The Nomological Network and the Research Continuum

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INTRODUCTION

Social science and management information systems (MIS) research have been criticized for failure to integrate theory construction and theory testing (see e.g., Subramanian & Nilakanta, 1994). In particular, concerns with MIS as a cohesive research discipline have long included inadequate construct development and lack of valid, reliable measuring instruments for those constructs (Keen, 1980). Understanding the theoretical basis of constructs and how they are developed and tested across the research continuum are fundamentals of a cohesive academic discipline. To provide a common research framework for the growth of MIS as a scientific discipline, this chapter proposes a framework for an integrated research continuum across the life cycle of the research process.

BACKGROUND

The growth of any scientific discipline entails the development of a system of specialized, abstract concepts that define the lawful relationships (or hypotheses) that represent a discipline's theories. Scientists recognize underlying concepts in observed phenomena and build those concepts into the lawful relationships of a scientific theory (Blalock, 1982, Hempel, 1952).

This search for lawful relationships among natural events is the primary function of science, and focuses on two objectives: (1) describing specific events, objects, or phenomena in the world of experience and (2) establishing theories, or general principles, to explain or predict the specified events, objects, or phenomena (Feigl, 1970 Hempel, 1952).

Theories of a science must support explanation and prediction. If a scientific discipline lacks explanatory and predictive theories, no connection can be established between descriptions of different events, objects, or phenomena. Such a nontheory based discipline is unable to predict or prepare for future occurrences. The lack of explanatory principles permits no use of theory for practical application. Practical application requires theories or principles that explain what particular effects occur when specific changes occur in a given system. In addition, comparability tests of the theory by other researchers would be impossible (Blalock, 1982).

SCIENTIFIC THEORY AS A SPATIAL NETWORK AND THE RESEARCH CONTINUUM

To develop precise theories of wide scope and high empirical confirmation, scientific disciplines create and evolve comprehensive systems describing lawful relationships of theoretical constructs (Hempel, 1952). Some variables of interest within these theoretical constructs cannot be directly observed. Thus, constructs contain theorized unobservable, latent factors measured by empirically observed indicators (Nunnally, 1978).

A comprehensive scientific theory can be represented as a spatial network in which hypotheses use correspondence rules to link theoretical constructs to derived and observed empirical concepts, which acquire meaning through operational definitions. The unobservable (latent) theoretical constructs are anchored to the empirical environment by rules of interpretation (the correspondence rules). By virtue of these interpretive connections, the network can function as a scientific theory (Blalock, 1982). The ability to interpret unobservable, underlying constructs transforms a theoretical, spatial network into an empirically testable theory.

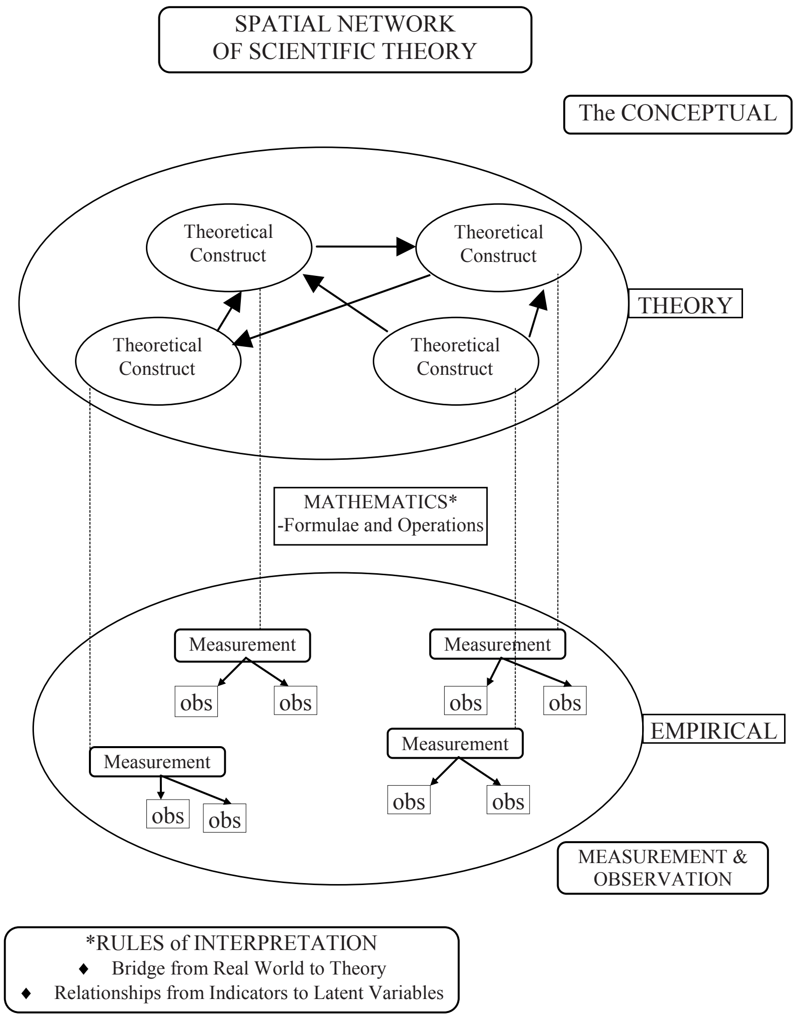
An important implication of this view of the structure of theory is that the integration of theory construction and theory testing across the research continuum is of major importance (Feigl, 1970; Hempel, 1952; Hughes, Price, & Marrs, 1986; Trochim, 1996). Figure 1 (below) is a graphic depiction of this spatial framework, developed from the work of Hempel (1952), Blalock (1982), and Trochim (1996).

Figure 1 represents a 1:1 correspondence between theoretical constructs and measurements, which is not always the case. Observable measurements, which are qualitatively different in the empirical world, can overlap or measure the same thing if their positions in this spatial network link them to the same theoretical construct. Also, a measurement may serve as the interpretive link to multiple theoretical constructs, though the researcher would specify the operative definition in use for that interpretive relationship, for example, measuring self-esteem requires accounting for elements of self-image and ego (Cronbach & Meehl, 1955; Hempel, 1952; Trochim, 1996).

In a spatial network of theory and observation, internal principles define basic entities (concepts and constructs) of the theory, and the hypotheses describe interrelationships of these theoretical constructs, either within the same theory or with other theories. (see "The CONCEPTUAL" in Figure 1). Bridge principles are the mathematical formulae and operations, stated as the rules of interpretation, that link the processes proposed by the theory to empirical phenomena (measures and observations). Bridge principles enable a theory to be used for explanations and/or prediction (see "EMPIRICAL" and "RULES of INTERPRETATION" in Figure 1). Without these principles, a theory has no explanatory power or practical application, and no empirical test is possible.

A fundamental requirement of science is that a statement of fact from an appropriate theory made by one scientist must be independently verifiable by other scientists. This principle of scientific generalization gains wide belief and support for any theory and is central to all scientific work (Nunnally, 1978).

Figure 1.



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