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Selling the American People

Advertising, Optimization, and the Origins of Adtech

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3 OPTIMIZATION TAKES COMMAND I: MANAGEMENT TECHNIQUE, FROM THE MILITARY TO MADISON AVENUE

To manage a business well is to manage its future; and to manage the future is to manage information.

—Marion Harper Jr., president, McCann-Erickson

Prediction is the goal of all operations research.

—William J. Horvath, Office of the Chief of Naval Operations

Marshall McLuhan began his 1951 book *The Mechanical Bride* with a scathing appraisal of advertising and cultural industries: “Ours is the first age in which many thousands of the best-trained minds have made it a full-time business to get inside the collective public mind. To get inside in order to manipulate, exploit, control is the object now.”¹ Over the next two decades, marketing management tried to fine-tune these efforts, enlisting even more of what elite universities, technical institutes, and military-funded science had to offer US capitalism. In 1962 *Advertising Age* welcomed “the new scholarly breed that has joined the advertising fraternity,” featuring one of its photogenic members in a flattering portrait.² Ithiel de Sola Pool was a professor at MIT and chairman of the Simulmatics Corporation, a company known for its involvement in the 1960 presidential election and, later, for its involvement in the Vietnam War.³ Simulmatics’ “people-machine” used computer simulations of voter behavior to advise the Kennedy campaign about communicating with parts of the electorate.⁴ The firm also simulated audience behavior to help advertisers decide how to spend their media budgets.

Advertising Age glamorized Pool's status as a jet-setting consultant—one day doing high-tech demonstrations for major advertisers and their agencies, another day advising the US Navy on classified matters of ordnance. But Pool was just one smiling face in a parade of calculative experts, or “math men,”⁵ who were already on the scene when advertising's “mad men” started their creative revolution. The business of influence was absorbing a brave new cohort “composed of mathematicians, scientists and professors in the behavioral sciences who are attempting, with the help of computers, to explore the great unknown areas in advertising.”⁶ As advertisers and their agencies went on engineering a consumer society, they accumulated mathematical expertise—some of the best-trained researchers in the world—and began to bend their ways of knowing and managing markets and consumers to match the capacities of what some people were calling the “mechanical brain.”⁷

Advertisements make up only a fraction of the “texts” marketers produce. Many more texts are created for internal audiences, to document, guide, justify, and narrate business activity. Advertising and marketing are calculative industries, deploying an arsenal of techniques to know the past, predict the future, and manage risk in the breach. Tim Wu calls Arthur Charles Nielsen the “grandfather of today's data geeks,” with good reason.⁸ As a leading market research firm and an important provider of information to the broadcasting industry, the A. C. Nielsen Company (ACN) was “an extensive and early user of IBM equipment,” employing punch-card machines to tabulate data about radio markets since the late 1930s.⁹ Eyeing dominance in the audience ratings business, Nielsen was quick to invest in a digital future.

In 1948 ACN contracted with the Eckert-Mauchly Computer Company to purchase “the first commercial adaptation of the Univac Electronic Computer.”¹⁰ J. Presper Eckert and John Mauchly were engineers involved in designing the ENIAC, one of the earliest general-purpose digital computers.¹¹ Eckert, hailed by *Advertising Age* as “the co-inventor of the computer,” recognized that the new technology held big implications for marketing, management, and scientific expertise. He speculated that sometime in the foreseeable future, marketing planning would “be handled by a psychologist who is a psychologist of the computer age, fully capable of relating his knowledge of human behavior to the machine”—a prescient if oddly worded forecast of today's behavioral data scientists.¹² The US Army commissioned the ENIAC to automate ballistics calculations. It is irresistible to point out that, since

then, advertising's approach to targeting consumers has been characterized by a shift from the indiscriminate blast of a shotgun to the precision of a carefully aimed rifle.¹³ Battle terms are common in advertising rhetoric. But advertising's relationship to weapon systems goes beyond metaphor and vocabulary. "As has often been the case," an advertising agency's research director noted, "engines invented for war have later become the tools of commerce."¹⁴

The first generation of digital adtech emerged at this nexus of defense spending, marketing management, and administrative science. Starting in the 1950s, parts of the advertising business became enchanted with a suite of technologies and technical experts that had been assembled during World War II and continued to enjoy financial backing as strategic assets in the American military-industrial-research complex. Computers, operations research, and related management sciences found a home in consumer capitalism. Together they stood for technologically powered economic and social progress. When writers in the *Harvard Business Review* coined the term "information technology" in 1958, they were referring to the integrated application of computers and operations research—what historian Ronald Kline calls "management technique."¹⁵ That concept passed out of currency, along with inflated hopes for the immediate revolutionary power of new information systems.¹⁶ But during its time at the forefront of US business culture, the definition of information technology as management technique left a lasting impact on the advertising industry.

Operations research (OR) is a mathematical science of optimization that uses models, algorithms, and other statistical means to help executives determine the best possible outcomes when facing complex decisions. It exemplifies the "intellectual technologies" for managing organizations and defining rational action that analysts like Daniel Bell expected to serve as the bedrock for an information society.¹⁷ OR exercised those intellectual technologies within the already knowledge-centric work of selling to the American people, and it did so at a moment when various conditions had magnified both the importance of marketing services and the pressures to systematize them. Corporate demand for quantitative methods of decision making helped motivate a lively subfield of OR dedicated to marketing and advertising. That technical discourse soon inflected particular areas of advertising management, though not without tensions. By 1963, the director of media planning and buying at J. Walter Thompson (JWT) observed that when people

talked about the “computer,” they were really invoking it as a metonym for the sea change represented by operations research. For him, OR was “a collective term covering all types of mathematical analyses of business problems: in our case, the problem of allocating media dollars in such a way as to maximize the return to the advertiser.”¹⁸

This chapter and the next examine how advertisers and their agencies attacked that problem in the 1950s and 1960s and, in the process, helped establish elements of a calculative culture that prefigured today’s data-driven advertising. The advertising business set its sights on optimization and began to imitate operations research and management science (OR/MS). Many of the largest advertisers and agencies in the United States established OR/MS units, and they hired researchers from elite universities as consultants as they implemented mathematical models and marketing information systems. Broadly, their mission was to increase efficiency and rationality in advertising decisions. They tried to achieve that, in part, by eradicating the incalculable—representing the parts of reality they cared about as quantities, probabilities, and formalized expressions. Through mathematical modeling and programming, this emergent class of technical experts formatted reality and decision processes to be amenable to electronic computers and optimal solutions. Advertisers and agencies saw in management technique the possibility to account “objectively” for all the behaviors and processes they wanted to predict, evaluate, and manage. Computerization and OR/MS promised new capabilities to plan rationally, act efficiently, and exploit value and profit opportunities that were inaccessible to traditional procedures. This was, by definition, a project of *quantification* and *rationalization*, and it helped motivate further *datafication* of behavior and social relations, as these math men demanded measurements to fill in or refine their models.

Eradicating the incalculable is a dream, of course. But the tendency to act as if the whole of existence can be counted and computed has had real consequences. Caitlin Zaloom observes a similar process related to the accommodation of electronic technologies in commodity futures markets. Zaloom explains that while the work of designing systems to approximate economic ideals, like rationality, is never perfect or complete, “the long-standing and ever-changing project of creating purely economic spaces is not merely a fantasy. The drive to improve the conditions of economic action leads to the making and remaking of new technologies, reformed rules, creative calculation practices, and emergent classes of professionals who bring the market

into being.”¹⁹ Advertising’s use of management technique was selective, self-serving, and overhyped, but the pursuit of optimization via information technology became a forceful vector in the evolution of media and electronic marketplaces. The calculative evolution did not progress thanks to the undeniable elegance of mathematical proof; it was a political project, where the authoritative language of models and scientific discipline disguised normative choices about what and who counts (and who does the counting).

MATH MEN COMETH

Philip Mirowski calls OR “the unloved orphan of the history of science.”²⁰ Critical studies of media and advertising have scarcely acknowledged its existence.²¹ Yet OR/MS influenced theories, design features, practical techniques, and computational dispositions that now power digital advertising. Adtech’s mechanics and its ideology of optimization belong to the lineage described in this chapter. Digital advertising platforms are automated incarnations of what operations researchers and management scientists started dreaming up in the 1950s and 1960s.

OR emerged as a disciplinary force in the United States after dedicated refinement of decision-making technologies during World War II. “The war produced a series of ‘managerial sciences,’” explains historian Nathan Ensmenger, “including operations research, game theory, and systems analysis—all of which promised a more mathematical and technologically oriented approach to business management.”²² Paul Edwards describes OR as “the first and most successful of the emerging system sciences,” adding that it was “largely responsible for the concept of ‘optimality’ in logistics.”²³ While its characteristic techniques were also applied in areas such as agriculture,²⁴ wartime experiences made an impression on many of the researchers and executives who carried OR’s mythology, and its funding, into the cultures of US business and business education.²⁵

Computers were a central part of that package, both as calculative tools and as conceptual resources for picturing markets and organization as matters of information processing. “Oddly, a good deal of the early history of AI [artificial intelligence] took place in the basement of a business school,” Herbert Simon reflects. That particular business school, at the Carnegie Institute of Technology, was home to operations researchers at the forefront of advertising optimization. “In that setting, and in the decade after 1955, the

tools of AI were applied side by side with OR tools to problems of management."²⁶ Universities and corporations (e.g., General Motors, General Electric, IBM) helped propagate these approaches, as well as an appreciation of their supposed potential, by hosting seminars where executives could learn from operations researchers and management scientists. A brochure advertising one such course at MIT in 1959 described the paradigm shift: "Building on the development of electronic computers, on military advances in understanding decision-making and in using simulation to solve complex systems, and on twenty years of research in feedback control systems, we may now develop new ways to analyze the industrial enterprise."²⁷

OR adapted techniques from mathematics and physical sciences to predict and control the behavior of organizations and sociotechnical systems. Its association with respected disciplines provided legitimacy that proponents leveraged to justify its application as a generalizable toolkit for rational planning and decision making. As a systems analysis manager at IBM put it in the *Harvard Business Review*, "It is now clear that the same reasoning processes which have led to notable progress in the physical sciences can be applied to marketing, and that marketing 'laws' can be derived in the same manner as the laws of physics."²⁸ A 1964 essay about emergent methods for classifying consumers and predicting their behavior suggested that "the probabilistic approach to developing complex marketing models has strong parallels with the methods of nuclear physics."²⁹ Instead of tracing particles and their collisions, marketing scientists would observe consumers and trace their collisions with all the forces that influence buying behaviors. One marketing professor said the collective methods associated with OR "refer to the attack of modern science on probability type problems which arise in the management, and the control of men, machines, materials, and money in their natural environment."³⁰ This was a decidedly eclectic pursuit, applying "all branches of scientific endeavor to solve problems." OR groups often "include[d] engineers, logicians, physicists, accountants, biologists, and statisticians as well as various types of business executives."³¹ The director of research and information services at a large advertising agency concluded that, for many corporate researchers, "it will be somewhat arbitrary whether they work in the physical sciences or the marketing and advertising sciences since the concepts and tools will appear so similar."³²

While cautious advocates warned against applying OR to unsuitable problems, many urged an ambitious program of study and intervention. As Edwards explains, "This extension of mathematical formalization into the

realm of business and social problems brought with it a newfound sense of power, the hope of a technical control of social processes to equal that achieved in mechanical and electronic systems."³³ As an analyst from the US Office of the Chief of Naval Operations argued in 1948, "this idea—that the scientific method be applied to the study of complex human operations—is as important to the continued economic and social improvement of a technological society as any single physical discovery."³⁴ Michael Halbert, a marketing consultant and soon-to-be OR specialist at DuPont, defined OR in a way that showcased its capacity to reduce almost any process to a numerical measure of value or efficiency. OR, he said, "considers the system [e.g., a business] as an operating unit, constructs a model (usually mathematical), and attempts to optimize some desired performance characteristic such as net profit, return on investment, machine down time, inventory cost, or the ratio of enemy units destroyed."³⁵ Simon gave OR/MS a simply staggering remit: "Joining hands with AI, management science and operations research can aspire to tackle every kind of problem-solving and decision-making task the human mind confronts."³⁶

By the mid-1950s, OR was "fast becoming" a commonplace in corporate life.³⁷ "With faith that scientific sophistication amounted to moral progress," one historian explains, business professionals "accepted the claims of [OR's] advocates, believing that science could help them eliminate the use of intuition in decision making, standardize routine decisions, render the future more predictable and controllable, improve planning, and integrate complex operations."³⁸ OR's industrial migration had powerful supporters and a gee-whiz appeal that excited the press. In 1953 *Business Week* observed "something like a concerted drive by statisticians, professors, and consulting firms to push the use of statistics deeper into business."³⁹ The statistics described here were not the descriptive tabulations executives had leaned on for decades. These were more exotic inferential techniques for knowing and organizing the world. An accountant at the Rand Corporation took an inventory of OR's repertoire, listing everything but the kitchen sink: "probability theory, symbolic logic, decision theory, queuing theory, linear and dynamic programming, game theory, information theory, Monte Carlo techniques, simulation theory, etc."⁴⁰ With these techniques, commercial analysts were "giving hard arithmetical values to things that have always been considered intangible."⁴¹

OR's presence was first felt in areas of business that closely resembled its military applications: inventory management, production scheduling,

financial planning, and logistics, including warehousing and transportation routing. George Kimball explains that “these problems all involve a flow of materials and information through a network of channels.”⁴² Analysts and executives soon wondered whether advertising and marketing could be defined in similar terms. Firms using OR to rationalize manufacturing and distribution spanned numerous industries, including petrochemicals, automobiles, processed foods, paper products, and more. Some of these companies were among the largest advertisers in the world. For them, there was an obvious appeal to finding new efficiencies in marketing, which was a rapidly growing expense across US and transnational capitalism and an increasingly central element of corporate management.⁴³

OR/MS IN ADVERTISING: EARLY APPLICATIONS

Operations research went into business as a “severely practical” discipline of problem solving and decision making.⁴⁴ In 1947 Charles Kittel, a physicist at MIT, called OR “a scientific method for providing executive departments with a *quantitative basis for decisions*. Its object is, by the analysis of past operations, to find means of improving the execution of future operations.”⁴⁵ One of its signature features, he suggested, was that it frames problems in terms of “exchange rates,” or “the ratio of output to input for a given type of operation, as measured in suitable units.”⁴⁶ In other words, it focuses on return on investment. As advocates outlined a program for OR’s industrial expansion, they acknowledged the potential to assess and fine-tune the efficiency of advertising.⁴⁷ In the first volume of the *Journal of the Operations Research Society of America*, Philip M. Morse of MIT pointed out that “*search theory*, developed for air and sea search for submarines and other vessels, has numerous applications in the problem of the optimum distribution of sales or advertising effort.”⁴⁸ Kimball, who coauthored with Morse the first US textbook on OR, also saw parallels between military and marketing operations. In the mid-1950s Kimball argued that mathematical models derived from Frederick Lanchester’s “formulation of the problem of combat” had been used “with great success to describe the effect of advertising.”⁴⁹

Not everyone was convinced of OR’s novelty. A researcher at the Leo Burnett agency complained that OR draped “fancy verbal clothing” on what agencies and advertisers already did—apply the scientific method to study

markets and consumers.⁵⁰ Peter Drucker went so far as to claim that OR's "tools of systematic, logical, and mathematical analysis and synthesis . . . differ very little from the tools used by the medieval symbolic logician, such as St. Bonaventure."⁵¹ But others argued that OR's focus on *systems* and its more sophisticated mathematical techniques constituted something distinct from existing forms of market research.⁵² OR was presented as a quantitative and generalizable method for approaching discernibly optimal decisions. Market research was complementary but far more modest and descriptive. Noting operations researchers' tendency to raise questions that market researchers couldn't answer and to agitate for data they didn't have, a professor at the University of Chicago surmised that "if all operations analysts were shot at sunrise tomorrow, company market researchers would live longer and die happier." But the organization would be worse off for the loss, he said.⁵³

Some emphasized OR's innovations while also acknowledging its lineage from scientific management. Horace C. Levinson argued this position from an authoritative vantage point. Levinson was chairman of the National Research Council's Committee on Operations Research, which sought to promulgate OR throughout corporate America. Starting in the 1920s, after earning a PhD in mathematical astronomy, Levinson applied his skills to marketing problems. His work for Bamberger's department store in the 1940s was later described by a researcher at the Young & Rubicam agency as "probably the earliest reported attempt at applying operations research to advertising."⁵⁴ Without naming Levinson, a pamphlet from the committee he chaired praised the pioneering effort to analyze "the difficult problem of determining the pulling power of certain important types of department store newspaper advertising."⁵⁵ Pulling power, here, meant return on investment, or "*the amount of sales produced per dollar of expenditure,*" and the analysis focused on ads that generated an immediate response, so-called R-advertising, which Facebook and others might now call "performance" ads.⁵⁶ OR techniques, the pamphlet boasted, brought the problem "to actual numerical solution."⁵⁷ The committee made a point of disclosing that these investigations were conducted by a theoretical astronomer, implying that the management of this complex operation owed not just to domain knowledge but also to a scientific attitude and a particular quantitative acumen—a commitment to systematic optimum seeking.

Even earlier, in the 1920s, Levinson had worked for a mail-order retailer. He explained how direct marketing is uniquely suited to optimization via OR:

A small mail-order house offers ideal opportunities for business research or, as it is called today, "operations research." In such a business, all the important data are quantitative. Buying habits of customers are easily studied, for, with few exceptions, every bit of sales action can be traced back to its source, namely, printed matter of some sort that is dispatched to former customers or prospective future customers. Each catalog, each order blank, and each newspaper or magazine advertisement carries its own code designation so that the sales it produces can be readily identified. All in all, the nature of the business is such that it lends itself almost ideally to experimental techniques, so that new and promising ideas can be tested at relatively little cost.⁵⁸

This is a harbinger of digital advertising from one of the first practicing operations researchers in the marketing field. More attachments to direct-mail marketing will surface shortly (and throughout this book).

Publicity credited OR with an impressive record in advertising during the 1950s. Success stories were often drawn from experiences at firms such as Arthur D. Little Inc. (ADL), a venerable research and management consultancy and a vehicle for OR evangelism.⁵⁹ In 1949 ADL organized an OR unit to serve industrial clients, in partnership with faculty at MIT and Columbia University, including Morse and Kimball. A decade later, a director from the group reported that they had completed "numerous marketing studies," which generally involved attempts to measure the influence of advertising on sales, statistical analyses of market potential, and studies of consumer behavior.⁶⁰ Other consulting firms reported similar experiences. An analyst at the Lybrand, Ross Bros. & Montgomery accountancy said in 1960 that most of his firm's OR work was still of the "bread-and-butter" variety (e.g., production scheduling, shipping and warehousing). "But," he added, "a large number of requests have come in from our clients, and this number of requests is increasing all the time, to study their marketing budgets and the allocation of them. . . . We are assisting some clients to interpret statistical information they continuously obtain, to develop systems of collecting proper information for their purposes and, beyond that, to build models for evaluation of the way they allocate their marketing dollars."⁶¹

Large advertisers paid particular attention to budgeting. They were intrigued by the potential for mathematical formulas to improve on intuitive judgment or simplistic policies such as setting advertising expenditures as a percentage of the previous year's sales. That sort of budgeting practice was widespread, but it effectively meant that sales caused advertising, and corporations wanted to demonstrate exactly the reverse. Operations researchers

claimed their methods could translate evidence of customers' "fundamental behavior pattern" into means of "predicting how the customer will in fact behave."⁶² They promised to discern, and thereby manage, the relationships between marketing efforts and marketplace events.

One of ADL's first triumphs supported Levinson's perceptions about the suitability of OR tools for direct-mail marketing and their important continuities with scientific management. OR is about controlling the behavior of systems. Its application to manufacturing and physical distribution tended to be straightforward, since those systems comprised elements that were relatively easy to measure and manipulate—machinery, inventory, and, in some cases, even workers. As companies and their consultants tried to extend managerial control over *marketing* systems, they needed to account for consumer behavior within their calculations. This involved recourse to stochastic and probabilistic models. Operations researchers saw opportunities to analyze advertising effects by conceptualizing purchasing behaviors, such as brand loyalty or switching, as a Markov process—basically, a way of representing the probability that agents in a certain category will make a change in state across some time interval. In this case, that meant representing the probability that customers would stay loyal to the brand they bought last time or switch to a different brand. As analysts from ADL explained, this way of seeing "provides a means for organizing the description of market behavior to permit application of powerful technical apparatus."⁶³

In 1950 ADL's OR group was consulting for Sears, Roebuck and Company, whose mail-order catalog was an American icon, sometimes called the "Consumers' Bible." ADL employed operations researchers from MIT, its Cambridge neighbor. In 1956 that group included Ronald A. Howard, a graduate student whose eventual work on Markov decision processes made major contributions to the AI method of reinforcement learning. In 1978 Howard said that ADL's use of Markov processes for Sears was still the only successful application of the technique, and it was this experience that sparked his interest in that area of study.⁶⁴

Sears was trying to determine the optimal policy for mailing its catalogs. The company's existing protocol was basically as follows: Sears reviewed the recent purchase records it kept on file for somewhere around ten million customers, and based on this analysis, the company determined which of those customers to include in the current mailing. The objective was to maximize the expected immediate profit by identifying the most responsive

customers. ADL's innovation was to account for profitability over a longer horizon by calculating the probability that sending or not sending a catalog would contribute to a change in a customer's behavioral pattern, such that they would become a more profitable customer. To put it more technically, each customer was classified into one of about fifty categories, based on previous purchases; each of those categories represented a certain amount of profit to the company; and each customer was assigned some probability of transitioning to a different category (and thus becoming more or less profitable) in the future. That transition probability was thought to be sensitive to marketing efforts. The OR solution for Sears was to choose a policy that would increase customers' overall transitions into more profitable categories and thus generate higher returns over subsequent periods.

Importantly, in relation to the prior discussion about the building blocks of a calculative evolution, Howard's recollections stress the importance of Sears' information system. "In fact," he says, "it was the existence of this system that made the entire approach feasible." As Howard describes it, this "unforgettable" system consisted of "two or three acres of green steel filing cabinets" containing customer profiles encoded on punch cards; a workforce of "about a 100 young women [who] continually circulated among the filing cabinets," updating those purchase records, which were attached to Addressograph plates for each customer; and a machine that read the "quantized" information represented by the holes punched in each card and determined automatically whether or not to address a catalog to the customer.⁶⁵ The OR group used this sociotechnical assemblage—the machine, Sears' information records, and the labor of its gendered data processors—to calculate the transition probabilities for the Markov analysis and thus decide how to treat each customer based on their predicted profitability.

Other marketers experimented with these sorts of probabilistic methods, although often without the luxury of immediate feedback from identifiable customers. Around the same time, the petrochemical giant DuPont used a similar tack to calculate which consumers or industrial customers could most profitably be targeted with advertising.⁶⁶ A research manager from the Benton & Bowles agency viewed this as a productive shift in perception. He told a group of his peers, "perhaps the single most important contribution of Markov chains to marketing is the way in which it forces us to change our point of focus. . . . It's concerned with the *dynamic aspects of market behavior*." He

said his agency was “doing a considerable amount of this type of analysis” in 1960.⁶⁷

Formatting consumption behaviors in mathematical notation, management scientists tried to establish relationships between advertising investments and the profits attributable to them, to formalize “optimization calculations” (i.e., choosing the best advertising policy from among several alternatives), and to anticipate the effects of changes in marketing strategy.⁶⁸ Early work with Markov processes had definite drawbacks; it relied on unrealistic assumptions, and obtaining data to inform credible probability calculations was not easy or cheap. In fact, it was prohibitive for companies without the formidable infrastructure of a Sears, Roebuck. But these were early efforts to sort and evaluate consumer populations according to their sales potential and the probability that they will act in certain ways. “The Markov process is a simplification of how a consumer actually behaves,” MIT’s Richard Maffei admitted, “but real data can show how well this kind of process describes what really happens.”⁶⁹

Designs to optimize advertising were also passed along in the business curriculum. This book opened with a quote from Albert W. Frey, president of the American Marketing Association in 1961. From 1947 to 1961, the Dartmouth University professor authored three editions of a textbook whose scope is suggested by its title—*Advertising*. By the third edition, its focus fell intensively on advertising and marketing *management*, which meant “attempts to maximize company profits and to meet other objectives by programming the optimum quantitative and qualitative mix of purchase-inducing components in the light of market opportunities.”⁷⁰ Frey said that executive judgment had been “improved considerably” through recent innovations in high-speed computing, the quantity and precision of available data, and intellectual technologies like “behavioral research techniques, operations research, mathematical programming, systems analysis, and experimentation of various types.”⁷¹ Among the most promising applications of OR, he said, was solving optimization problems related to advertising allocation.⁷²

ASSEMBLING EXPERT COMMUNITIES

Whatever mathematical method was favored, devising more rational advertising policies was a growing priority for large manufacturers of consumer

and industrial goods. *Business Week* reported how DuPont had turned to OR in its search for “a scientific way to fix ad budgets to yield maximum profit.”⁷³ A leader in this effort was Charles K. Ramond, DuPont’s manager of advertising research. Ramond went on to serve as the technical director of the Advertising Research Foundation (ARF), a professional association created in 1936 by the Association of National Advertisers and the American Association of Advertising Agencies. Ramond was also the founding editor of the ARF’s *Journal of Advertising Research*, established to reinforce advertising’s scientific credentials and address disciplinary concerns. Writing in the journal’s first issue in 1960, Ramond took stock of the mysteries confounding advertisers (following the convention of presuming that anyone in authority in business is a man): “Who knows the return on his advertising investment? His optimum media combinations? His right themes?” With these animating questions, Ramond framed the journal’s agenda in terms that appealed to the mode of knowledge pursued at DuPont. “The task of the marketing scientist,” he wrote, “is the prediction of consumer behavior.” Through experimentation and refinement, management could gradually solve any lingering mysteries and irrationalities: “there will simply be better advertising decisions—measurably better.”⁷⁴

The ARF was a catalyst for this work, hosting regular liaisons between applied and academic researchers. Its fourth annual conference in 1958 focused on mathematical techniques for understanding the economic impacts of advertising. For some speakers, this was a chance to hand out congratulations. John F. Magee, a senior analyst at ADL, crowed about his firm’s successes: “we have worked out ways of predicting the effect of advertising changes on profits and these ways are being used. Ten years from now, I believe we will pretty generally be able to predict the effect of advertising on profits and we will be able to use these predictions to design efficient advertising programs.”⁷⁵ For other speakers, however, this meeting was an opportunity for a wake-up call.

Jay W. Forrester, a professor of industrial management at MIT, told the attendees that they needed to do better. He complained that “much of so-called advertising research is itself merely advertising.”⁷⁶ Noting that advertising “is a powerful and important influence in our present-day economy,” he stressed the geopolitical urgency of scientific progress: “The challenge and new frontier in our capitalist society during the next three decades is not space flight, but the science of management and economics. It is in

management and economics, not on the moon or Mars, that the current international competition will be won. The American corporation is the heart of the American economic system. How well we fare will depend on how well American corporate management understands its job."⁷⁷ Forrester saw advertising as critically important but in desperate need of rationalization. "I doubt that there is any other function in industry," he surmised, "where management bases so much expenditure on such scanty knowledge."⁷⁸ Forrester insisted that "intuition is totally unreliable" for the management of dynamic marketing systems. "We must turn instead to methods developed in the study of engineering and military-weapons systems."⁷⁹

Forrester spoke as an admitted outsider to the advertising industry. Others at the conference had more skin in the game. Russell L. Ackoff and John D. C. Little represented an OR group at what was then the Case Institute of Technology. They were already consulting for large marketers such as M&M Candies.⁸⁰ Ackoff and Little promised no panaceas, but they expressed "the firm conviction that many of the basic problems of advertising strategy can have more than a little light thrown on them by the type of application of scientific methods that has come to be known as *Operations Research*."⁸¹ They used these methods to measure advertising effects and return on investment and to formulate procedures for selecting the most efficient media placements. Companies were intrigued by OR's potential, even if they did not grasp all its details. An executive from Standard Oil of Indiana reportedly said of Ackoff, "I'm not sure what he's selling, but I want to buy some of it."⁸²

Throughout the 1950s, then, a distinctive professional community began to establish some particular means for determining advertising effectiveness and optimizing media selection. More precisely, two communities that were committed to solving these respective problems—advertisers and advertising agencies—invested in technical experts and knowledge-making practices that promised authoritative solutions. A class of management scientists who applied their methods to marketing was taking shape in research firms and universities and hiring out their skills to industry. Before the end of the decade, they found additional institutional support and some organized opportunities for exchange.

THE ARF'S OR DISCUSSION GROUP

From 1959 to 1965 the ARF convened an OR discussion group in New York City. Leading US companies were represented up and down its membership.

The group's first chairman, Michael Halbert, was an OR specialist at DuPont and had previously been a research associate at the Case Institute of Technology. Across a dozen meetings, the group assembled delegates from firms spanning much of the American economy (table 3.1), as well as staff from the Department of Agriculture and the Weapons System Evaluation Group of the US government.

Table 3.1

Partial list of organizations represented in the ARF's OR discussion group.

| | |
|--|--|
| Consumer goods | General Mills Johnson & Johnson M&M Candies National Biscuit Company Pillsbury Scott Paper Company |
| Advertising agencies | BBDO Benton & Bowles D'Arcy J. Walter Thompson Ogilvy, Benson & Mather Young & Rubicam |
| Accounting/management consultancies | Alderson & Associates Arthur Andersen and Company Arthur D. Little Inc. Lybrand, Ross Bros., & Montgomery McKinsey & Company Price Waterhouse |
| Computer, research, information, communication/media | CEIR General Electric IBM Rand Corporation RCA Laboratories Simulmatics Corporation Time Inc. |
| Petroleum/petrochemicals, pharmaceuticals | Atlas Chemical Industries Imperial Oil E. I. du Pont de Nemours & Company (DuPont) Smith, Kline & French Socony-Mobil Oil Union Carbide Corporation |
| Higher education | Columbia University Harvard University Massachusetts Institute of Technology Princeton University Stanford University University of Pennsylvania |

Participants discussed a range of OR projects conducted by their organizations, although corporate secrecy inhibited an open scientific exchange. More generally, the gatherings promoted the use of “mathematics as an aid to management decisions.”⁸³ As of 1961, more than one thousand transcripts of the group’s first five meetings had been requested by researchers and managers, which the ARF considered “remarkably high interest in matters so complex.”⁸⁴ By its ninth meeting in November 1963, the group had forty-three members.⁸⁵

Information, science, and technology were once again part of the repertoire advertising could draw on to assert professional authority in US capitalism—at a time when the efficient management of consumption seemed like an urgent necessity and a compelling reason to leverage or invest in technoscience. By the middle of the twentieth century, as one observer reports, it was well established that “accurate knowledge of the characteristics of consumers and markets, of the relative effectiveness of appeals and media, is indispensable to present-day advertising and marketing.”⁸⁶ Advertisers demanded research services, and almost all agencies claimed to be providing cutting-edge expertise. Agencies’ research activities varied in rigor and verve, but it was common sense by then that companies needed “aids more scientific than one man’s opinion” to cope with the scale and complexities of marketing and media businesses.⁸⁷ Because clients essentially shared decision-making responsibilities with their agencies, including the ultimate determination of how to spend clients’ money, those agencies also absorbed pressures toward rationalization and optimum seeking. “Research personnel need thorough backgrounds in statistics and the behavioral sciences,” a 1961 textbook advised.⁸⁸ An article in the *Journal of Marketing* later confirmed that “research departments in advertising agencies have taken the lead in developing algorithms that produce optimal solutions to media mix problems.”⁸⁹

CALCULATIVE AGENCIES

Computerization and OR shifted the composition and culture of the advertising business. An appetite for data and analytical muscle and an increasingly scientific cadence in management values were reflected in the development of research services, which were growing at a faster rate than advertising services overall. From 1950 to 1964 the amount agencies spent on research, as a proportion of total expenses, increased by 50 percent.⁹⁰ The largest agencies led this general trend, as well as the particular gravitation toward management sciences (table 3.2).

Table 3.2
 Partial list of top advertising agencies, 1955–1970

| Agency | Year formed | Domestic billings (millions) / Rank | | | | Notable clients |
|---|-------------|-------------------------------------|-----------|-------------|--------------|--|
| | | 1955 | 1960 | 1965 | 1970 | |
| J. Walter Thompson | 1877 | \$172 / 1 | \$250 / 1 | \$351.5 / 1 | \$436 / 1 | <ul style="list-style-type: none"> • RCA • Scott Paper • Lever Bros. |
| Young & Rubicam | 1923 | \$166 / 2 | \$212 / 4 | \$306.1 / 2 | \$356.4 / 2 | <ul style="list-style-type: none"> • Johnson & Johnson • General Foods • General Electric • Procter & Gamble |
| Batten, Barton, Durstine, & Osborn (BBDO) | 1928 | \$162.5 / 3 | \$232 / 2 | \$292.7 / 3 | \$324.4 / 3 | <ul style="list-style-type: none"> • DuPont • American Tobacco • U.S. Steel |
| McCann-Erickson | 1930 | \$132 / 4 | \$216 / 3 | \$270 / 4 | \$246.5 / 7 | <ul style="list-style-type: none"> • Republican National Committee • Colgate-Palmolive • General Motors • National Biscuit Company |
| Leo Burnett Company | 1935 | \$69.2 / 5 | \$116 / 6 | \$184.7 / 6 | \$283 / 4 | <ul style="list-style-type: none"> • Kellogg's • Marlboro • Pillsbury |
| Benton & Bowles | 1929 | \$68 / 6 | \$114 / 7 | \$130 / 10 | \$139.3 / 15 | <ul style="list-style-type: none"> • Procter & Gamble • Philip Morris |

Source: *Advertising Age*.

Young & Rubicam (Y&R) formed a dedicated OR unit in 1961. Before that, the agency was engaged in what its research director Peter Langhoff called “the seat of the pants operations research school.”⁹¹ By the mid-1950s, Y&R began experimenting with OR methods for media selection. Martin K. Starr, a professor at Columbia University and a consultant to Y&R, reported on some of these experiences in a textbook coauthored with David W. Miller, a colleague at Columbia and later a consultant to JWT.⁹² Starr had been invited to Y&R by Langhoff, who reportedly admitted, “I don’t know what OR is all about, but I’m sure that it’s something we need.”⁹³ Langhoff hoped OR would increase the presence of the physical sciences in advertising research, and Y&R brought Starr into the office on a weekly basis starting in around 1956.⁹⁴ Starr helped develop a computer-supported media selection algorithm, and he collaborated for decades with Bill Moran, a research manager at Y&R who had previously worked at Pillsbury and later became the director of market research at Lever Brothers—two giant advertisers and early advocates of OR/MS.

BBDO invested in OR around the same time Y&R did. The agency hired Charles L. Wilson as its director of research in 1959, and Wilson hired David B. Learner a year later. Learner began developing a linear programming (LP) approach to optimal media selection, working with computing and data resources from CEIR. LP is an optimization technique for finding the maximum or minimum value of some target criterion, or objective function, subject to constraints. Learner had been exposed to LP in his previous job at General Motors, one of many companies that hosted seminars with marketing and business researchers. One of the seminars Learner attended was led by Abraham Charnes of Northwestern University and William W. Cooper of the Carnegie Institute of Technology. Charnes and Cooper went on to rank among the most decorated management scientists in the United States. Charnes was short-listed for the Nobel Prize in economics in 1975, and Cooper was the founding president of the Institute of Management Science (which later merged with the Operations Research Society of America). In 1982 they shared the John von Neumann Theory Prize for their contributions to OR/MS. Learner met them again in 1961 at a summer course at the University of Michigan, and soon thereafter the group went to work on an LP-based media optimization model.⁹⁵ Charnes and Cooper collaborated with BBDO researchers for many years, funded in part by the Office of Naval Research, the US Army Research Office, and the National Science

Foundation.⁹⁶ They helped BBDO refine later iterations of its media optimization model (LP II) and devised predictive models for marketing new products. By the late 1960s, they proposed that they work on retainer as continuing consultants.⁹⁷ Minutes from an April 1968 meeting show that the agency's first priority for Charnes and Cooper's ongoing efforts was "immediate adoption of LP II as a working component of day-to-day operations in BBDO."⁹⁸

BBDO established a Marketing Science Department in 1971. It was founded by the agency's director of research services, an MIT-trained Bayesian statistician who eventually became the CEO of BBDO Europe. He described the department in retrospect as "a remarkable business commitment to the utility of OR in Marketing."⁹⁹ A senior vice president of marketing sciences later claimed that BBDO was "participating in the expansion of behavioral statistics," building directly on work at major centers such as the University of Michigan and Bell Labs.¹⁰⁰

As mentioned earlier, the J. Walter Thompson Company saw OR and computers as interlinked. In an internal report dated January 1, 1963, management discussed the computer system the agency had ordered and the OR techniques it might use to take advantage of this new technology. JWT expected to use the machines for media planning and consumer research, as well as for routine accounting and administration. The agency had already retained the consulting services of Professor David Miller, whose writing partner, Martin Starr, helped Y&R develop its computer-based optimization model. However, the company expressed misgivings about what its peer agencies were doing: "We have not been satisfied that any of the much touted approaches to the use of electronic data equipment in media planning would accomplish what was claimed and, in fact, might dangerously cause reliance to be placed on mechanical findings from assumptions fed into the machines which are actually not subject to quantitative measurement."¹⁰¹ Despite that sober note, by the late 1960s JWT had implemented an "integrated system for media planning," which culminated in the "computer production of an optimized schedule"—pretty closely resembling the techniques its rivals used for media selection.¹⁰²

A 1970 memorandum from JWT's New York office acknowledged the need for both "a functional unit of specialists in psychology, statistics, operations research, etc." and specialized quantitative help from technology and information service vendors.¹⁰³ By then, JWT's London office had already organized an Operational Research Unit ("operational research" was the

British term). Its director explained in 1967 that “the method and the discipline” of OR could be applied to many marketing operations “with at least equal effectiveness” as in its uses for production, distribution, and inventory control.¹⁰⁴ He expected OR to increase the intensity and sophistication of market research and analysis. “Operational Research,” he said, “feeds on data and already a massive amount of information has been collected about markets, and marketing operations which will serve as a base on which to work. . . . [I]ncreased use of operational research will lead to calls for more market data and probably for more precise and detailed knowledge of markets than has been available in the past.” The culmination of applying OR to marketing would be the construction of a “total marketing model” that could specify relationships and predict outcomes with unprecedented detail.¹⁰⁵ His vision was consistent with active discussions about using management information systems and computerized “nerve centers” for adaptive control.¹⁰⁶

This is an important reminder that OR/MS work was not exclusive to the United States. British operational researchers designed some of the first quantitative advertising models, although they focused almost exclusively on print advertising, reflecting international differences in media industries. For example, researchers from London’s International Wool Secretariat developed an early model for “optimum geographical distribution of publicity.”¹⁰⁷ Drawing inspiration from the natural sciences, other researchers tried to model advertising effects based on analogies with physiological stimulus-response and epidemiology.¹⁰⁸ With the help of a physicist from the Royal Naval College, they developed an “electronic simulation of advertising response” to predict coupon returns and assist with media planning.¹⁰⁹

Without diminishing the international scene, this book focuses on US approaches to advertising optimization, which were the most widely publicized at the time. Even a researcher from the London Press Exchange admitted in 1970 that BBDO’s linear programming model was the “best known [mathematical] formula approach” to media selection and that Y&R’s offering appeared to be “the most ambitious of all media models.”¹¹⁰ (Both are discussed in the next chapter.)

By the mid-1960s, then, OR/MS techniques were becoming ordinary and authoritative in parts of the advertising industry. “Over the past decade,” the director of information systems at Benton & Bowles wrote in 1966, “the roles of Management Science and Operations Research have grown, under the salient influence of computer methodology, from a modest experimental

project state to a full scale systems state." Researchers and managers, he noted, were tackling larger and more complex problems with new analytical resources: "Techniques such as mathematical programming, simulation, Bayesian analysis, multivariate analysis, and Markov analysis have become everyday production and research tools to the Advertising Industry."¹¹¹

Some saw broad significance in what agencies were doing. Writing in *Journalism Quarterly*, the manager of research development at Leo Burnett celebrated the "role of advertising research as a catalyst" for systematic knowledge and techniques of persuasion.¹¹² He admitted that advertising "seems like a most unlikely spawning ground for a new behavioral science," noting that "a good deal of advertising research practice remains today what it has been in the past—a pseudoscientific rationalization for advertising expenditures." But he detected a transformation: "The successes of modern cost accounting, production planning, inventory controlling procedures and other 'management science' methods have created a new climate in American business. Businessmen feel a new need for rational understanding of the business processes for which they make major expenditures." With all this disciplinary expertise being assembled around practical business problems, "the polyglot jargon of behavioral science and communication theory is being distilled to produce a pragmatic language for decision makers."¹¹³

POLYGLOT JARGON: A LANGUAGE OF POWER

Management technique venerated certain classes of problem solving and problem solvers. "With the computer comes a small army of mathematicians and scientists, new terminology, new media outlooks and attitudes," one journalist observed. "As with anything new and unknown, there also comes fear."¹¹⁴ As Y&R's Langhoff put it, "today's prophets are heard voicing the new vocabulary—the vocabulary of management science. For marketing men, this verbal veneer can have a disturbing, even a threatening ring."¹¹⁵ One such prophet, a senior vice president at the Kenyon & Eckhardt agency, looked forward to the emergence of "a 'marketing elite' . . . primarily concerned with the new social, behavioral and mathematical sciences," who would be fluent in "sophisticated techniques" such as "operations research models."¹¹⁶ A 1960 profile remarked with some fascination on his habit of using words like "'feedback,' 'maximize,' 'input,' 'output' and 'optimum.'"¹¹⁷ When *Sponsor* took stock of "the new vogue in media vernacular" a few

years later, it listed “automation,” “data processing,” “linear programming,” and “memory drums” among the terms of the trade.¹¹⁸

Seasoned professionals sometimes resented this jargon’s invasive influence. Puzzled and annoyed, the director of TV and radio at a Detroit agency pulled together a partial lexicon of this “almost mysterious language.” He called it “a form of cant” used by specialists in media, research, and other areas of the business “to make what is said or written unintelligible to persons outside the group.” Among many examples, he noted the tendency for media buyers and sellers to take inspiration “from the language of warfare.”¹¹⁹ Similarly, an executive at General Mills disparaged the growing trend toward “almost automatic” media selection, calling it “Malarkian Media.” He was skeptical of specialists in “numerical manipulation” who were rising through agency media departments. “We all know that, in spite of mountains of numbers to the contrary, media is nowhere near the exact science it is frequently made out to be.” Shielded by the dazzling promises of the computer age, “Malarkian Media blots out questions of substance with little columns of numbers.”¹²⁰

Critics of management technique were understandably defensive. Rationalization threatened the autonomy and status of advertising professionals who benefited from their personal relationships with customers and clients, the perception that they possessed unique instincts and experiences, and the use of intangible metrics that left enough room to dodge responsibility for disappointing or unprofitable campaigns. A mathematical science of optimization implied that these subjective factors could be objectified and commanded by management systems. The naysayers quoted above recognized that this new language and numeracy were levers of power, conferring a cultural legitimacy on these specialists and protecting their claims from critical adjudication by nonexperts. Computer analysis, for example, implied an intimidating gravity. According to the media manager at Y&R, “There seems to be something very final and very impressive about the computer’s output. The little printed numbers often appear to overrule the soundest judgments of the most capable marketing man, even when the data that produced the numbers are open to serious question.”¹²¹ One observer pointed out that some managers without mathematical expertise tended to “treat operations researchers with a ‘halo effect.’ Individuals who can manipulate symbols, use computers, refer to the proper mystic and mathematical concepts, and arrive at solutions are accorded status.”¹²²

These anxieties indicate the struggles surrounding change. Agency media and research departments were experiencing a local version of broader shifts in quantitative knowledge making.¹²³ Some regarded the prominence of mathematical models and the imitation of “more mature disciplines” as indices of marketing’s elevation into a legitimate “branch of empirical science.”¹²⁴ Philip Kotler, for example, welcomed the language of “higher mathematics.” But he also recognized “the danger . . . that mathematics might be used by some to lend authority to some essentially ill-conceived decisions.” He warned against careless or cunning uses of jargon: “Marketing men will be subject to further mathematical name-dropping in written reports and at their conventions—cybernetics, information theory, econometrics, distributed lags, Bayesian decision theory, and so forth. Although these terms stand for perfectly good ideas, they should be viewed as part of a larger plan to advance knowledge, and not just represent verbal glibness.”¹²⁵ A market researcher at Xerox agreed, writing in 1966, “‘OR’ and ‘mathematical models’ have become catchwords; they have become ‘in’ types of activities. In our world of market research, where the norm is to use semi-scientific techniques in inappropriate ways, people are particularly vulnerable to the latest gimmick that will lead them from the wilderness of their own lack of self-confidence.”¹²⁶ Some hoped that as corporate executives were “increasingly drawn from the ranks of science and engineering,” advertising agencies would no longer be able to “abuse” statistics and self-serving research.¹²⁷ But as a former management scientist from BBDO put it, “We all know how to bludgeon managers into quiescence with technotalk.”¹²⁸ The present state of affairs in digital marketing suggests that “technotalk” remains a forceful bludgeon.

Even sympathetic observers complained that OR was overhyped and misused. The ARF’s Charles Ramond was a fierce proponent of using science to bolster the credibility of advertising. He even recommended the imitation of physical sciences as a means of “virtue-by-association.” But he also admitted that advertisers usually lacked vital knowledge about the efficacy of their investments. This “chronic information deficiency” left them exposed to any discipline promising solutions to their problems, an affliction he called “galloping panacea.” He called OR the latest and gravest “epidemic” of this sort. Its apostles seemed to be peddling “a magic formula” for advertising, heralding the eventual replacement of “flesh-and-blood practitioners with the smug certainty of decision-making computers.”¹²⁹

This was a reasonable critique. OR presented itself as a mode of technocratic optimum seeking that could be generalized to solve almost any decision problem. Not surprisingly, that attitude created conflicts within organizational hierarchies. "What we are seeing," explained a market research director at Pillsbury in 1962, "is the development of the 'elite of logic and mathematical precision' because of the nature of mathematical and computer technology." While he celebrated the rising importance of these elite mathematical experts, he feared that their new technologies would not be exploited to the fullest unless OR was adapted to the practical realities of management.¹³⁰ Marketing managers often lacked the time, wherewithal, or even inclination to search for truly optimal solutions. They would usually just *satisfice*, or settle for a less-than-perfect choice that met some minimum threshold.¹³¹ One study concluded that a decision maker is typically content with "a solution he can justify (or rationalize) to his superiors, 'sell' to his peers, and pass on to his subordinates with the assurance that they will consider it logical and acceptable enough to act upon it in a predictable way."¹³² Operations researchers faced the reality that acceptance of mathematical designs would be won not simply by their logical merits but rather on the basis of organizational politics, culture, and trust. According to the market researcher from Pillsbury, "The important thing is not the rightness or wrongness of the recommendation, but how the decision-maker feels about it."¹³³

For people like Donald Longman, director of research at JWT and American Marketing Association president in 1963, the treatment of OR as a "fad" was impairing its development.¹³⁴ The patience and rigor required to build better models, collect better data, and refine OR in advertising competed against the day-to-day demands for problem solving from companies and managers. "The best thing we can do for our customers," one consultant said, "is the kind of research that will lead to better decisions later, rather than putting out fires today." But he acknowledged the counterpressure arising in commercial technoscience: "If your boss's boss comes in and says, 'I want to know what's wrong in Topeka with the ad campaign we started last week,' you can't very well [*sic*] say, 'Don't bother me, I'm doing a ten year research project.' You try to find out what happened in Topeka."¹³⁵ Likewise, DuPont's Halbert strongly endorsed efforts to gather better information to feed into computer models, but he conceded, "we can't sit back and wait for the millennium when we have perfect data."¹³⁶

Other critics were more devastating. A. S. C. Ehrenberg referred to OR modeling and optimization methods as “Sonking, or The Scientification of Non-Knowledge.”¹³⁷ He lampooned OR with a series of “scientific laws,” including, “*The Law of the Ignorant Problem-Solver*,” described as someone with no understanding of the topic but an irresistible urge to optimize, and “*The Law of Perpetually Promising Pseudo-Probabilistic Paraphernalia*,” where analysts fish for insights with impressive but inappropriate statistical methods.¹³⁸ Referring to stochastic models of purchasing described by several management scientists, Ehrenberg wrote, “if these authors actually knew anything factual about consumer behaviour, they have successfully kept it both from their readers and from their models.”¹³⁹

These barbs may have raised eyebrows at the Royal Statistical Society, but it is not hard to imagine an industrial consultant shrugging them off. “The operations research worker,” wrote one such consultant, “typically is willing to use any or every analytical technique at his disposal which shows promise of helping solve his problem.”¹⁴⁰ OR consultants were offering their clients what Bernhard Rieder calls “interested readings of empirical reality.”¹⁴¹ Careful theory building and even causal explanation sometimes conflicted with that ruthlessly practical mission. One marketing professor admitted that picking predictive techniques based on convenience, rather than any motivating theory, “is not to be belittled in solving a company problem where the criterion of goodness is, ‘Does it work?’”¹⁴²

This orientation prefigures some hallmarks of commercial data science, where the search for useful patterns and correlations motivates indiscriminate data collection and promiscuous analyses. Understanding why something happens often takes a backseat to predicting what is likely to happen. Recall from the start of this chapter that “prediction is the goal of all operations research.” That attitude followed OR into the advertising world. As ADL’s Marcello Vidale explained in 1959, “I think that market models are predictive and do not necessarily imply causal relationships. A good model is one that makes correct predictions.”¹⁴³ Kenneth Longman, an advertising researcher, agreed: “it’s generally true, that what we are looking for are relationships in nature of a statistical or correlational type; relationships between how much you expend on advertising and what you get in return in sales.”¹⁴⁴ Not quite a decade later, Longman, then an editor at *Management Science*, suggested that marketing was less like a theoretically driven science and more like a form of engineering that “has the task of using whatever applicable theory

it can find, coupling it with some hard trial and error, and developing a method for solving a problem."¹⁴⁵ As one professor put it to the ARF's OR discussion group, "I don't think we ever know whether a model is right. We only know whether it is useful."¹⁴⁶

Looking back from the mid-1980s, a group of prominent operations researchers that included Charnes, Cooper, and Learner argued that scientific progress had come not from "substantive theorizing" but from new methods of collecting and analyzing marketing data. They likened this to the invention of microscopes, providing access to relationships and phenomena that were previously hidden. Combining new technologies of data collection with multivariate statistics, OR/MS was developing "new and improved ways of dealing with large scale data systems" and "better types of decision support systems." The next step was to move beyond "pure prediction" and toward intervention and control: "management's role is to change the way the future is likely to behave relevant to a set of goals or standards. . . . Marketing strives for maintenance and growth of profit making in a largely uncontrollable environment, using whatever controllable factors managers have available."¹⁴⁷ Advertising technoscience carried forward the dream of using technology to transform more of reality into controllable factors. OR/MS thereby helped establish marketing optimization as a design value for a capitalist information society and its large-scale data and decision systems. When an anonymous marketing data scientist described their work in 2018, they echoed exactly the rhetoric that accompanied OR/MS: "I'm doing my job right if I can give my company and stakeholders the data they need to make decisions. . . . You're solving a puzzle every day. How can I predict future behavior? . . . Throughout the history of mankind, people have loved fortune tellers."¹⁴⁸

CONCLUSION

In a 1961 presentation A. C. Nielsen Jr. relayed some of the questions he was hearing from executives: "How can my ever-increasing marketing costs be lowered in relation to results?" "How can marketing results be more accurately determined and predicted?"¹⁴⁹ Nielsen was a top tycoon in the marketplace feedback business—someone that captains of industry looked to for informed answers. And he had a hopeful story to tell them. "While much progress is yet to come in the area of reducing marketing to a science,

we can point to the very real progress that has been made to date.” His specific advice for improving profitability sounds familiar today. He encouraged executives to build their marketing programs around a strong “intelligence system” to continually monitor consumer demand and an ongoing, “carefully administered program of controlled experimentation”—A/B testing different marketing plans and levels of expenditure, iterating toward an “optimum.”¹⁵⁰ Sixty years later, he might have told them just to advertise on Facebook. He also expected that existing “intelligence systems for reporting the activities of consumers” would soon be “augmented by other systems for finding out what the consumer thinks, or hopefully, finding out what he might think tomorrow.”¹⁵¹ Today, that sounds like the self-promotions of Google and Amazon. In 1961 it was basically a nod to computerization and OR/MS—to information technology as management technique.

Math men sold the advertising business on visions of efficiency and rationality. The overarching impulse was to optimize advertising by determining the relationships between advertising actions and marketplace outcomes. This was a holy grail for advertisers, and it was what brought OR into advertising management at corporations like DuPont. But it was an uncomfortable project for their agencies. There was a serious risk that close examination of advertising effectiveness would lead to the conclusion that advertisers should spend less. Since agencies received almost all their revenue from commissions on clients’ media spending, they had no interest in discovering that an advertiser’s budget was too large. Agencies therefore had to spin the power of computers and OR in a different direction. They concentrated on performing more efficient ways to spend advertisers’ money. As advertisers’ appointed decision makers, agencies used management technique to promise an unprecedented scientific capacity to choose.

According to a textbook by consultants to BBDO and the Leo Burnett agency, “The problem of selecting from a nearly infinite number of possible combinations was solved to a considerable extent when John Mauchly and J. Presper Eckert submitted a plan to the U.S. Ordnance Department in 1943 for an electronic computer.” The authors noted that high-speed computers, and the optimization methods they enabled, were perfectly suited to one of agencies’ major functions: planning and buying media placements.¹⁵² Operations researchers working for advertising agencies framed the media selection problem as a type of decision making that lent itself to mathematical formalisms and optimal solutions. This framing relied heavily on

models, computers, and a rising technical elite. It affected language, dispositions, data requirements, and organizational relations in advertising and media businesses. Media directors and researchers at advertising agencies saw the science of optimization as a powerful set of resources that allowed them to make authoritative claims that would validate their expertise. More broadly, advertising agencies saw new tools and discourses to build their media services for the future that corporate America wanted: computerized, rationalized, optimized. They channeled management technique toward the efficient buying of consumers.

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