Operations Research Analysts

SIGNIFICANT POINTS

Employers generally prefer applicants with at least a master?s degree in operations research or management science, or a closely related field such as computer science, engineering, business, mathematics, or information systems.

Employment growth is projected to be slower than average, reflecting slow growth in the number of jobs with the title ?operations research analyst.?

Individuals with a master?s or Ph.D. degree in management science, operations research, or equivalent should have good job opportunities as operations research analysts or in closely related occupations, such as systems analysts, computer scientists, or management analysts.

NATURE OF THE WORK [About this section] Back to Top

Operations research and management science are terms that are used interchangeably to describe the discipline of applying advanced analytical techniques to help make better decisions and to solve problems. The procedures of operations research have been used effectively during wartime in areas such as deploying radar, searching for enemy submarines, and getting supplies to where they were needed most. New analytical methods have been developed, and numerous peacetime applications have emerged, leading to the use of operations research in many industries and occupations.

The prevalence of operations research in the Nation?s economy reflects the growing complexity of managing large organizations that require the effective use of money, materials, equipment, and people. Operations research analysts help determine better ways to coordinate these elements by applying analytical methods from mathematics, science, and engineering. Analysts often find multiple possible solutions for meeting the particular goals of a project. These potential solutions are then presented to managers, who choose the course of action that they perceive to be best for the organization.

Operations research analysts often have one area of specialization, such as working in the transportation or the financial services industry, but the issues and industries in which operations research can be used are many. In general, operations research analysts may be involved in top-level strategizing, planning, forecasting, allocating resources, measuring performance, scheduling, designing production facilities and systems, managing the supply chain, pricing, coordinating transportation and distribution, or analyzing large databases.

The duties of the operations research analyst vary according to the structure and management of the employer?s or client?s organization. Some firms centralize operations research in one department; others use operations research in each division. Operations research analysts also may work closely with senior managers to identify and solve a variety of problems. Some organizations contract with consulting firms to provide operations research services. **Economists**, **computer systems analysts**, **mathematicians**, **industrial engineers**, and others may apply operations research techniques to address problems in their respective fields. (These occupations are discussed elsewhere in the *Handbook*.)

Regardless of the type or structure of the client organization, operations research entails following a standard set of procedures and conducting analysis to help managers improve performance. Managers begin the process by describing the symptoms of a problem to the analyst, who then formally defines the problem. For example, an operations research analyst for an auto manufacturer may be asked to determine the best inventory level for each of the parts needed on a production line and to ascertain the optimal number of windshields to be kept in stock. Too many windshields would be wasteful and expensive, whereas too few could result in an unintended halt in production.

Operations research analysts study such problems, breaking them into their components. Analysts then gather information about each of the components from a variety of sources. To determine the optimal inventory, for example, operations research analysts might talk with engineers about production levels, discuss purchasing arrangements with buyers, and examine storage-cost data provided by the accounting department.

With the relevant information in hand, the analyst determines the most appropriate analytical technique. Techniques used may include Monte Carlo simulation, linear and nonlinear programming, dynamic programming, queuing and other stochastic-process models, Markov decision processes, econometric methods, data envelopment analysis, neural networks, expert systems, decision analysis, and the analytic hierarchy process. Nearly all of these techniques involve the construction of a mathematical model that attempts to describe the system being studied. The use of models enables the analyst to explicitly describe the different components and clarify the relationships among them. The descriptions can be altered to examine what may happen to the system under different circumstances. In most cases, a computer program is developed to numerically evaluate the model.

Usually the model chosen is modified and run repeatedly to obtain different solutions. A model for airline flight scheduling, for example, might stipulate such things as connecting cities, the amount of fuel required to fly the routes, projected levels of passenger demand, varying ticket and fuel prices, pilot scheduling, and maintenance costs. By assessing different possible schedules, the analyst is able to determine the best flight schedule consistent with particular assumptions.

Based on the results of the analysis, the operations research analyst presents recommendations to managers. The analyst may need to modify and rerun the computer program to consider different assumptions before presenting the final recommendation. Once managers reach a decision, the analyst usually works with others in the organization to ensure the plan?s successful implementation.

WORKING CONDITIONS [About this section] Back to Top

Operations research analysts generally work regular hours in an office environment. However, because they work on projects that are of immediate interest to top managers, operations research analysts often are under pressure to meet deadlines and may work more than a 40-hour week.

TRAINING, OTHER QUALIFICATIONS, AND ADVANCEMENT

[About this section] Back to Top

Employers generally prefer applicants with at least a master?s degree in operations research or a closely related field, such as computer science, engineering, business, mathematics, information systems, or management science, coupled with a bachelor?s degree in computer science or a quantitative discipline such as economics, mathematics, or statistics. Dual graduate degrees in operations research and computer science are especially attractive to employers. Operations research analysts must be able to think logically, use computers proficiently, work well with people, and demonstrate good oral and written communication skills.

In addition to supporting formal education in one manner or another, employers often sponsor training for experienced workers, helping them keep up with new developments in operations research techniques and computer science. Some analysts attend advanced university classes on these subjects at their employer?s expense.

Computers are the most important tools used by operations research analysts for performing in-depth analysis. As a result, training and experience in programming are required. Analysts typically need to be proficient in database collection and management, programming, and the development and use of sophisticated software packages.

Beginning analysts usually perform routine work under the supervision of more experienced analysts. As the novices gain knowledge and experience, they are assigned more complex tasks and are given greater autonomy to design models and solve problems. Operations research analysts can advance by assuming positions as technical specialists or supervisors. Analysts also gain valuable insights into the industry or field in which they specialize and may assume higher

level nontechnical managerial or administrative positions. Operations research analysts with significant experience may become consultants, and some may even open their own consulting practices.

EMPLOYMENT [About this section] Back to Top

Operations research analysts held about 58,000 jobs in 2004. Major employers include computer systems design firms; insurance carriers and other financial institutions; telecommunications companies; management, scientific, and technical consulting services firms; and Federal, State, and local governments. More than 4 out of 5 operations research analysts in the Federal Government work for the Department of Defense, and many in private industry work directly or indirectly on national defense.

JOB OUTLOOK [About this section] Back to Top

Employment of operations research analysts is expected to **grow more slowly than average** for all occupations through 2014, reflecting slow growth in the number of jobs with the title ?operations research analyst.? Job opportunities in operations research should be good, however, because organizations throughout the economy will strive to improve their productivity, effectiveness, and competitiveness and because of the extensive availability of data, computers, and software. Many jobs in operations research have other titles, such as operations analyst, management analyst, systems analyst, and computer scientist. Individuals who hold a master?s or Ph.D. degree in operations research, management science, or a closely related field should find good job opportunities because the number of openings generated by employment growth and the need to replace those leaving the occupation is expected to exceed the number of persons graduating with these credentials.

Organizations face pressure today from growing domestic and international competition and must work to make their operations as effective as possible. As a result, businesses increasingly will rely on operations research analysts to optimize profits by improving productivity and reducing costs. As new technology

is introduced into the marketplace, operations research analysts will be needed to determine how to utilize the technology in the best way.

Opportunities for operations research analysts exist in almost every industry because of the diversity of applications for their work. As businesses and government agencies continue to contract out jobs to cut costs, opportunities for operations research analysts will be best in management, scientific, and technical consulting firms. Opportunities in the military will exist as well, but will depend on the size of future military budgets. Military leaders will rely on operations research analysts to test and evaluate the accuracy and effectiveness of new weapons systems and strategies. (See the *Handbook* statement on **job opportunities in the Armed Forces**.)

EARNINGS [About this section] Back to Top

Median annual earnings of operations research analysts were $60,190 in May 2004. The middle 50 percent earned between $45,640 and $78,420. The lowest 10 percent had earnings of less than $36,180, while the highest 10 percent earned more than $95,990.

The average annual salary for operations research analysts in the Federal Government in nonsupervisory, supervisory, and managerial positions was $89,882 in 2005.

RELATED OCCUPATIONS [About this section] Back to Top

Operations research analysts apply advanced analytical methods to large, complicated problems. Workers in other occupations that stress advanced analysis include **computer systems analysts**, **computer scientists and database administrators**, **computer programmers**, **engineers**, **mathematicians**, **statisticians**, **economists**, and **market and survey researchers**. Because its goal is improved organizational effectiveness, operations research also is closely allied to managerial occupations such as **computer and information systems managers**, and **management analysts**.

SOURCES OF ADDITIONAL INFORMATION

[About this section] Back to Top

Disclaimer:

Links to non-BLS Internet sites are provided for your convenience and do not constitute an endorsement.

Information on career opportunities for operations research analysts is available from:

Institute for Operations Research and the Management Sciences, 7240 Parkway Dr., Suite 310, Hanover, MD 21076. Internet: **http://www.informs.org**

For information on operations research careers in the Armed Forces and the U.S. Department of Defense, contact:

Military Operations Research Society, 1703 N. Beauregard St., Suite 450, Alexandria, VA 22311. Internet: **http://www.mors.org**

Information on obtaining positions as operations research analysts with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government?s official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not tollfree, and charges may result.

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[About this section] Back to Top

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Suggested citation: Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2006-07 Edition*, Operations Research Analysts,

on the Internet at **http://www.bls.gov/oco/ocos044.htm** (visited *August 14, 2006*).

Last Modified Date: August 4, 2006