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John Leslie King
University of California, Irving

Kenneth L. Kraemer
University of California, Irving

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An Assessment of Nolan's Stage Model*

John Leslie King
Kenneth L. Kraemer
Public Policy Research Organization
University of California, Irving

ABSTRACT

The stage model of Richard Nolan, as published between 1973 and 1979, is the best known model of evolution related to organizational information systems. The model has been accepted as a sound description of this evolution, but has never been subjected to careful conceptual assessment. This paper evaluates the model in light of its logical structure and its place within the larger realm of evolution explanations in the social sciences.

The model evolved over a period of years. The original 1973 version derived from the "S" shaped logistic curve of growth in computing budgets. The three points of directional change in the curve were taken as a surrogate of major changes in the environment and management of computing within the organization, dividing the total curve into four sections Nolan called "stages:" initiation (beginning of use); contagion (rapid expansion of use); control (constraining response from top management to restrict growth); and integration (refinement of controls to accomplish organizational objectives in computing use). This basic descriptive hypothesis was elaborated in the 1974 version (with Cyrus Gibson) which added two significant features: definition of the primary driving agent in computing growth as change in technology; and the development of the model as an equilibrium model. The state of computing at any time was the result of an equilibrium between the stimulating forces of technical change and the constraining forces of managerial control policies.

The model was elaborated in 1977 and 1979 to include two new stages. Management policies were characterized as either "slack" policies (lack of controls, encouragement of innovation) or "control" policies (constraints on growth, encouragement of efficiency). The S curve was said to illustrate the organization's "learning curve" in dealing with computing, in which management policy improves over time in its effectiveness at achieving desired results. A basic change was said to be underway in management attitude toward

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computing, from concentration on control of computing resources to control of organizational data resources, stimulated in part by the emerging technology of database management systems. A new stage called data administration was added to the model, which would eventually give way to a sixth stage called maturity. In maturity managers would be sufficiently knowledgeable to effect a productive balance or equilibrium between slack (encouraging innovation) and control (encouraging efficiency).

Our evaluation of the model reveals problems with its assumptions. First, the empirical foundation of the model is questionable. Computing budgets are not likely to be effective surrogates for the wide range of variables they are said to represent, and, as subsequent empirical research has shown, do not necessarily conform to the S curve. Moreover, predictions made using the model's assumptions have proven inaccurate. Second, the focus on technological change as the basic driving force in computing growth is probably too simplistic. It does not adequately deal with the many demand-related contextual factors of change that have been shown empirically to be important. Third, the model implicitly assumes that there is clarity and congruity on organizational goals for computing use among top managers, but this expectation is seldom upheld. A lack of congruity in goals weakens the assumption that acquisition of knowledge will automatically result in the development of appropriate management controls. Fourth, we doubt that knowledge of "appropriate" means for dealing with computing will be as easy to acquire as the model suggests. There are many competing theories about how "best" to manage computing, and differences in organizational actors' abilities to acquire knowledge and dispositions about how to use it. There is no specification in the model regarding how knowledge of appropriate policies leading to maturity will be found and applied. Fifth, balancing control vs. slack policies implies that managers have some idea of the direction computing use is headed. In fact, most policies are reactive, and the notion that balance can be deliberately achieved is questionable. Finally, the assumption that change actually proceeds in a continuous manner is not upheld either by the history of computing development in organizations or by other studies of organizational or social change.

Within the context of evolution explanations in the social sciences, Nolan's model is an example of "evolutionist" models, which assume some a priori direction of change and an expected end state of change, but seldom precisely specify the mechanisms whereby change takes place. Nolan's model posits a definite end state (integration in the early versions, maturity in the later versions), but does not provide a detailed account of how change takes place. As such,

Nolan's model offers some useful insights, but suffers from problems common to evolutionist models: it is difficult to test empirically, and does not offer a good account of why specific changes occur the way they do. Most importantly, the only empirical test available for such models (waiting to see whether predictions made using them prove to be correct) has not supported the Nolan model to date. The model remains an insightful organizing framework for thinking about computing change in organizations, but is not the empirically validated model of change some of its proponents claim it to be.