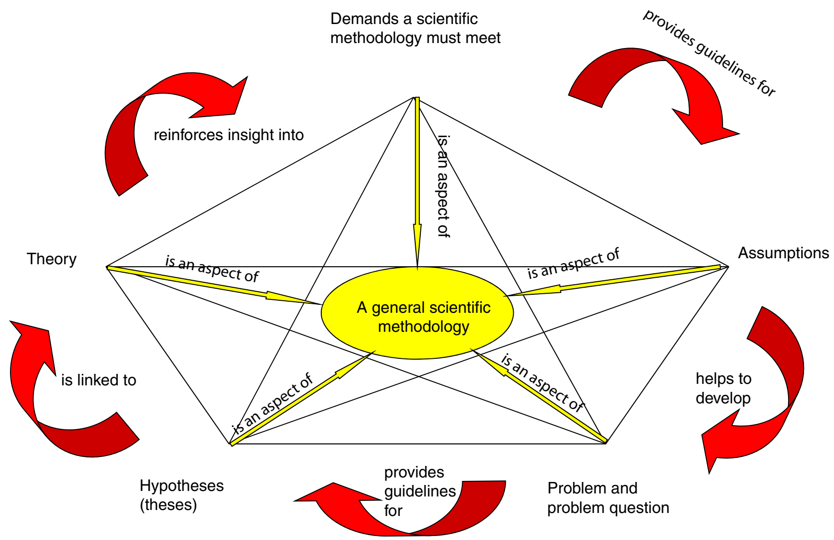

Figure 1.
A general scientific methodology on tenets from Mario Bunge's philosophy of social science

Methodology: conceptual generalisation

We will here very shortly present the methodology used. For further investigation into the methodology named conceptual generalisation we recommend the paper by Adriaenssen and Johannessen (2015) and Bunge (1998a, b, 1999).

Research falls into two main categories: conceptual generalisation and empirical generalisation (Bunge, 1998a, b, pp. 3-50, 51-107, 403-411). Conceptual generalisation is an investigation whereby the researcher uses other researchers' empirical findings in conjunction with his or her own process of conceptualisation in order to generalise and identify a pattern. This contrasts with empirical generalisation, where the researcher investigates a phenomenon or problem that is apparent in the empirical data, and only thereafter generalises in the light of his or her own findings (Bunge, 1998a, b, pp. 403-411). The starting point for the researcher in the case of both empirical and conceptual generalisation will be a phenomenon or problem in the social world.

Conceptual generalisation and empirical generalisation are strategies that are available for answering scientific questions. Which of these strategies one chooses to use will be determined largely by the nature of the problem and "the subject matter, and on the state of our knowledge regarding that subject matter" (Bunge, 1998a, b, p. 16).

Conceptual generalisation, which is the subject of our investigation here, is "a procedure applying to the whole cycle of investigation into every problem of knowledge" (Bunge, 1998a, b p. 9).

The demands that a general research methodology must meet

The following question will be examined here: What demands must a general scientific methodology meet?

There are two main categories of scientific methodology: general scientific methodology and specific scientific methodology. The general scientific methodology is of the following form: problem or phenomenon, problem definition, problem question, research questions (hypotheses), literature review (theory), model, research, findings, explanation. There are various procedures for each step in general scientific methodology.

Most students are drilled in specific scientific methodology, which is divided into quantitative and qualitative methods. To master the production of scientific knowledge researchers should be specialists in general and specific methodology; he/she must use various specific methods in their scientific production to become familiar with different ways of developing knowledge. Familiarity with general methodology, however, is a prerequisite for all procedures in specific methodology.

In the systemic perspective, general scientific methodology constitutes the basic platform which all the subordinate concrete methods must relate to (Bunge, 1998a, b). Being adept at using specific scientific methodology, but not well versed in the use of general scientific methodology, may be likened to having a boat with a rotten hull but a very good engine.

A scientific methodology has as a minimum the following five characteristics (Bunge, 1983a, b, pp. 253-254)[1]; they are logically organised by the process of the scientific study:

(1) (E): data, information and knowledge collected using the methodology must be able to explain at least some aspects of the phenomenon or problem being studied.

(2) (A): the methodology will be used to analyse data, information and knowledge that emerges in the study.

(3) (V): the results and the procedure must be verifiable by others who have knowledge of the methodology. The verifiability must be able to determine whether the results are true within a given deviation.

(4) (C): the results obtained using the methodology should be criticised by researchers with knowledge of the methodology.

(5) (Rc): the research community should be familiar with the methodology (and possibly have developed it) and have received specialized training in the use of it. New methodology should not be used until it has been tested by a research community[2].

The demands that a scientific methodology based on conceptual generalisation in must meet can thus be written: (E, A, V, C)+(Rc).

Assumptions

The question we will investigate is the following: What assumptions are a general scientific methodology based on?

All research is based on explicit and implicit assumptions. The following presents an example of a logical assumption: if one assumes that the work environment affects productivity in an organisation, then it would make sense to implement measures to improve the working environment. This is called linear thinking, because it literally occurs in a line from cause to effect – in this case, the work environment and productivity. If, however, one assumes that the work environment affects productivity, but also that productivity affects the work environment, then it is not obvious how to implement measures to improve productivity. For instance, measures could be implemented to improve productivity by introducing new technology. If this resulted in increased productivity, it could be assumed in this line of thinking that the work environment would also be improved, because productivity affects the work environment. This latter way of thinking is called circular thinking (or interactive thinking) (Bateson, 1972). Since a circle has no beginning or end, this approach means that whatever the starting point, the end result will be the same. The two ways of thinking may be explicit to some people but less than explicit to others, and in some cases they will not be explicit at all but implicit or hidden. The systemic perspective is based on circular or interactive understanding of relationships (Bunge, 1998a, b, 1999).

Assumptions may also be ontological. An example of an ontological assumption is that social facts exist, which is also characteristic of a systemic perspective. It is important in this context to distinguish between social facts and mental constructs of these facts. Example: hunger is a social fact, but social distress is a mental construct.

Another ontological assumption is that a system at a higher level has properties that a system at a lower level does not have. This assumption relates to emergence.

Emergence is an important concept in systemic thinking. An emergent is if something new occurs on one level that has not previously existed on the level below. By emergent we mean here: "Let S be a system with composition A, i.e. the various components in addition to the way they are composed. If P is a property of S, P is emergent with regard to A, if and only if no components in A possess P; otherwise P is to be regarded as a resulting property with regards to A" (Bunge, 1977, p. 97).

The assumption in other words is that emergent properties occur at a higher system level. Economic growth, for instance, is a property that does not exist at the individual level, but at organisational and social levels. Social mobility and political stability are similar examples. For instance, a social function has no meaning without viewing it in relation to other social functions in a system. Functional differentiation is thus a property of a system which is not found at the individual level.

Methodological assumptions relate to issues concerning scientific process and procedure.

The view that individuals (actors) are the only active people in a social system is called individualism, or (by some) methodological individualism.

Methodological individualism, possibly the most widespread of rationalist doctrines, states that social phenomena should be explained in terms of "the psychologies and situations of the participants in these situations"(Miller, 1978, p. 387). The doctrine may be expressed as follows: facts about social systems must be explained by facts about the individuals that constitute such systems. Methodological individualism "claims that the understanding of social facts requires only the investigation of the beliefs, intentions, and actions of the individual concerned" (Bunge, 1996, p. 249). It may be said that methodological individualism attempts to explain the whole by referring to the parts.

Methodological collectivism, on the other hand, attempts to explain the behaviour of the parts by referring to the whole. This represents the opposite position to methodological individualism.

The systemic perspective in social science attempts to make a connection between methodological individualism and methodological collectivism. Structure and organisation are such collective phenomena. Individuals who act are individual phenomena. A systemic perspective takes all these perspectives into account.

An epistemological assumption is based on understanding of how knowledge processes are developed. We will consider here the two central epistemological assumptions in a systemic perspective: social laws and social mechanisms.

When a hypothesis is well documented over time, a pattern can be established – some would say a social law. In the social sciences, social laws are controversial; hence we will briefly clarify what is meant by this construct in a systemic perspective.

Social laws constitute a pattern of a unique type. They are systemic and connected to a system of knowledge, and cannot change without the facts they represent also being changed (Bunge,1983a, b). The main differences between a statement of a law and other statements are:

(1) law statements are general;

(2) law statements are systemic, i.e. they are related to the established system of knowledge; and

(3) law statements have been verified through empirical studies.

A pattern may be understood as variables that are stable over a specific period of time. A social law is created when an observer gains insight into the pattern. By gaining such insight, we can also predict parts of behaviour or at least develop a rough estimate within a short period of time.

Social laws are further related to specific social systems, both in time and space. However, this does not represent any objection to social laws, because this is also true of natural laws (although these have a longer time span and are of a more general nature).

A social mechanism is also an epistemological assumption in a systemic perspective (but not only for this perspective). Bunge (1997) says: "[…] a (social) mechanism is a process in a concrete system, such that it is capable of being about or preventing some change in the system as a whole or in some of its subsystems" (p. 414). By social mechanism we mean those activities that promote or inhibit social processes in relation to a specific problem or phenomenon.

It is one thing to indicate relationships between phenomena, but something quite different to give satisfactory explanations of these relationships. It is the latter which a social mechanism should do. A social mechanism tells us what will happen, how it will happen and why it will happen (Bunge, 1967). Social mechanisms are primarily analytical constructs, which cannot necessarily be observed: they are, however, observable in their consequences. An intention may be considered to be a social mechanism of action. Although we cannot observe intent, we can interpret it in the light of the consequences that are manifested through action. Preferences may also be considered to be a social mechanism of economic and organisational behaviour; although we cannot observe people's preferences, we can interpret them in light of the behavioural consequences which they manifest. Understood in this way, social mechanisms are analytical constructs that indicate relationships between events (Hernes, 1998).

Material resources and technology are social mechanisms of the economic subsystem, power is a social mechanism of the political subsystem, fundamental values are a social mechanism of the cultural subsystem, and human relationships are a social mechanism of the social subsystem. These system-specific social mechanisms interact with each other to achieve certain goals, maintain these systems, or to avoid certain undesirable conditions in the system or the outside world. The difficulty of discovering social mechanisms and distinguishing them from processes may be partly explained by the fact that social mechanisms are also processes (Bunge, 1997, p. 414).

Problem and problem question

The question that will be examined here is the following: How are problems and problem questions developed in a general scientific methodology?

The problem question should satisfy at least two criteria:

(1) First, it should as a rule be useful in a practical context. This is the pragmatic test of the problem question.

(2) Second, it should be related to existing knowledge. This is the knowledge test of the problem question.

Similarly, the conclusion or answer to the problem question should also be subjected to similar tests:

(1) What are the practical implications of the findings? For instance, will they be of use to a leader involved in a process of change?

(2) What are the theoretical implications of the findings? In other words, how do they relate to existing knowledge – do they support it or not?

Problem

Scientific problems may be empirical and conceptual. Empirical problems are related to a database, which can be analysed. Conceptual problems do not presuppose a database, but rather a knowledge base.

The systemic approach to defining and solving a problem is that it consists of three main parts (Bunge, 1985a): the problem's prerequisites, the processes that are involved in solving the problem and the solution(s).

The three parts have three related questions:

(1) What is the history of the problem?

(2) Which actors are interested in the problem remaining a problem?

(3) Which solutions will ensure the problem is not solved in such a way that it creates new unwanted problems in the future?

If we respond satisfactorily to these three questions, we will have to a great extent set the limits of the actions we will later carry out when solving the problem.

There are three main types of problem that the systemic perspective is concerned with (Bunge, 1983a, b):

(1) Why-problems: for example, why do the employees in department X experience central override as a major problem in the change processes they are involved in?

(2) What-if problems: for example, what happens in an organization if the fear of inadequacy: spreads in a change process?

(3) Real existing problems: for example, are there groups in your organisation that actively oppose change?

It is always easier to describe a problem (a real existing problem) than to explain why the problem occurred (why-problem). We need both these approaches because a description of a problem must be available before we can explain it.

When we are faced with a problem, we first seek information. We may ask the question: What is the problem? Then we try to arrive at a description of the problem: How has the problem developed and evolved? What consequences arise as a result of this particular problem? Finally, we are interested in explaining the problem. Then we ask the question: Why is there a problem? The purpose of the explanation is that it will provide guidelines for the solution of the problem.

What constitutes an explanation of a problem? Problems may be understood in different ways and to varying degrees, but they must be understood adequately before they can be explained. Regardless of how we proceed when explaining a problem, it is important that the problem is systemised, perhaps into a main problem and associated sub-problems. Consequently, it becomes easier to understand what is the main problem and how some sub-problems are related to it.

When explaining a problem at least five types of explanation are used:

(1) those that indicate a cause and effect relationship;

(2) those that indicate a random event as a cause of the problem;

(3) those that indicate an interaction between various, interrelated forces;

(4) those that refer to conflicts between persons or groups as driving forces of a problem's development; and

(5) those who show that the problem is related to the goals that the system has set.

The problem question and research questions

When the problem is analysed the next step in a systemic investigation is to develop the problem question. The problem question is formulated always as a question related to the problem that has been analysed. As a rule, the problem question is an overarching one and only operational to a small extent, such as: What promotes and inhibits organisational innovation? It is impossible to say anything sensible about such an overarching question. Therefore, the problem question must be broken down into a number of research questions (for instance, three to five questions). Research questions are always operational, so it is possible to answer them using various concrete scientific methods, which may be of different types. Simplified, one can say that the research questions constitute the system that constitutes the problem question; thus, they are the parts that together constitute the problem question. The problem question is only one of many approaches (perhaps infinitely many) that may be constructed in relation to the problem being analysed. As explained above, it's the problem analysis that is essential, then the design of a precise problem question. Finally, research questions are developed that can be operationalised using some indicators and recognised methods.

Hypotheses

The following question will be examined: How does a general scientific methodology relate to hypotheses in scientific studies?

To answer the question, first phenomenological and dynamic hypotheses will be discussed, and then indicators.

Phenomenological and dynamic hypotheses

Hypotheses are intended to act as a link between our mental and social constructs, on the one hand, and social facts on the other (Turner, 1988, 1991). For instance, hunger is a social fact, while social deprivation is not a fact but rather a mental or social construct. Not being able to read is a social fact, while illiteracy is a social construct. Mixing up mental and social constructs and what these are meant to represent creates confusion and should be avoided.

Hypotheses are intended to provide explanations of social facts or to reveal correlations between social facts. The first is called dynamic hypotheses and the latter phenomenological hypotheses (Bunge, 1983b).

It is always easier to describe a condition or a change in a state (phenomenological hypotheses) than to explain how and why the condition or change developed (dynamic hypotheses).

Examples of phenomenological hypotheses:

(1) the more external information an organisation uses, the more likely it is that it will achieve its goals; and

(2) the more communication channels there are to the leadership in an organisation, the more likely it is that the quality of the work environment will be better.

Examples of dynamic hypotheses:

(1) the more external information an organisation uses, the more likely it will achieve its goals, because uncertainty is reduced; and

(2) the more communication channels there are to the leadership in an organisation, the more likely the quality of the work environment will be better, because the leadership will be able to intervene quickly and decisively to change poor work environment conditions.

Both types of hypotheses are necessary because a description of/change in a condition must be available before we can attempt to explain why such a condition has arisen.

Dynamic hypotheses are preferable to phenomenological hypotheses in a systemic perspective because the former include an element of explanation. In most cases, research attempts to provide explanations of a problem or a phenomenon (Bunge, 1985a, b).

In order for a hypothesis to be realised (not proven), three criteria must be met (Bunge, 1985a, b):

(1) variables must correlate;

(2) the causal direction must be made visible; and

(3) there must be no other variables which in some way have an effect that cannot be made visible.

All types of hypotheses have to meet three demands. First, of two competing hypotheses, we should prefer the one that is best rooted in practice. Second, we should prefer the hypotheses that are rooted in existing knowledge. Third, we also need to consider the systemic nature of hypotheses, that is, whether they are rooted in a theory. In a well-developed science, systemic hypotheses are to be preferred.

Indicators

Indicators are essential so that the researcher is able to come to grips with the problem or phenomenon being examined. What is an indicator? Let us take an example from the field of medicine. Fever is an indicator of an underlying disease, but it does not tell us what disease is causing the fever. By this example, it may be said that an indicator is an observable variable. The variable can be observed directly or indirectly by using an instrument that signals something about the variable being investigated (the variable in the above example cannot be observed directly).

Unemployment may be said to be an indicator of various underlying phenomena and problems. For instance, it may be caused by a low level of education, but it can also be caused by types of higher education that are not in demand. Unemployment may also be caused by technological innovations. Poverty may also be a cause of unemployment because malnutrition and a lack of education can result in the population being unable to adapt to the labour market. However, unemployment is usually considered in the context of reduced economic growth. The point being made here is that unemployment can be an indicator of one or more underlying phenomena, but which ones? To clarify the relationships we often need a theory that shows relationships between indicators and the phenomenon under investigation.

Indicators can be quantitative, such as a basal thermometer used for measuring body temperature in cases of suspected fever. Quantitative indicators are often considered to be valid and objective. Figures, number, quantity and volume are examples of types of quantitative indicators. Indicators may also be qualitative, such as the degree of exercise of power in an organisation, the degree of bureaucracy in an organisation, etc. Qualitative indicators are sometimes considered to be subjective and unreliable, because they depend on interpretations and personal assessments relating to the use of the indicator. However, qualitative indicators are of interest when people's perceptions, expectations and assumptions about future situations are important.

In addition to the fact that indicators can be quantitative and qualitative, they can also be empirical and theoretical. An example of an empirical indicator is inequality in the distribution of value creation (the Gini coefficient). Some indicators, however, are theoretical. An example of a theoretical indicator in economics is price elasticity. This indicator (I) tells us something about the percentage change of the price (P) when there occurs a percentage change in quantity demanded (E) ($I = (E/P)$).

Theory

The following question will be examined: How does a general scientific methodology relate to theory in scientific studies?

Any field of study starts out with a problem/phenomenon, a data basis, the search for relevant variables and the construction of hypotheses/theses or research questions. As research progresses, stronger relationships will be developed between the hypotheses. New hypotheses are developed, and as a result, a system of hypotheses is constructed. When a field of study has developed a system of hypotheses, we say that a theory has been developed. In the systemic perspective, a theory is defined as a system of propositions (Bunge, 1985a, b).

Propositions are overarching hypotheses.

The development of a field of study to a science will always follow a path in which data and hypotheses are systemised and structured into a system of hypotheses. When this happens, the hypotheses will become supported by a continually developing knowledge base, and the goal is the development of a theory.

Theory development in a systemic perspective has the following aims (Bunge, 1998a, b, pp. 436-437):

(1) to systematise knowledge;

(2) to explain social facts;

(3) to increase knowledge acquisition;

(4) to test hypotheses and their relation to other hypotheses;

(5) to guide research; and

(6) to provide a map for a complex terrain.

Working with theory leads to the researcher working in a qualitatively different way than if he/she is only concerned with data collection and relationships between the data collected.

Theory development does not necessarily presuppose a large amount of data. The scope of the data may prevent theories becoming irrelevant. In the same way as data collection without direction by theory can lead to irrelevant information, theory development without data can lead to knowledge of little use. It is not possible to say with certainty how much data must be available before starting theory development.

Regardless of how theories are constructed, it is important to be aware of the fact that they only say something about certain aspects of reality; no theory can cover all aspects of the reality we want to describe and explain (and to possibly predict future developments). Therefore, rival theories are necessary in order to achieve the greatest possible depth of explanation about a problem or phenomenon. Rival theories may be compared to two people taking a photo of an object simultaneously standing in different positions. In other words, their positions relative to the object will be at least slightly different, and in most cases very different, resulting in photos that show the object from different perspectives. In this manner, different aspects of the object are made available to an observer (Asplund, 1970). In a similar way, rival theories reveal different aspects and perspectives of a phenomenon or problem we want to illuminate. Thus, theories covering the same phenomenon:

(1) will only cover certain aspects of a problem or phenomenon;

(2) are partial;

(3) are based on subjective selections of certain aspects of a problem or phenomenon. This also applies to using quantitative methods and quantitative indicators; and

(4) present only partial truths about a problem or phenomenon.

The above description, however, may limit the scope of theories but does not make them less true. We should just be aware that theories, no matter how they are developed, cannot describe the full and whole truth. Any theory is an idealisation of reality and will contain one or another form of simplification: in the selection of certain aspects of the problem or phenomenon, in the choice of problem question, research questions and methodology, and in how we choose to highlight the results (Asplund, 2010).

For researchers, theories should be a help to direct attention in the research process. Thus, the theory can provide guidance for selecting problem areas for empirical research (Merton, 1967, p. 5).

How are theories developed? What are the elementary building blocks and how are these put together? When developing theories, should one start with data or begin with hypotheses?

The building blocks of a theory are always propositions in a systemic perspective. Propositions contain concepts. A concept that belongs to a theory can be called theoretical if it is:

(1) unique to the theory, or

(2) specifically clarifies the theory.

Propositions in a theory are either premises (postulates), definitions or consequences of terms. Once a system of postulates and definitions has been created and organised, an essential condition may have been fulfilled but this is not sufficient in theory development. To proceed we must expand the system with propositions that are related to each other (Bunge, 1983a, b).

There is considerable consensus among researchers that any actual theory should be based on data. However, there are still three reasons why data elements should not exist in the actual theory: The theory should be: general, testable and predictable.

A theory of social systems can be assessed from the practical value it has for a user of the theory. An example of such a theory is Asplund's "motivation theory"[3]. This mini-theory may be written as: people are motivated by social response. It can be applied in practical organisational contexts; for instance, by leaders who want to improve the performance of knowledge workers. Another example of a mini-theory that has practical relevance for leaders is North's "action theory"[4], which may be written as: people act on the basis of a system of rewards as expressed in the norms, values, rules and attitudes in the culture (the institutional framework). If we combine Asplund's motivation theory and North's action theory we arrive at the following practical theory: people are motivated by the social responses that the institutional framework rewards. This theory can be tested and applied by organisational studies in practical contexts.

Conclusion

Answer to the problem question

The problem question that has been discussed in the paper is: How can we develop a general scientific methodology, on tenets from Mario Bunges philosophy?

The answer to the problem question is that in the systemic perspective we clarify our assumptions, and emphasise a thorough analysis of the problem to be investigated. Then we develop a problem question with related research questions. The research questions are designed so that they are operationalized. In addition, the systemic perspective is concerned with dynamic hypotheses and the application of theory.

Theoretical implications

The systemic perspective and a general scientific methodology helps the researcher to apply appropriate rules, like in a complex game. For instance, if you are unsure about the rules that apply in a game such as chess, then you are obviously doomed to make mistakes and may be put into an embarrassing position. A systemic perspective can help us to do the right thing when procedures are crucial to the end result. It can also help researchers by pointing out that the knowledge one has about a phenomenon/problem may be based on faulty procedures. The hypothesis is quite simple: The more knowledge you acquire about a phenomenon/problem, the more likely it is that new gaps in the knowledge will appear. It is a systemic perspective, inter alia, that may help empirical scientific studies make improvements and so continuously fill revealed gaps in knowledge. A systemic perspective can be helpful in the following manner.

The perspective may be helpful when we need to clarify the problem to be investigated (Bunge, 1979, pp. 253-292), and when the problem and problem question need to be conceptualised.

Practical implications for the student and researcher

To develop a conceptual model on the basis of the problem and problem question, it may be appropriate to take as a starting point some social facts, or as Bunge (1999) says: "a type of social system" (p. 11). Examples of social systems are teams, institutions, private or public organisations, and NGOs. Once this has been done, someone selects some properties of the social system that are considered to be important for the problem and problem question, and which relate to other important properties. These properties are then designated by using concepts. The concepts are then formulated into research questions in the scientific investigation. Further, an assumption (reasoned guess) is made concerning the relationships between the concepts (research questions). Once this is done we will have established a preliminary conceptual model of the problem, the problem question and research questions. In such a conceptual model the problem question will constitute the core of the model, as shown in Figure 1. The next step is the development of indicators for the research questions (elements of the model), so that issues can be examined in a practical context. Some theorists, including Bunge (1999), term research questions "operationalised hypotheses" (p. 11).

When data, information and knowledge are collected and analysed, the original model may need to be corrected because new knowledge and insights have emerged in the investigation. In such a case, the revision of the model will be described, say, in a separate chapter; in this chapter, the new model will be explained, the application of the findings that have been acquired, and possibly the theory or theories that have been relied on to explain the new relationships in the revised model. The investigation is then concluded by generalising the new model so that it includes several concepts, variables and indicators. In this way, those that research the same problem and problem question may use it as a guideline for further research.

Further research

Asplund's motivation theory and North's action theory, as mentioned above, are mini-theories that should be tested in practice to see if they have relevance for the problems related to for instance leadership issues. If the theories are able to predict how people are motivated and which incentives they value, then the two mini-theories could be of great use in practical leadership contexts.

Notes

1. The five criteria are reduced from Bunge's initial ten criteria for establishing a scientific methodology (Bunge, 1983a, 253-254); this has been done for pedagogical reasons, hopefully while still retaining scientific rigour.
2. Researchers stand divided with regard to various scientific-theoretical and scientific-philosophical ideas. This means that there will always be some researchers who disagree with the appropriateness or validity of the chosen methodology. However, such disagreements are usually based on basic science and philosophical foundations, such as phenomenology, hermeneutics, logical empiricism, and to a lesser degree, the functionality of the methodology.
3. Asplund's "motivation theory" is constructed (framed) here by the authors of the paper on the basis of two of Asplund's books (Asplund, 1970, 2010).
4. North's "action theory" is constructed (framed) here by the authors of the paper on the basis of a number of North's (1990, 1993, 1994, 1996, 1997) books.

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