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THE MANAGEMENT RESOURCE AND AGRICULTURAL MARKETING

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I define management in the Marshallian utility concept. Thus, I like Simon's tendency to make it synonomous with "decision making."[1/] I honor such definitions as "management is the decision and control of resource allocation," "management involves decisions on how resources will be used between alternatives at a given point of time and between alternatives over time," or "management may be considered as synonomous with planning and coordination." But the straightforward idea of putting the whole thing up to the buzz saw of decision appeals to my practical approach.

A thread of continuity has forced classification and priority into modern definitions of management. This gives them much needed utility. Number of classes in these verbal hierarchies varies, but the effect is the same. Traditionalists have classified with planning and control; they had trouble with priority. John R. Commons with institutionalism set the stage for functionalism in management. We get classifications such as strategic, semi-strategic and routine decisions from writers like Ashby[2/] and Alderson[3/]. Such concepts elevate the comptroller function and modern mathematical approaches. Simon[4/] has gone modern and effectively used "programmed"

1/ Simon, H.A., The New Science of Management Decision, (New York: Harper and Brothers) 1960, p.1.

2/ Ashby, W. R., Design For A Brain (New York: John Witey and Sons, Inc.) 1952.

3/ Alderson, W. Marketing Behavior and Executive Action (Homewood, Illinois: Richard D. Irwin, Inc.) 1957

4/ Simon, op. cit., p. 5.

and "nonprogrammed" to sort among decisions and to build a detailed case for establishing priority.

This type of management has a long history, rather well recorded[5]. To be trite, it is merely another portrayal of a phase of modern life being moved from an art toward a science. A body of knowledge is being constructed; tools are accumulating. Permit me some broad liberties with a bit of history.

Early business history found management a one-man show--a man with wide experience from "coming up through the ranks". Smaller businesses dominated, often with subsistence the goal. Management reward was for the art of making the right decision in a majority of the situations at the right time. If the manager made the right "what" decision, his "how" decisions weren't crucial.

The Industrial Revolution fostered cost reductions. Managers with cost-reducing patents rose. Kraft, Borden, Swift and Kellogg were imprinted on the pages of management history. But industrial patents were soon to be butressed with economics, and economics came forth as a prominent tool of management made manifest in general accounting. Inventory of resources was formalized by the balance sheet; economic growth by the income statement; and operating procedures by the budget. A basis for science was appearing. Cost accounting refined this new science.

Operations planning, control and improvement were then subjected to the scientific approach of so-called industrial management. The father, Frederick Taylor, bore principles of management which still stand. Engineering thus gained entry. Taylor held that science could come to all phases of management including scientific selection and training of people, as well as scientific relations of workers to management and to each other.

Engineering and economics tended to develop a management science, but a piecemeal one. Mathematics and statistics along with high-speed calculators are today welding this piecemeal pattern into an over-all science of management. Such develop-

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5/ for instance, Merrill, H.F., Classics in Management (New York: American Management Association) 1960

ment parallels scientific automation of production and distribution.

Scientific management does not displace the manager. In fact, its fastest growing aspect is science of the manager himself--the so-called behavioral sciences. A major thrill of the future is its promise to integrate managers into management science.

The Uncomfortable Theorist

Boulding makes the point that the traditional firm theorist has a short tradition[6]. That classical economists should focus on the market system was logical; competition was to whip the individual firms in line. Businessmen have never embarrassed the classical theorist more thoroughly than by their tradition of making money while seemingly ignoring the marginal analysis. The Chamberlain-Robinson Revolution made more sense to the businessman, but some of the things said this time embarrassed him. Abbott and others have added some salve, but the facts are that a theorist in business management has usually been uncomfortable.

Cleland[7] says the theorist will remain uncomfortable unless he realizes that management is a positive force. Thus, the theorist must get inside the internal organization and consider the fact that administrative authority may act as an alternative to the market mechanism. Hopefully this will continue to come through the metamorphosis of Jacob Viner's skills concept, so amply buttressed by Boulding[8], toward the goals of a well-rounded theory of management. In fact, this metamorphosis may be approaching a climax as inferred by the work of Leavitt and Whisler[9], Newell,

6/ Boulding, K. E. and W. A. Spivey, Linear Programming and The Theory of the Firm, (New York: The Macmillian Company) 1960, Chapter 1.

7/ Cleland, S. "A Short Essay on a Management Theory of the Firm", Linear Programming and The Theory of the Firm, (K. E. Boulding and W. A. Spivey, New York: The Macmilliam Company) 1960, Chapter 7.

8/ Boulding, K. E., The Skills of the Economist (Cleveland: Howard Allen, Inc.) 1958

9/ Leavitt, H. J., and T. L. Whisler "Management in the 1980's" Harvard Business Review, Vol. 36, No. 6, (November-December 1958), pp. 41-48.

Shaw and Simon[10], and others.

The agricultural marketing theorist has had a grace period. First, many agriculturally related industries have lacked the concentration necessary to make traditional firm theory inappropriate. Second, the farm management bias of many marketing workers has focused their attention on the firm analysis rather than market system analysis. Moreover, conventional marketing problems have been couched in the price-making complex for which market system analysis has been helpful. Also, the agricultural marketing profession is new and an old tradition in firm theory was not necessary.

This grace period is about over. Concentration studies of several years ago, now buttressed on every side, suggest we heed the warning of Cleland. Farris[11] strongly urged in 1956 that we classify our marketing structures so as to focus appropriate tools on appropriate problems.

Businessman and theorist both respect Dewey[12] who set out the three classical, closely related, stages of problem solving as:

1. What is the problem?

2. What are the alternatives?

3. Which alternative is best?

Simon adapted these to decision making and called them, respectively, the intelligence activity, the design activity, and the choice activity.[13] Such terminology fits the modern twist with emphasis on improved information, activity programming, and basic choice indicators. It is held that these activities involve skills

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10/ Newell, A., J. C. Shaw, and H. A. Simon, "A General Problem Solving Program for a Computer", Computers and Automation, Vol. 8, July 1959, pp. 10-17.

11/ Farris, P. L., "Marketing Extension and Competitive Structure" Journal of Farm Economics, May 1956, pp. 597-602.

12/ Dewey, J. How We Think (New York: D. C. Heath and Co.) 1910, Chapter 8.

13/ Simon, op. cit., p.2.

"as learnable and trainable as the skills involved in driving, recovering and putting a golf ball." Moreover, this philosophy cuts across both programmed and nonprogrammed decisions. Not only the concepts but also the terminology of the current theorist is being promoted by the businessman, even with an assist from the military. This theorist has now become so comfortable that his comfort now makes him uncomfortable!

Baumol[14/] wrote a book developing this spirit as stated: "The last few years have brought with them a happy increase in rapport between the economic theorist and the managerial economist. This development has involved their simultaneous realization that business practice can be a fertile source of more abstract analytical ideas and the theorist's rigorous tools can make an important contribution to the analysis of applied problems."

The Decision-Making Complex

Simon has illustrated well the traditional and modern techniques that go with the programmed and nonprogrammed decisions of his formulation (Figure 1).

The programmed group in agricultural marketing is being tackled and work there is moving rather well.[15/] Operations research is part of most major research programs in agricultural marketing. We have some work on the place of electronic data processing and the food industry has increased research activity in this area materially within the last year. Unfortunately mechanization is the scope of thought of too many food industry managers in this area.

Potential savings from applied research and extension in this area is great. Merely shedding top management of the routine here would mean much. Sixty-four dairy

14/ Baumol W. J., Economic Theory and Operations Analysis, (Englewood Cliffs, N. J.: Prentice Hall, Inc.) 1961

15/ French C. E., M. M. Snodgrass, and J. C. Snyder, "Application of Operations Research in Farm Operations and Agricultural Marketing," Journal of Operations Research, September-October 1958, pp. 766-775.

Figure 1. Traditional and Modern Techniques of Decision Making

Types of Decisions	Decision-Making Techniques	
	Traditional	Modern
Programmed: Routine, repetitive decisions Organization develops specific processes for handling them	1. Habit 2. Clerical routine: Standard operating procedures 3. Organization structure: Common expectations A system of subgoals Well-defined informational channels	1. Operations Research: Mathematical analysis Models Computer simulation 2. Electronic data processing
Nonprogrammed: One-shot, ill-structured novel, policy decisions Handled by general problem-solving processes	1. Judgment, intuition, and creativity 2. Rules of thumb 3. Selection and training of executives	Heuristic problem-solving techniques applied to: (a) training human decision makers (b) constructing heuristic computer programs

Source: Simon, H.A., The New Science of Management Decision, (New York: Harper and Brothers) 1960, p. 8

plant managers spent 53 percent of their time on decisions that would not affect the firm for more than one week.[16] Reynolds[17] found that supermarket managers perform 23 routine functions, 14 semi-strategic functions, and only 10 strategic functions. Much work on mechanization of routine decisions is needed. Tentative analysis shows that current mechanization alternatives in data processing often break even on a straight labor-capital substitution basis. This suggests the great potential for these machines to aid decision making directly. A broad frontal attack must be made to take advantage of the low marginal cost for performing these activities.

Let me emphasize only two operations research techniques--linear programming and simulation. The first illustrates the broad field of mathematical formulation; the second a family of techniques in applied statistics. These are currently the most promising fields of operations research in agricultural marketing.

Linear programming has already shown its mettle. However, two recent developments deserve mention. Snyder[18] and others have put price making as well as price taking concepts within these models. Thus we have put back into demand and supply schedules the slope, so conspicuous by its absence in most marketing work using these techniques to date. Recent work such as that by Gomory[19], Dantzig[20], and Peart,

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16/ Hood R. W., "An Evaluation of the Economics of Product Selection Problems for Multi-product Fluid Milk Plants" (Unpublished Ph.D. Thesis) Purdue University, Jan. 1960

17/ Reynolds J.W., "An Evaluation of the Rate and Performance of Selected Owner-managers of Affiliated Indiana Retail Food Stores in Indiana," (Unpublished Ph.D. Thesis) Purdue University, January 1962.

18/ Snyder J.C., "Management Models of Mathematical Programming," (Unpublished Ph.D. Thesis) Purdue University, January 1962.

19/ Gomory R.E., "All-integer Integer Programming Algorithm," Research Report RC-189, IBM Corp. Research Center, Yorktown Heights, N.Y., January 29, 1960.

20/ Dantzig G.B., Discrite-variable Extremum Problems, Operations Research, Volume 5, 1957, pp. 266-277.

et. al.[21] on integer solutions allows the economist to go back to traditional cost accounting concepts of fixed and variable costs, so rudely taken away by assumptions of traditional linear programming. This could be the most fundamental change in mathematical formulation of economic problems since the simplex method.

Simulation must be mentioned in approaching programmed decisions by applied statistics. We recently worked on such a planning problem in a cheese manufacturing plant.[22] In this study Monte Carlo techniques were used so management could plan taking into consideration the extreme situations that can occur as a result of probablistic milk arrivals. This simulation of milk arrivals allowed management to plan in advance the labor requirements for cheese room operations. Results of various milk purchasing policies were also tested as well as efficiency of labor utilization under various policies.

Traditional analysis has not been able to incorporate explicitly into most models the stochastic characteristics of environmental factors playing on a management decision. In most analysis, especially in the so-called economic-engineering approaches, case studies, before-and-after illustrations, or replications were necessary to test the synthesis under operating conditions. Attempts to develop short cuts to gain the advantage of experience have been many; formal education has not been the least of these. Simulation through computers gives a promising approach most appealing to an economist.

This discussion may have overemphasized operations research but operations research is the basic modern development in this programmed decision area. Miller and Starr[23] defined operations research as "a continum of methods resulting from a funda-

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21/ Peart R.M., Isaacs G.W. and French C.E., "Optimizing Materials Handling Systems by Mathematical Programming," Paper 60-804, American Society of Agricultural Engineers, December 4-7, 1960.

22/ Glickstein A., "The Development of an Integrated Production Control System Through Simulation Procedures," (Unpublished Ph.D. Thesis) Purdue University, Jan. 1960

23/ Miller G. W. and M.K. Starr, Executive Decision and Operations Research (Englewood Cliffs, N.J.: Prentice Hall, Inc.) 1960

mental program of model building within the decision theory framework."

Nonprogrammed decisions may provide the most lucrative area of exploration for the young agricultural marketeer--stakes are high and state of arts low. Agricultural marketing firms, as well as industry firms in general, seem to have awakened recently to long range planning as have agricultural marketing researchers.[24] Yet this area has been traditionally, and is for the most part currently, an art based upon that elusive management quality of judgment. The work of Reynolds in supermarkets and the recent study by Milliken and the author[25] in fluid milk plants illustrate that management is cognizant of this type of decision, even if their approach to it leaves something to be desired.

Training in problem formulation and solving has increasingly been emphasized in resident and adult teaching by agricultural economists. Probably such traditional emphasis will continue to be our major attack on this area. Undoubtedly the developing management climate will give such training more opportunity for fruition. But skills for this type of decision do not have the build-in floor of a safe margin such as the programmed decision does. Programmed decisions have safety in an underpinning of rather simple psychological factors establishing habits. Unfortunately the psychological aspects of judgment are less understood and presumably more difficult.

Selection of personnel with high level skills in such problem solving has been an approach much underused in our field. Some agricultural firms are known to be borrowing from work such as that of McCormick, Blanchard, and Thomas[26] in farm production. Opportunity for much greater use of these selection techniques exists.

24/ Bock R.H., et. al., "Long Range Planning for Agricultural Marketing Firms," Purdue University Miscellaneous Publication, March 1960.

25/ Milliken D.B. and C. E. French, (Publication in progress)

26/ McCormick E.J., R.E. Blanchard, and D.W. Thomas, "An Objective Method of Selecting Farm Tenants," Purdue University Research Bulletin 678, April 1959.

Various studies such as that by Hood have shown that top management could free more time from programmed decisions for non-programmed ones. This is probably the most appropriate source of relief for this problem in the short run. Mechanization can do much here at low marginal cost.

In the longer run, we in agriculture must experiment with the modern heuristic problem solving techniques.27/ This intriguing work of studying how people make decisions by techniques using tape recorders and such devices suggests a whole series of approaches running analogous to what modern thought gives in consumer reaction. My bias suggests that exploration on the management decision area of production may have greater reward than such exploration in the consumption end. Yet, I applaud the work there as well.

Studies on how management makes decisions such as we have made merely by asking managers why they do what they do have been helpful. But the psychologists have cautioned us sternly about asking consumers "why". Let us use this lesson in production management analysis. Computer language is not as far advanced as some of its proponents claim, but it is moving fast. Mechanization in this area seems limited only by how fast the brain can tell the computer how the brain should be imitated. Agricultural marketing researchers have the responsibility to be conversant with the computer as a technique of research in this sense, as contrasted to viewing it merely as a machine for data processing.

Incidentally, a test of the rationality assumptions we so glibly use for describing both consumer and producer managers may be necessary in order to free us for objective research in these fields. Also, it is interesting to speculate on what we may uncover in the area of risk and uncertainty. Discovery is yet a major part of this field. Its existence has generally been shrouded by the traditional theory assumptions. It is a paradox that controls in the agricultural field have become a reality at the very

27/ Newell, op. cit. and Simon, op. cit.

time we try to escape using such controls by using more complicated techniques.

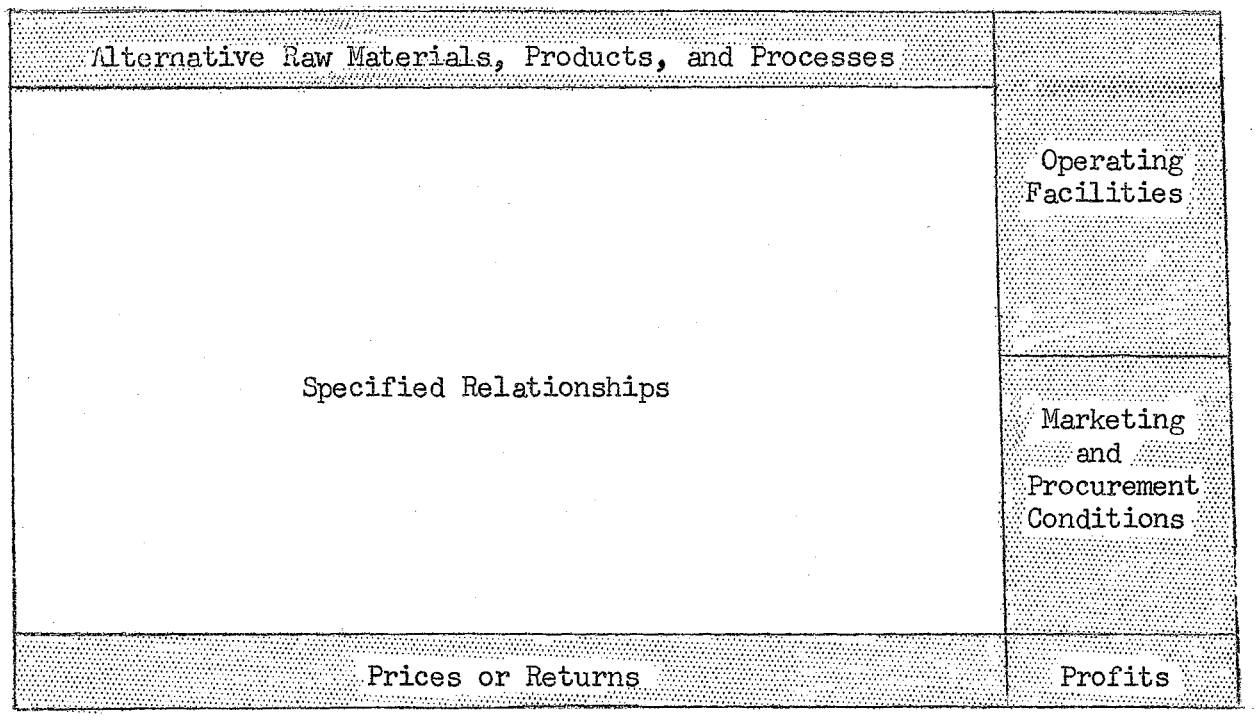
The Wedding

To deliniate the basic components of the management problem, modern literature has emphasized classification and priority. I have used it in my analytical model. Now, let me say that this useful approach runs a risk of eclipsing the most basic need in management today, especially in the agricultural area. We need a capacious concept of management. Today senses the interlocking of science. Our diversion of current thinking to emphasize divisions of management is paradoxical in its usefulness. Where we in agricultural economics go so unbridled in our subject matter as to risk losing our profession, we need this embracing concept of management. Thus, where I split the field for emphasis, I try now to wed it for effectiveness and direction. All classifications proposed are for convenience; the decisions actually form a continuum. The techniques and skills can be specialized, but their general utility in this area should be of greater concern to the student of management.

Information has come to the fore as the basic ingredient of this general approach. With enough information we can tie a programmed decision to an unprogrammed one. Planning feeds on control and vice versa. The feed back principle is a part of our age. Information theory in its broadest perspective encompasses so much more than seen by the traditional economic analyst begging for more coefficients so he can use an established model, more than seen by the risk-and-uncertainty analyst trying only to decide which items are insurable, more than seen by the structural analyst trying to break down a theoretical assumption of the classicalist, and more than seen by the top manager wanting to know where he has been. Ironically, the broad prospective has in many agricultural firms now placed the top manager in the shadow of his comptroller, whom top management considered only a necessary evil.

The agricultural manager needs relevant information--facts to be taken, not given. Information for decision making is rather complicated with several compcnents. (Figure 2) The most typical management problem deals with alternative sources of raw materials

Figure 2. The Complex of Information Needs in a Typical Agricultural Marketing Firm.



convertible by alternative processes into alternative products at varying rates. Moreover, these alternatives are subject to various limited operating facilities and usually limited market outlets or supply sources. The alternative raw materials, products, and processes have varying costs or values usually denoted by prices. A complicated set of relationships combine these many factors. Usually the objective is to choose a set of alternatives which will maximize profits.

The unshaded area (Specified Relationships) in Figure 2 represents the basic data mandatory for use by an up-to-date manager. Basically, these are operational in nature, essentially devoid of traditional economics. They are power requirements, machine speeds, product formulas, storage requirements, package size, and a myriad of such other data necessary to run a business.

The shaded areas tend to involve planning and control--items essentially managerial or economic in nature. These items tend to be stock in concept, often fixed over time and limiting in nature. These involve decisions of choice, especially in the long run. Labor qualities, machine capacities, market limits, and many other factors make up this group.

To focus attention on a piece of hardward and to say that is alters seriously the main stream of economic concept goes against the grain of any social scientist, let alone an economist. But the digital computer has diverted attention from professional partisanism. One may ignore a commercial voice such as that of Ralph J. Cordiner of General Electric who said "When the history of our age is written, I think it will record three profoundly technological developments: nuclear energy which tremendously increases the amount of <u>energy</u> available to do the world's work; automation, which greatly increases man's ability to use <u>tools</u>; and computers which multiply man's ability to do <u>mental work</u>. Some of our engineers believe that of these three, the computer will bring the greatest benefit to man." But realization that actual synthesis of thinking processes which parallel closely some thinking processes of humans is another thing. Professional research claims that "The potentialities

of a computer for flexible and adaptive cognitive response to a task environment are no narrower and no wider than the potentialities of a human "[28] do not go unheeded.

The computer will never be anything more than a machine, but an astounding machine it is. Humans will control computers, but complexity is a sign of our time. Unraveling of management complexes takes energy--humans are poor sources of energy (approximately equivalent to a light bulb). Computers can be programmed to ease the burden of management at many practical levels of decision and degrees of analytical sophistication. The mechanization process will tend to span this scale and cement widely diverted parts of the complex.

Writers such as Pfiffner and Sherwood[29] emphasize the unfortunate clustering at the poles of management approaches as they grapple with administrative organization. The need for a wedding has a practical ring. Agricultural firm people are not ready to absorb the output of the modern management scientist, even if such a scientist has approached in a professional sense the comfortable setting I pictured earlier. The crying need is for management-oriented people who are well enough acquainted with quantitative technique and automation in the broad perspective to interpret directly this promise and challenge for management. Our people were the last to industrialize; many are small; and they lack traditional management sophistication. We seek to blend an optimum mix from these modern concepts, traditional management approaches, and economic theory. We seek to fashion a positive management approach. This is the challenge of those interested in the management resource in agricultural marketing.

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[28] Simon, op. cit., p. 24

[29] Pfiffner, J.M. and F. P. Sherwood, Administrative Organization, (Englewood Cliffs, N. J.: Prentice Hall, Inc.) 1960