

IDEAS

1. Building a Model for Technology Studies

by John W. Sinn

This model is based on several years of interaction with business, industry, and academic colleagues. It has taken its current form after being applied and “tested” in several undergraduate and graduate courses at Bowling Green State University. The applied research program of the College of Technology’s Center for Quality, Measurement, and Automation (CQMA) has benefited from the application of the model, and in turn, the experiences have guided the model’s development. Essentially, this occurred because the CQMA enabled students of an applied quality science curriculum leading to a BS degree to undertake numerous technology transfer projects for industrial firms.

For several years, the idea has been pursued that a “universal conceptual” model could be developed that would not only complement but subsume and enhance the many models that have been put forward in the past few years. What follows is a brief description of the progress we have made in developing such a model, which we have also operationalized (applied) in a variety of situations. The underlying concepts and a graphic representation of *The Technology Change Model* (Figure 1) is explained in the following paragraphs.

OVERVIEW

The overriding concept is based on creativity and problem solving, the heart of human technological behavior. At risk of being presumptuous, or in the opposite extreme, of oversimplifying, everything that can be identified as possibly influencing this behavior and everything that can be identified as technology solutions resulting from the behavior are fair game for inclusion in the model.

The central organizing concept, and thus located in the center of the figure, is related to creativity and problem solving. It is represented in the model by *Technical Teams* that, for their effectiveness, rely on a *Synchronous Leader*, *Data*, and *Documentation*. Representing the central core of human technological activity, *Technical Teams*, as they conduct their work, are directly

affected by, and in turn affect and modify, *Inputs*, *Processes*, *Outputs of Technological Functions*. In the model, these surround the elements in the center. The two major dimensions, the central core, and the technological functions, are, in turn, affected by, are dependent upon, and are significantly influenced by the third and last component, the *Technological Infrastructure, Culture*. This last component includes those elements of culture and society that influence, are connected to, or are directly related to the latter two. This accounts for the symbolic display of the elements vectoring inward.

A final goal of the model conceptualization process was to produce a framework that would be enduring, but which would allow and accept change in its components and elements in response to the very changes that are envisioned to result from the technological behavior the model seeks to characterize.

Academics and industrialists who have considered the elements of the model find that it provides structure for core knowledge of technology that is useful in their situations. It yields content guidelines for courses and activities in educational and training situations as well as procedures and organizational devices that may be adapted in the public and private sectors to solve problems and increase efficiency, productivity, and quality.

The Center of the Graphic

Technical Teams are centermost. They are primary driving forces in organizations and culture. They initiate and implement change through technological means. To be effective, members of technical teams must master the complexities of data collection, utilization, analysis, and synthesis, as well as document all that is pertinent to the problem or issues with which the team is dealing. It should be noted that with “empowerment” having taken root in many dimensions of human activity, the concepts presented herein have wider application than something called “Technical Teams” would have suggested a

few years ago. Today, the term and the concepts that undergrid it apply to a galaxy of collaborative and cooperative arrangements in the professions and workforce situations.

Members of teams so engaged must develop leadership skills that will permit them ultimately to become *Synchronous Leaders*. That is to say, they will have mastered not only the techniques of working with, guiding and motivating, and structuring teams, but will have derived and mastered the critical and relevant elements that apply to their work as derived from those forces and influences that are arrayed between the central core but within the ellipse, as well as those elements shown as directing themselves inward from the outside of the ellipse.

From the Center to the Ellipse Wall

The leader and the team members need to be knowledgeable of the elements that make up *Inputs/Processing/Outputs-Technological Functions* in this part of the model. In many instances as they go about their creative and problem-solving work, the team borrows heavily from the repository of technological functions, processes, and issues and adapts them to their solutions and the changes they are creating. In fact, in some instances the work of the team may result in the creation of a new element that would take its place in this array; for example, “reengineering” and “concurrent functions” were added not too long ago. Similarly, continual change and innovation by the technical team will likely see that some of the elements of this array will be supplanted by others.

On the Outside of the Ellipse

Equally important to effective functioning of those who work within the technology system is a galaxy of other elements. Represented in the array on the outside of the ellipse, and described as the *Technological Infrastructure, Culture*, they are symbolically shown as forces vectoring inward. It must be understood that the consequences of the technological behavior which is

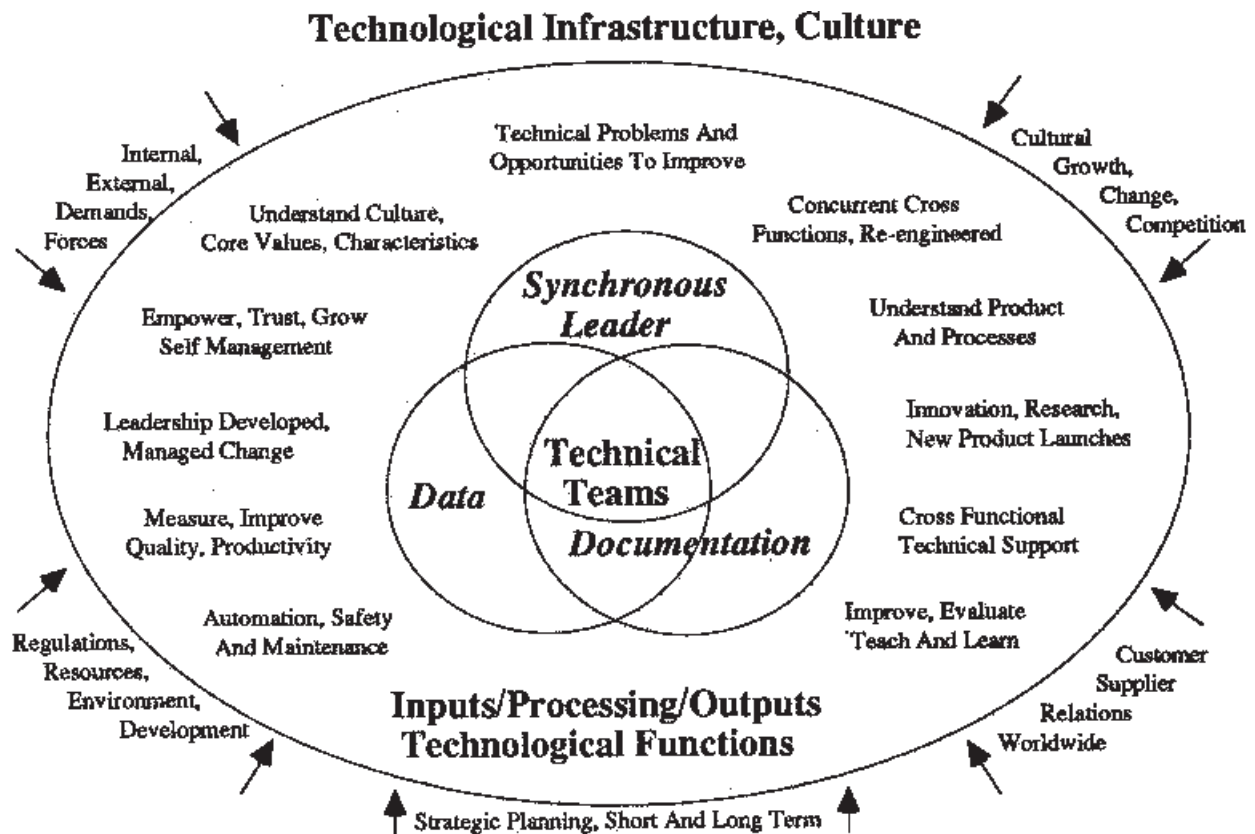


Figure 1. Technology Change Model.

represented within the ellipse do interact and modify these wider cultural forces which are depicted outside of the ellipse. It is therefore incumbent upon those who labor in the technology system to be as knowledgeable of these entities as they are about the other elements in the model. After all, these forces arise out of the institutions of the society (the culture) and are encountered in a variety of ways in our increasingly global culture. Whether they include resources, regulations, customer acceptance, or environmental restraints, they must be considered and often will significantly affect the direction, rapidity, and scope of change and solutions of the technical team.

THE CHALLENGE OF THE MODEL

Experience with the model has shown that it performs a vital service in explaining and defining technology studies. It is useful on various levels of education and in other areas of the public sector and the enterprise system. Yet, it is only a beginning. The exciting challenges that unfold may be exemplified by the following questions: Are there changes in the three major phases of the model and in the specific entities that could make the model stronger? What specific teaching and training content could be derived from the elements in the model as they are presented in static graphic form and from their envisioned interaction? Does the

model provide a guide to the selection of knowledge that may be considered core knowledge that is fundamental for all who prepare to study technology or who practice in one of its professions? Does the model accurately depict a central role and function for the technologist as a primary agent of change in society?

Answers to these questions have begun to emerge as this reporter and colleagues apply the model in teaching and applied research activities. If at all possible, these will be shared in a future report in this journal. In the meanwhile, readers are invited to "play" with the model and share any questions, concerns, constructive suggestions, and criticisms with the author.