

Readers' Comments

The Individual in Models and in Reality

Recently I was reading an article about a new approach to business management. It was a so-called system-oriented approach which borrowed quite a bit from electrical engineering and information theory. The structure of the corporation was depicted as a large electrical network. A servo system or a process controller, and the flow of information and the decisionmaking process was analyzed analogously to how one would analyze such a network.

What struck me most strongly about this analogy was the complete absence of the human element or of psychological factors. While it is true that mathematical models have a very important place in understanding the behavior of social systems, it must not be forgotten that human nature is the primary factor; and no matter how ingeniously one structures a corporation or organization, there is no way of avoiding this factor.

But the tendency to schematize and dogmatize is encountered in all areas of intellectual activity: in economic theory, in politics, in religion, and even in an exact science like physics. In the latter case one observes Nature through experiments, and then tries to reduce the mass of experimental data by constructing appropriate theories. The language of theoretical physics is mathematics, and sometimes theorists become so enamored with the beauty and relative simplicity of the mathematical formulation that they mistake the theory for reality, forgetting that Nature is what it is irrespective of the theories we might construct.

The tendency to dogmatize is a manifestation of a very important feature of human nature. Man is torn between the desire to investigate the unknown and a desire for tranquility, to set his mind at rest. The critical

thought-process involves two essential elements: comparison and decision. Without applying these, we are not thinking, but dreaming. In a dream the most astounding things can happen, simply because the comparison with reality, with that we know, is lacking. It is this comparison and decision (with consequent discarding of one of two conflicting possibilities) which makes thinking extremely hard work, whereas dreaming is not.

To escape the incessant work of thinking we have a large store of fixed decisions which we apply to most of the choices confronting us. If we had to think about every choice and make a conscious decision for each one, we would quickly go insane.

This aspect of human nature is of great importance for research and, in particular, for research management. But just as in business management, research managers sometimes become so engrossed with organizational charts and progress reports that they forget that progress in research is the product of *individual* brains. Except for the arts, there are few other fields in which one is so dependent on individuals.

Therefore, an important role for the research manager is to provide an optimum environment for the individual scientist. In view of what was said earlier, optimum must mean an environment which provides adequate stimulation to overcome the natural tendency to intellectual laziness, but which at the same time provides adequate opportunity for capitalizing on achieved results in a routine manner so as to maximize the feeling of achievement (an important motivation for most scientists) for a given amount of intellectual effort.

The correct balance between novelty and routine varies widely from individual to individual, and re-

search management should take this fact into account. As there is a practical limit to how many persons a manager can know well enough to assess where the correct balance lies for each individual, a clear implication is that the authority to direct the scientific work should be delegated downward as far as possible. Indeed, a large portion of this authority ought to rest with the individual scientist.

The success of research has been most spectacular in the United States, and since teamwork has been a watchword in American-style management, there has arisen in Europe the widely propagated belief that success in research is best attained through a centralized organization, where all authority is held by a few persons at the top, thus insuring that the whole organization operates as a unified team. Considering the already outmoded, autocratic structure of European management in general, this belief is most harmful. Whereas the team in research should provide the environment where the scientist is optimally stimulated through contact with the other members of the team and where he, as an individual, can work most efficiently (e.g. through sharing of expensive equipment etc.), the European version of the team tends to become stifling. It does not provide much motivation as all authority, and thereby effectively all responsibility, has been removed from the individual scientist, and there is no allowance for the different temperaments and abilities of the members of the team. It is a prime example of the dogmatic attitude mentioned earlier, which substitutes a schematic, rigid model for the much more detailed and ever changing reality.

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