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Free for All—Factors Making for Implementation Success and Failure

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(though requested) was generally not specified. Sixty-five percent of the programs were written in Fortran; 20 percent in Cobol; four percent in PL1 and two percent in Dynamo. Time sharing is rare at this point.

Seventy-eight percent of the models were developed without the direct use of outside consultants. Where used, consultants assisted, primarily, in setting out the objectives and plan for model development.

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Factors Making for Implementation Success and Failure

The gap between brilliant management science solutions and the translation of these solutions into practical and profitable management action has, of course, long been recognized. Certainly TIMS has been concerned about this problem since the organization was founded.

Despite the persistence of the problem and its increasing importance, there has been little hard-fact research on either causes or cures. For the most part, the discussions in the professional literature has been conceptual, and usually begin by complaining about how little research has been done on the problem of implementation.¹ More important, most of the research that has been done on this problem relates implementation success to factors over which the management scientist himself has little influence [3]. For the most part, these studies seem to be passing the buck to the organizational theorist or the behavioral scientist [6][4]. They seem to be saying that if these disciplines would only do their thing, all management science solutions would be smoothly and successfully implemented [5]. Without exception,¹ the available hard research focuses on one factor—on management support, on the need for participation by operating management, and more recently on probing the psyche of line managers [5][7][8].

Our own experience in the field made it possible for us to examine the question from another vantage point. We regard an assignment as a failure if it does not achieve implementation. We are, therefore, continually concerned with improving our ability to select assignments and manage them in a manner that improves our implementation batting average. To do this, we need criteria that will improve our ability to predict whether our work with a particular client on a particular problem will—if we do our part—end with the implementation of the solution we develop and recommend, and to guide our work toward that practical and profitable end.

With this in mind, we undertook an analysis of thirty-one companies with whom we have worked in the past five years. First, the senior members of our organization developed a list of factors that they considered relevant to the decision to implement, and we then studied every company for whom information on these factors was available. This was the only criterion applied in the selection of this sample. There was no professional vanity involved: of the thirty-one companies studied, in eleven cases the client did implement our recommended solution, while in eight we did not achieve implementation. The remaining twelve fell somewhere in between.

¹ [4], p. 1ff. This recent and thoughtful review of the literature on implementation opens with a statement on "the paucity of literature on the subject . . ."

In only one sense is this sample not a random one. Companies that come to us do so for the most part because they know something about our work that indicates to them that we are committed to pragmatic and practical applications of a wide range of advanced techniques that incorporate all of the appropriate tools of management science [6]. In that sense we are identified as problem-solvers, rather than as management scientists committed to any particular disciplines or techniques. Thus, all of the companies represented in the sample were self-screened in one dimension—they were looking for state-of-the-art solutions to problems rather than for conventional approaches.

Why Study Implementation?

Why study empirically the very practical and somewhat mundane problems of implementation? Obviously, because this is the real-world problem that confronts management science and management. Anyone who has selected management science projects and conducted management science studies has, inevitably, developed some “gut feel” criteria that he associates with acceptance and implementation of the recommended solution. One purpose of this study is to put some of this kind of information into codified form. Without trying for any mathematically elegant answers, what we hoped to accomplish was the following:

1. To test the validity of our own criteria, and thus to improve our ability to select projects that are likely to succeed.
2. To assess the relative importance of different criteria and to find what weight should be assigned to each in selecting management science projects and in structuring our approach.
3. To convert the hard-earned intuitions of old-timers in this field into predictive techniques that should help younger men in management science and in management to make more knowledgeable decisions about when to embark on management science applications to management problems.
4. To offer management some basis for knowing in advance the factors that will lead to a solution to their critical problems.

What we really want is a way of looking at management science as a management tool, and we want to be able to apply the same kind of return-on-investment thinking that we do in the purchase of any tool. To do that, we have to know more than we now know about the factors influencing implementation.

Procedure

I want in all modesty to disclaim any sophistication for the research techniques or the level of statistical sophistication applied in this study. For those of you who routinely apply advanced management science techniques to your research, or read the research of others through eyes accustomed to sophisticated analytical procedures, this study offers no breakthroughs in research design or technique, and no nice quantitative precision in its analyses.

What we frankly set out to do, and what we feel we have accomplished, was to explore the problems of implementation and the factors related to it, starting from subjective judgments of our group based on its experience with the problems of implementation. We ask you to keep in mind that all we set out to do was to probe the ingredients of the experience of a management-science-oriented group, and to define in more detail than has heretofore been available in the literature the ingredients that appear to us to go into the management decision to implement—or not to

implement—recommendations that reflect appropriate application of management science to management problems.

For all of its limitations, the study has already helped us as practitioners of management science to improve our batting average. We present these results here in the hope of encouraging others to take up the challenge of applying more sophisticated research techniques and more objective and quantifiable information to these very important problems that we have tried to come to grips with in a preliminary way.

We began our study by asking five senior members of our group to think more specifically about what we mean by the decision to implement. For our purposes we decided, after much soul-searching, to settle for three categories:

1. *Implementation success.* By this we mean a decision by management to implement the recommendations of the management science team essentially without significant modification. In these cases, the solution achieved the objectives as defined.

2. *Partial implementation.* By this we mean decisions to implement a modified version of the recommendations. These are cases in which the modifications, in our opinion, applied the results of the management science effort but chose a solution that did not accomplish the objectives as originally defined. These managements were in effect settling for something less than a real solution to the problems posed at the start of the project.

3. *Implementation failure.* In these cases management either made the decision to deal with the problem in some manner other than that recommended by the management science team, or to take no major step to solve the problems that the management science project was designed to deal with.

On the basis of this classification of implementation results, the sample of thirty-one companies on which we are reporting today includes:

1. Eleven implementation successes.
2. Twelve partial successes.
3. Eight implementation failures.

Having thus structured our sample, we then asked our five senior people, each of whom has had experience in leading a number of these projects, to draw up a list of factors that in their experience were associated with management decisions to implement the recommendations of the management science team. In the course of the study, some of these factors were eliminated because they proved to be applicable in only one or two instances which we considered peculiar to particular situations. In presenting the results of the study, we will comment on some of these factors, but our analysis is based on factors that fell logically into three main categories:

1. Management Characteristics (See Exhibit A).
2. Characteristics of the Problem (See Exhibit B).
3. Characteristics of the Management Science Team and the Solution (See Exhibit C).

Each of our five "seniors" was asked to rate each of the thirty-one cases on each of these factors, using a ten-point scale from +five to -five, to indicate his estimate of the presence or absence of these factors as positive or negative influences on the decision. Our study is still under way. The following are the results of the analyses we have completed to date.

General Findings

Our survey demonstrates quite convincingly that the group of factors identified in this study—taken together—are strikingly correlated with implementation success.

This appears to be demonstrated quite clearly by the findings. Our total rankings of these thirty-one cases range, on a scale of 100, from +100 to -38. All but one of the successes rated above 53. The single exception was a company in which the management science team was able to bring extraordinary pressure to bear on management.

Among our twelve partial implementers, eleven had a total rating of 45 or less. The other case was a company whose management made the decision to have its in-house engineering staff undertake the implementation itself in order to expose the staff to the difficult learning process involved in implementing sophisticated solutions. It was this management's decision that the risk involved was worth the learning their staff achieved and they willingly paid the price in the diluted quality of the implementation.

EXHIBIT A

Management Characteristics

Sophistication

Do they have the experience of previous success with developing and implementing sophisticated approaches to problem-solving?

Do they accept the longer time it takes for these approaches?

Do they recognize that sophistication affects the authority and responsibility of people in the organization, and that they will have to handle these problems?

Management Style

Are they future oriented?

Are they sensitive to environmental change and its requirements?

Is their climate favorable to innovation?

Is conflict within the organization regarded as a positive catalyst for innovation?

Decision-Making Orientation

Does management insist on quantitative criteria in assessing alternatives?

Is the importance of interrelationships between activities appreciated as well as the significance of trade-offs?

Does management include a long-term dimension in its decisions?

EXHIBIT B

Characteristics of the Problem

Nature of Objectives

Is the problem area one in which management is willing to be challenged?

Does management identify the problem area as of major importance to the profitability and growth of the business?

Does the problem deal with the more effective use of substantial resources already committed or certain to be committed?

Is there an alternative decision-making approach that has proven to be reasonably productive?

Are the objectives of the management science solution realistically broad?

Manner in Which Objectives are Stated

Are they explicit even when intangible?

Are they quantified as far as possible?

Are the activities involved in the problem tangible and measurable?

EXHIBIT C

Characteristics of the Management Science Team and the Solution

Sensitivity and Responsibility

Did the management scientists accept responsibility for achieving successful implementation?

Were they sensitive to organizational motivations and priorities?

Realistic Recognition of the Difficulties of Implementation

Did they recognize the range of skills required?

Did they recognize the technical problems involved in achieving an operating reality?

Did the approach and the solution demonstrate an awareness of the "people problems" posed by implementation?

All of our "failures" had total ratings of 9 or less, with one exception. In that case a very stubborn management insisted on a solution quite inconsistent with the findings of the management science study and incompatible with its recommendations.

The high correlation of implementation success with total ratings on the factors we identified is confirmed by the finding that the median rating for the "successes" was 66; for the "partial successes", 39.5; and for the "failures", -1.5.

Our second general conclusion is that implementation success is not a function of any one cluster of characteristics. This is illustrated in Exhibit D which summarizes our findings in terms of ranges and medians. The range of rankings of the successful companies is about the same for each cluster of characteristics. The same is true for the range of ratings of the partial successes and of the failures.

A close inspection of the data confirms the fact that while the companies with the highest total ratings achieved this by virtue of high ratings in all three categories, there are some high-total rated companies whose ratings in one category, or even in two, may be lower than the ratings in these same categories for companies whose total was intermediate, or even low, and thus associated with only partial implementation success or with actual failure. Conversely, there are companies with low total ratings—ratings associated with implementation failure—whose ratings in one of the three categories were actually as high as the ratings in that same category achieved by companies in our highest total-rated group, the group of implementation successes.

EXHIBIT D
Range and Median (in parentheses) of Implementation Factors

	MT 34 to -18 (10)	PR 33 to -13 (13)	MS 33 to -18 (15)	Total 100 to -38 (41)
Success	34 to 7 (27)	33 to 7 (23)	33 to 7 (24)	100 to 21 (66)
Partial	20 to 4 (9.5)	23 to 3 (13)	20 to -15 (16.5)	58 to 2 (38)
Failure	8 to -18 (-4)	17 to -13 (-1)	7 to -18 (1.5)	20 to -38 (-1.5)

If we may rephrase slightly the title of a popular song of another decade, what our study seems to show is that "it takes three to tango." We find little reason for agreement, in other words, with those who seem to be saying that strong top management support is, in and of itself, any assurance that a management science solution will be implemented. We are equally unimpressed with those studies of implementation that seem to link success specifically with either the kind of problems studied or with the management science approach applied. Our study seems to us to demonstrate quite conclusively that combinations of factors in all three of these categories are the real-world correlates that can improve our ability to predict successful implementation of management science solutions.

Management Characteristics

The range of ratings in the management characteristics we studied was from +34 to -18; with the successful implementers ranging from 34 to 7; the partial successes, from 20 to 4; and the failures, from 8 to -18. There was thus a significant overlap in the range of these ratings as related to implementation success. On the other hand, the median rating for the successful companies was 27; for the partial successes, 9.5; and for the failures, -.4. Thus, while there is this broad statistical relationship between management characteristics and implementation, we find no reason to conclude that implementation can be successfully predicted or accomplished on this basis alone.

What is true of these management characteristics as a group is equally true of particular characteristics of management, though some are more highly correlated than others with implementation success. In fact, the highest correlation anywhere in our study was between management's confidence in the capabilities of management science to develop successful solutions to company problems and the decision of management to undertake the implementation of these solutions. So compelling was this correlation that as it manifested itself early in the study, we decided to eliminate from our sample those companies that had an impressive history of successful implementation of management science solutions to problems. Obviously, to include such companies in the study would have tilted our findings. Accordingly, the sample we are analyzing is made up of companies whose decision to implement is not based on first-hand familiarity with the potential impact of management science solutions on profitability and on growth.

What we did observe in this study, therefore, is confirmation of the fact reported elsewhere that companies with experience in sophisticated problem-solving do apply that sophistication to management science implementation solutions. Conversely, in virtually all instances of failure to implement, management lacked conviction in

advance of the study that management science was likely to lead to a solution to their problem.

Closely related, and also showing a very high correlation, is management's attitude toward innovation. In every one of the projects that were implemented, management had created a climate that encouraged innovation throughout the organization. Again, looking at those companies that failed to implement, we found prevalent a generally negative attitude toward actions involving the kind of bold attitudes that encourage the breakthrough mentality, as contrasted with the climate that favors waiting until someone else has tried a new approach and proved that it is all it claims to be.

We thought that this might be related to management's attitude toward getting action and getting results. We looked therefore at the dimension of management sophistication that is reflected by patience or impatience. There are quicker ways—though not usually as effective—to get action than is usually offered by a management science solution. A management that wants results tomorrow does have simpler techniques available. Actually, this correlation was not as high as we would have expected.

We looked closely at a cluster of management characteristics that we have broadly termed "management style" and found that these turn out to be quite diagnostic. Nine of our eleven "successes" were what we call "future-oriented managements," managements that attach high importance to where they want the company to be at various points in future time. All but one of them were sensitive to changes in the environment and committed to doing whatever it takes in order to live with environmental change. And related to this is the fact that these implementers of management science had created a climate in the company that views cautiousness with disfavor and does not excessively punish failure.

A third cluster of management characteristics we grouped together under the heading of "decision-making orientation." A commitment to fact-based decision-making is certainly a good place to start a positive attitude toward the acceptance of management science, and all but one of our "implementers" practiced this kind of decision-making in the organization. On the other hand, a respect for facts is not enough to guarantee acceptance of management science solutions, as evidenced by the fact that some of our "non-implementers" also seemed to have a healthy respect for fact-based decisions. I think what we are saying is that management scientists sometimes regard their solutions as the only solutions that conform to the facts. What has to be recognized is that traditional industrial engineering was also fact-based. What is needed is a perception of the difference in the kind of facts we are talking about—as this difference relates to acceptance or non-acceptance of these solutions.

More critical is the characteristic of decision-making that relates to the ability to see solutions in terms of trade-offs. This was a characteristic in which our implementers rated very highly. On the other hand, seven of our eight non-implementers had low positive or negative ratings in this characteristic.

Problem Characteristics

It has been apparent to us for some time that the kinds of problems to which management science techniques are applied, and the objectives defined, can play an important part in the decision to implement the solution we recommend. For that reason, it has been our practice to screen clients as carefully as we can in order to avoid undertaking projects in which the nature of the problem itself made it less than likely that

management would decide to implement the solution. Despite this screening practice, our study shows that in the sample we analyzed there are still important differences in the characteristics of the problem that do have a significant bearing on success or failure. In fact, in several cases in which our recommendations were implemented, the characteristics of the problem were sufficiently favorable to implementation to outweigh management and management science factors that were otherwise only moderately correlative with the decision to implement.

Obviously, implementation is more likely when management identifies the objectives of the study as of major importance to the objectives of the business. In fact, in all of the failures, this factor was rated negative. A special case of this characteristic of the problem emerged in those instances in which the study concerned the use of substantial resources already committed or certain to be committed by management. Typical were those cases in which management had made the decision to build a new facility or to undertake a major refurbishment of an existing facility. Management scientists concerned with implementation would do well to select such problems as those involved in the design of new distribution facilities, for example.

In our experience there is one important qualification of this finding of our study that explains some "low successes" or some "failures" even when the problem involved the use of newly committed resources. Sometimes management will call in an architect to design a building and then assign to a management science team the problem of structuring the mode of operation within the structure as designed. It takes a strong management and a skillful management science team to reverse the accepted designs of the architect under these circumstances.

Sometimes a problem is one that lends itself readily to more conventional approaches, requiring less bold decisions and more modest management commitments. This tends to diminish the positive influence of the problem on the decision to implement a management science solution. On the other hand, there are business problems that do not readily respond to traditional approaches. Distribution is a case in point. The complexity of the distribution problems facing most companies, the proliferation of products and the segmentation of markets, and the increasing importance of customer service, are problems that conventional industrial engineering—applied on an activity-by-activity basis—can really not solve. These kinds of problems tilt the balance in favor of implementation.

Our survey also shows that in seven of eight "failures" the objectives of the problem-solving effort were either too narrowly conceived or too global. In every one of our "successes," the realistic scope of the objectives was a positive factor in favor of implementation, usually ranking high or medium in degree.

Explicitness of objectives, tangibleness, and quantifiability were other characteristics of the problems in this sample that had a significant favorable effect on the decision to implement the recommended solution.

Management Science Approach and Solution

Many studies of the problems of implementation have emphasized the relation of the management science team to those responsible for implementing their solutions. Our study confirms the importance of this relationship. In four of the six "failures," the characteristics of the approach and the solution had a significant negative effect on the outcome; and in the other two, the rating of these factors was barely positive. On the other hand, in the successful cases the approach and the solution received consistently high ratings. However, the management science effort also received high

ratings in several of the low successes, sufficiently high to raise the total rating to the level associated with implementation success.

A critical factor identified in this study is the acceptance by management scientists of the responsibility for achieving successful implementation. In all but two of the "successes," this factor had a medium or high positive rating while in no one of the "failures" was it highly positive.

Closely paralleling the significance of this factor is the question of whether the management science team and the solution they developed reflected a sensitivity to the motivations and priorities that existed in the organization. In the successes, this factor rated high or medium positive in ten of eleven cases.

In all of the instances in which the solution was implemented, the approach and the solution reflected realistic recognition by the management science team of the difficulties to be expected in implementing the solution. These included the technical problems of converting the solution into an operating reality, the skills and disciplines required, and the people problems. Significantly, in all but one of the failures, the sensitivity of the management science team to people problems received a negative rating.

Conclusion

This study suggests strongly that if we want to be more successful in applying new techniques to new technology of existing problems, either of two alternative courses of action will significantly improve our results. One thing we can do is to use the kind of information developed in this study to pick the kinds of managers and the kinds of "experts" who are more likely to get results, and define our problem areas in a way that is likely to increase our chances of getting successful action. This will enable us to focus our energies on efforts that are likely to lead to significant solutions.

The other alternative is to identify the human and organizational problems in advance, and take whatever action is necessary to deal with them effectively in a way that will assure effective action on these critical problems. It is in this way that the kind of study here reported provides a framework within which many more specific studies of implementation factors can find a productive application.

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