OPERATIONS RESEARCH: THE PRODUCTIVITY ENGINE

HOW TO CREATE REAL PRODUCTIVITY GAINS IN YOUR BUSINESS

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EXECUTIVE SUMMARY

OA key focus for management is determining steps that can achieve Productivity Gain – and doing it before the competition. A valuable tool in this quest is operations research (O.R.), a field devoted to the creation and management of productivity gain. Operations researchers identify ways to achieve high levels of performance. They approach productivity gain by uniquely conceptualizing problems at the organizational level. Their solutions flow naturally from the way they describe, understand, appreciate, and represent these problems. An operations researchers' approach is to analyze traditional quantities, such as profit, cost, efficiency, and other practical, measurable items. Operations research, the discipline of applying advanced analytical methods to help make better decisions, has come to be known as "the science of better." Organizations that don't rely on O.R. to identify the opportunities to improve productivity that are inherent in their firms' structure will likely operate below potential. The range of savings generated by O.R. models is broad, from modest to billions of dollars. Examples of productivity gains that would not otherwise have existed are seen in case studies of Sears, Weyerhaeuser, National Car Rental, Taco Bell, HP, and Procter & Gamble.

We all know that some people are better executives than others. This is true at even the most senior levels within an organization.

Question: the skillful execution of what kind of task is most central, most important in your own definition of excellence in general management?

There are quite a few potential candidates for this honor and, of course, the list will vary somewhat from business to business. Some answers will focus on abilities like strategic insight and seasoned judgment. Others will emphasize interpersonal skills, character and leadership. Many will reflect such fundamental truths as that good management is all about creating a perfect organization from a large number of imperfect parts.

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One type of response will surely stress the uniquely managerial responsibility for creating more and more out of less and less, for getting the very most out of the limited and expensive human, material and financial resources available to that executive. It's this definition, together with aspects of its realization, which I'd like to explore here.

Getting "more and more out of less and less" is by no means an unfamiliar concept. General management, better than anyone, knows of the inexorably increasing requirement for this ability, reflecting, in particular, today's competitive intensity and shortened time horizons. Productivity Gain is vital to most organizations. Without it, in ever larger and larger amounts, some companies will fail. It's that simple.

So, at or near the top of most management's objectives will be Productivity Gain, in capital letters.

Productivity Gain, as a parlor discussion topic, has become quite fashionable, at least in the parlors and boardrooms of business. It is Productivity Gain that is largely responsible for making many of our nation's economists worry for the first time about what they now call the wealth effect. It is, furthermore, now universally acknowledged that Productivity Gain has permitted our economy to grow rapidly without simultaneously fanning the fires of self-destructive inflation.

This truth is accepted at the macroeconomic level of measurement and is equally evident within individual firms. Just ask Alan Greenspan. So, since Productivity Gain provides business with perpetual growth and prosperity, it's important to understand, business by business, division by division, just exactly where that Productivity Gain comes from. Perhaps more important still, management needs to know what steps can be taken to "get more of it" — especially to get more of it before one's competitors do.

That, in turn, is where operations research (OR) comes in. Operations research, as a field, is all about the creation and management of Productivity Gain. In fact, in a very real sense, productivity gain is virtually the sole purpose of OR. It's what we do. To raise the question of improvement in an organization's productivity without taking full advantage of all that OR offers would be analogous to pursuing a required improvement in one's health while ignoring the entire medical community. The realm of operations research is Productivity Gain.

OR people, in turn, are identifiable by: 1. our focus on productivity, and 2. the way we find, identify and come to describe, understand, appreciate and represent a problem. Operations research people are problem-conceptualizers. Our "solutions," in this sense, can (and should) be seen as flowing naturally and easily from the unique way in which we have visualized the problems/opportunities in the first place. We operate on such traditional quantities as profit, cost, efficiency and other practical, measurable items. Our goal, ordinarily, is to achieve higher

and higher levels of performance. We are the people whose job it is to create productivity. We are, in fact, the productivity engine of an organization. Operations research, in this sense, is a process, a way of thinking and a way of managing. Our sense of satisfaction, in other words, is quite likely to come from the same place as it does for those in general management: from gain, efficiency, improvement and money. Often, big money.

Given that perspective, what are the alternatives? If you must have it (and you must), presumably you'll need to either make it or buy it, or both. This means that you should ensure that your firm employs enough (and the right kind of) OR people to permit the creation of these gains, tailor made for your organization or industry. Or, you should purchase, for cash, the expertise and solutions developed by those who are external to your firm and whose business it is to provide that service to others. In this latter case, the "expertise and solutions" may be acquired in the form of either or both software and consulting organizations.

The key point is that this is a base that really must be covered. If you have not already established responsibility within your organization for productivity improvement and if you don't already have operations research people employed (directly or indirectly) on the productivity opportunities inherent in your firm's structure, your company is very likely to be operating well below its potential.

Let's take a look at a few examples of what operations research people have actually done — not what they've talked about, not what they've trained for, not what they promised somebody. The list that follows contains examples of what OR people have done. It represents only a few examples, drawn from among a much larger group that has generated literally billions and billions of dollars for the American economy and the organizations of which it is composed. In all these cases, we refer to profit that would not have otherwise existed, profit that has helped our economy grow at unheard of rates while not generating the inflationary pressures long thought to inevitably flow from such growth.

Sears, Roebuck and Company manages a U.S. fleet of more than 1,000 delivery vehicles, some company owned and some not. The company makes more than 4 million deliveries a year of 21,000 uniquely different items. It has 46 routing offices and provides the largest home delivery service of furniture and appliances in the United States. The company also operates a U.S. fleet of 12,500 service vehicles, together with an associated staff of service technicians. Service demand is on the order of 15 million calls per year and revenue generated is approximately $3 billion.

Operations researchers designed a system to deal with such variables as customer schedules and requested performance times, time estimates for the required service, vehicles and personnel available, skills needed, parts and product availability and so on. The system was designed to automatically schedule all facets of performance in such a way as to: 1. provide accurate and convenient time windows for the Sears customer, 2. minimize costs and, 3. maximize certain objective measures of task performance, including customer satisfaction. This effort generated a one time cost reduction of $9 million as well as ongoing savings of $42 million per year.

The Weyerhaeuser Company is one of the largest forest product companies in the world, with revenues in excess of $13 billion. Because this is largely a commodity business, Weyerhaeuser's profit comes from: 1. control of cost and, 2. efficient use of the company's raw material base (i.e., trees). These latter decisions are especially important because the business is very highly leveraged and involves more than a billion cubic feet per year of product.

The problem (and the opportunity) for Weyerhaeuser was that the key decisions — where to cut the stem into logs of what length and to what use should the resulting logs be allocated (export, lumber, plywood, paper) — were made in the field, far removed from ultimate marketplace reality. Note, too, that once made, these decisions are irrevocable.

Operations researchers at Weyerhaeuser addressed these problems, resulting in savings well in excess of $100 million. More to the point, Group Vice President Don Rush stated for the record that this work "changed our corporate behavior in ways that have made us more money and these changes have persisted. The contributions to our bottom line have not only held up over the years, but have actually increased in importance over time and under adverse industry economic conditions. This is an advantage unique and exclusive to Weyerhaeuser, an advantage enjoyed currently by none of our competitors."

In 1993, **National Car Rental** faced liquidation. General Motors Corp. (National's parent) took a $744 million charge against earnings that year, related to its ownership of National. Faced with the loss of 7,500 jobs unless it could show a profit in the short term, National initiated a comprehensive revenue management program at whose core was a suite of analytical operations research models developed to manage capacity, pricing and reservations. As it improved the management of these functions, National dramatically increased its revenue. The initial implementation in July 1993 generated immediate results and

returned National Car Rental to profitability. In July 1994, National implemented a state-of-the-art revenue management system, improving revenues by $56 million in the first year. In April 1995, General Motors sold National Car Rental for an estimated $1.2 billion.

The Procter and Gamble Company makes and markets over 300 brands of consumer goods in over 140 countries. P&G is the worldwide market leader in seven categories of consumer goods. In 1995, it had sales of $33.5 billion and profit of $2.64 billion. Two years earlier, the company had begun to re-examine and reengineer its product sourcing and distribution system within North American operations.

Operations research played the central role in this overall effort to streamline work processes, drive out non-value-added costs, eliminate duplication and rationalize manufacturing and distribution. This effort to restructure the supply chain, involving such operations research approaches as integer programming, network optimization models and geographic information systems, led to a reduction of nearly 20 percent in the number of North American plants and a savings of over $200 million per year. P&G now requires that all sourcing decisions be based on operations research models of this type. Moreover, the company has even established, at its headquarters in Cincinnati, a new Center for Expertise in Analytics for solving business problems within P&G. Translated: that means operations research.

The system planned by the **Hewlett-Packard Corp.** for the manufacture of ink-jet printers in 1993 was neither fast nor reliable enough to meet its production goals. The market for these printers was exploding at that time. As a result, any and all incrementally produced printers would translate into market share and sales revenue.

Operations researchers used analytical methods to predict capacity and to determine the size and location of buffers designed to increase that capacity at a cost of only minor increases in inventory. This work yielded incremental revenues of about $280 million as well as productivity gains around 50 percent.

In 1997, **The Taco Bell Corp.** had approximately 6,500 stores and annual sales of about $4.6 billion. The company developed and used an integrated set of operations research models, including forecasting to predict customer arrivals, simulation to determine the optimum manpower levels required to provide desired customer service, and optimization models to schedule and allocate crew members efficiently. This effort, among other accomplishments, saved $53 million in labor costs through 1997.

This is just a sample. There is much, much more. The range of savings generated by operations research models is as broad as you'd expect; from very small to a few models which are, alone, responsible for billions and billions of dollars. OR is used by investment bankers and others to evaluate firms and provide guidance in merger and acquisition activity. In marketing, OR has been used successfully for decades to predict the financial performance of new products and to evaluate the worth of a brand name. There's a whole range of work done in the financial markets variously referred to as financial engineering or, sometimes, "rocket science" on Wall Street. Buying and selling programs, for example, are often mentioned by the pundits to explain a day's activity in the markets. All of this is operations research.

Beyond even all these calculable contributions of OR in the business context, there is a wide range of actual value that is more difficult to compute accurately but which is nevertheless real. For example, decisions based on numeric averages are often poor. OR people uniformly and even instinctively know that. And, they know why. Averages destroy information. The entire range of the data needs to be understood before correct decisions can be made with confidence. This is one of the most common mistakes made in business. It is largely unrecorded but nevertheless true that OR people, day in and day out, prevent errors of this type from happening. And, sometimes, those errors are huge. The boss, though, will never hear about them — unless, of course, the mistake is made.

And, finally, there is the contribution of OR in less traditional, non-business fields. The game of blackjack was essentially "beaten" 40 years ago by an OR man. One of my own early efforts in the field, taken with two fellow students at MIT in the mid '60s, was a horse racing model. We successfully used this model virtually every day on the New England racing circuit (Suffolk Downs, Rockingham, Narragansett, and Lincoln Downs).

Rather more seriously and far more importantly, consider the role of OR in the logistics of recent military campaigns in which America has been involved — making the right equipment available to the right soldier at the right place at the right time.

And, speaking of big issues, consider the fact that in May of 1940, Winston Churchill was (very reluctantly) persuaded by operations researchers to remove all British fighter planes from France — when OR estimated that loss levels of 250 planes per week would result if that decision were not taken. The Battle of Britain would almost certainly have been lost without this modeling effort. Now that's a Productivity Gain!

Operations research really *is* the Productivity Engine. It is "The Science of Better." I hope your firm is already well aware of that fact.

Lew Pringle spent most of his career at BBDO, retiring as chairman/CEO of BBDO Europe, as well as executive vice president and Board member of BBDO Worldwide. He now serves as Chairman of the Department of Managerial Economics at Yorktown University. Before becoming an 'Ad Man,' Pringle earned his Ph.D. in Bayesian Statistics and Finance at MIT's Sloan School.

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