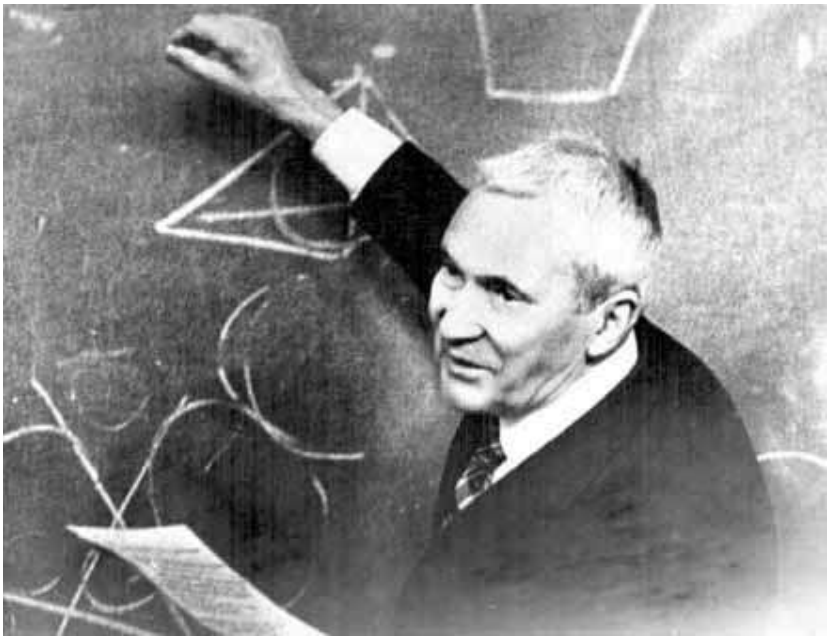


Andrey Nikolaevich Kolmogorov

1903-1987, Tambov, Russia

Father of modern probability

"Every mathematician believes he is ahead over all others. The reason why they don't say this in public, is because they are intelligent people"

In 1922 Kolmogorov constructed a Fourier series that diverges almost everywhere, gaining international recognition. In 1925, he published his famous work in intuitionistic logic on the principle of the excluded middle. In 1929 Kolmogorov earned his Doctor of Philosophy degree, Ph.D., at the Moscow State University. His pioneering work About the Analytical Methods of Probability Theory was published (in German) in 1931. Also in 1931, he became a professor at Moscow University. In 1933, Kolmogorov published the book, *Foundations of the Theory of Probability*, laying the modern axiomatic foundations of probability theory. In 1939, he was elected a full member of the USSR Academy of Sciences. Around the same years (1936) Kolmogorov contributed to the field of ecology and generalized the Lotka-Volterra model of predator-prey systems.

In his study of stochastic processes (random processes), especially Markov processes, Kolmogorov and the British mathematician Sydney Chapman independently developed the pivotal set of equations in the field, the Chapman–Kolmogorov equations. Later on, Kolmogorov changed his research interests to the area of turbulence, where his publications beginning in 1941 had a significant influence on the field.
Kolmogorov died in Moscow in 1987."

William Edwards Deming

1900-1993, Washington, D.C, USA

“The only useful function of a statistician is to make predictions and thus to provide a basis for action”

Deming was a pioneer of quality control. He was voted by business staff of the Los Angeles Times as being one of the 50 most influential business people of the century, though he described himself as 'Consultant in Statistical Studies'.

He studied electrical engineering at University of Wyoming, graduating in 1921. As a summer job he worked for the Western Electric Company in Chicago where he encountered Shewhart's work on quality control. He obtained his MS in mathematics and mathematical physics from University of Colorado in 1925 and his PhD from Yale University in 1928. He began working first for the US Department of Agriculture and then for the US Bureau of the Census. In 1947 he spent three months in Japan

helping with the Japanese census. On his return to Japan in 1950 he gave an extended course in quality control; the course was so successful and influential that he was invited back on many occasions, being received by Emperor Hirohito and awarded the Second Order of the Sacred Treasure. He was President of the IMS in 1945. In 1955 he was awarded the Shewhart Medal of the ASQ, in 1983 the Wilks Award of the ASA, and in 1987 the National Medal for Technology.

Deming's advocacy of the **P**lan-**D**o-**C**heck-**A**ct cycle, his 14 key principles for management for transforming business effectiveness, and Seven Deadly Diseases have had tremendous influence outside of manufacturing and have been applied in other arenas, such as in the relatively new field of sales process engineering.

Frederick Winslow Taylor

1856-1915, Philadelphia, Pennsylvania, USA

Father of Scientific Management

"It is not a question of producing physical changes, but rather of working a great mental revolution in large numbers of men, and any such change demands time, and a large amount of time."

U.S. inventor and engineer, the founder of modern 'Time Study. He introduced time-and-motion study in order to systematize shop management and reduce manufacturing costs. Taylor proposed that the work of each employee be planned out by the Management at least one day in advance. Taylor's attempt to create new ways of thinking and acting was one of his most significant contributions to the growing science of management. Much of the debate surrounding the adoption of Taylor's methods disappeared after the 1920s, but the method continued. The disappearance of the debate reveals a widespread acceptance of much of the power and authority that Taylorism had constructed. The pressures of World War II, in fact, drove wider acceptance of scientific management and made Taylorism one of the most significant aspects of American (and much of the rest of the world's) social organization - connecting people through work and uniting their viewpoints around the perspective of efficient production.

Taylor died in 1915 at the age of 59.

His methods would be tried and applied to an endless range of activities, including education, military discipline, home economics, ergonomics, and medicine.

George Bernard Dantzig

1914-2005, USA

Development of the Simplex Algorithm

American statistician George Bernard Dantzig affected the world enormously with the mathematical discovery of the Simplex Method. Devised by Dantzig in the late 1940s, this mathematical formula, or algorithm, is used by industry and governments to identify the best possible solutions to problems with many variables. The Simplex Method is useable in calculations that involve resource allocation, worker scheduling, and production planning. Airlines use the algorithm to coordinate routes for commercial flights and governments use it to schedule refuse collection. In addition, the Simplex Method is embedded on most computers through spreadsheet programs.

Dantzig also worked as an applied mathematics and statistics professor, producing more than 50 doctoral students, many of whom became leaders in their fields. Colleagues and former students remember Dantzig as a well-rounded thinker who was concerned not only with mathematical challenges but also with solving political, economic and household problems. Writing in OR/MS Today, former Dantzig student Mukund Thapa, who traveled from India to study at Stanford under Dantzig, said "the best times in my life were interactions with George." Thapa said Dantzig treated everyone as an old friend. Thapa recalled that Dantzig once worried that he was bothering the renters below him so he cut open some tennis balls and placed them on the legs of the tables and chairs in his dining room so as not to disturb the downstairs neighbors.

Henry Laurence Gantt

1861-1919, Calvert County, Maryland, USA

Developing the Gantt Chart

Developed simple graphs that would measure performance while visually showing projected schedules. These Gantt Charts were employed on major infrastructure projects including the Hoover dam and interstate highway system and continue to be an important tool in project management. Invented a Wage Payment system that rewarded workers for above-standard performance, eliminated any penalty for failure, and offered the boss a bonus for every worker who performed above standard.
Emphasized Human Relations and promoted Scientific Management as more than an inhuman 'speed up' of labor.
The Gantt chart is still accepted as an important management tool today, it provides a graphic schedule for the planning and controlling of work, and recording progress towards stages of a project. The chart has a modern variation, Program Evaluation and Review Technique (PERT).

Industrial Efficiency: Industrial efficiency can only be produced by the application of scientific analysis to all aspects of the work in progress. The industrial management role is to improve the system by eliminating chance and accidents.

The Task and Bonus System: He linked the bonus paid to managers to how well they taught their employees to improve performance.

The social responsibility of business: He believed that businesses have obligations to the welfare of the society in which they operate.

Lotfi Asker Zadeh

1921 (alive), Baku, Azerbaijan

Founder of Fuzzy Mathematics, Fuzzy Set Theory, and Fuzzy Logic

IEEE Medal of Honor, ACM (Association for Computing Machinery) fellow

Better known as Lotfi A. Zadeh, is a mathematician, electrical engineer, computer scientist, and a professor of computer science at the University of California, Berkeley. Zadeh was born in Baku, Azerbaijan, to an Iranian Azeri father from Ardabil, Rahim Aleskerzade, who was a journalist on assignment from Iran, and a Russian Jewish mother, Fanya Koriman, who was a pediatrician, Zadeh is quoted as stating: "The question really isn't whether I'm American, Russian, Iranian, Azerbaijani, or anything else. I've been shaped by all these people and cultures and I feel quite comfortable among all of them". Zadeh also notes in the same interview from which the above quote is taken: "Obstinacy and tenacity. Not being afraid to get embroiled in controversy. That's very much a Turkish tradition. That's part of my character, too. I can be very stubborn. That's probably been beneficial for the development of Fuzzy Logic. “Because of the importance of the relaxation of Aristotelian logic, which opens up applicability of rational methods to the majority of practical situations without dichotomous truth values, Zadeh is one of the most referenced authors in the fields of applied mathematics and computer science, but his contributions are not limited to fuzzy sets and systems. Zadeh taught for ten years at Columbia University, was promoted to full professor in 1957, and has taught at the University of California, Berkeley since 1959. He published his seminal work on fuzzy sets in 1965, in which he detailed the mathematics of fuzzy set theory. In 1973 he proposed his theory of fuzzy logic.

Peter L. Hammer

1936-2006, Timisoara, Romania

The father of the Boolean Function Theory

He was one of the most influential researchers in the fields of Operations Research and Discrete Applied Mathematics. He made numerous major contributions to these fields, launching several new research directions. His results influenced hundreds of colleagues in discrete mathematics and operations research, and made a lasting impact on several areas, including binary optimization and algorithmic graph theory.

His landmark book on *Boolean Methods in Operations Research and Related Areas* (co-authored with S. Rudeanu, 1968) founded the new area of pseudo-Boolean optimization. His systematic approach to study the combinatorial structure of Boolean functions, and their role in and relationship to optimization problems developed a whole new *Theory of Boolean Functions* (a book about this field, co-edited and co-authored with Y. Crama). He applied in novel ways Boolean techniques to other areas, including graph theory, integer programming, data analysis, and so forth. His application of such Boolean techniques to data analysis proved to be particularly novel and effective.

The technique, called Logical Analysis of Data (LAD), was successfully applied to several real-life data analysis problems, including in the last few years numerous medical datasets.

One of his final lectures was entitled "Why not to turn 70" and subtitled "Problems left for my second and third lives". This exemplified not only his humor, but also his relentless energy.

Thomas L. Saaty

Born in 1926 (alive), Mosul, Iraq

Developer of AHP (Analytic Hierarchy Process) method in decision making

American mathematician who is a Distinguished University Professor at the University of Pittsburgh, where he teaches in the Joseph M. Katz Graduate School of Business.

He is the inventor, architect, and primary theoretician of the Analytic Hierarchy Process, a decision-making framework used for large-scale, multiparty, multi-criteria decision analysis, and of the Analytic Network Process, its generalization to decisions with dependence and feedback.

Dr. Saaty has made contributions in the fields of operations research (parametric linear programming, epidemics and the spread of biological agents, queuing theory, and behavioral mathematics as it relates to operations), arms control and disarmament, and urban design. He has written more than 30 books and 300 papers on mathematics, operations research, and decision making. Their subjects include graph theory and its applications, nonlinear mathematics, analytical planning, and game theory and conflict resolution.

In 2008, he received the INFORMS Impact Prize for his development of the Analytic Hierarchy Process. The Impact Prize is awarded every two years to recognize contributions that have had a broad impact on the fields of operations research and the management sciences. Emphasis is placed on the breadth of the impact of an idea or body of research.

Maximilian Carl Emil Weber

1864 – 1920, Germany

German political sociologist, one of the founders of modern study of sociology and public administration

He began his career at the University of Berlin, and later worked at the universities of Freiburg, Heidelberg, and Munich.

Weber's major works deal with rationalization in sociology of religion and government. His most famous work is his essay The Protestant Ethic and the Spirit of Capitalism, which began his work in the sociology of religion. In this work, Weber argued that religion was one of the non-exclusive reasons for the different ways the cultures of the Occident and the Orient have developed, and stressed importance of particular characteristics of ascetic Protestantism which led to the development of capitalism, bureaucracy and the rational- legal state in the West. In another major work, Politics as a Vocation, Weber defined the state as an entity which claims a monopoly on the legitimate use of physical force, a definition that became pivotal to the study of modern Western political science. His analysis of bureaucracy in his Economy and Society is still central to the modern study of organizations. His most known contributions are often referred to as the 'Weber Thesis'

His most valued contributions to the field of economics are his famous work, *The Protestant Ethic* and the *Spirit of Capitalism*. This is a seminal essay on the differences between religions and the relative wealth of their followers.

Richard Muther

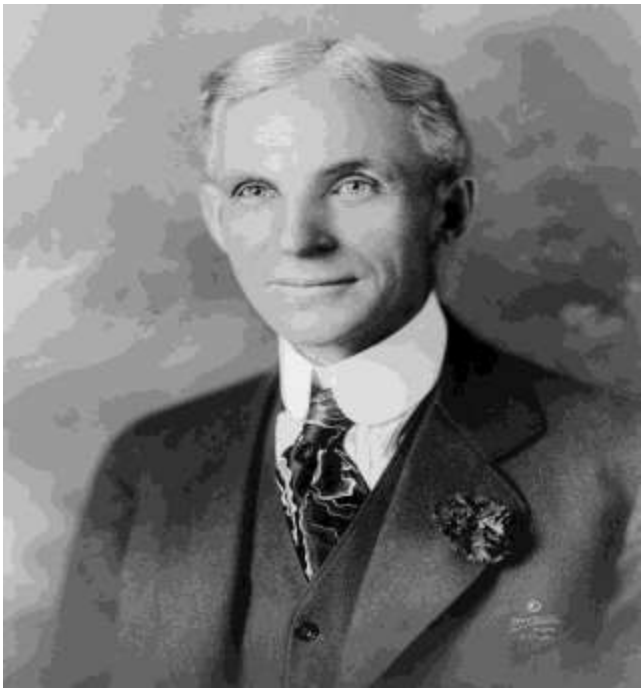
Born in 1913 (alive), Newton, Massachusetts, USA

Father of Systematic Planning

Developed many basic techniques used in Plant Layout, Material Handling, and other aspects of Industrial Engineering

He was the original developer of relationship chart (REL-CHART) and its companion space-relationship diagram. This tool is the basis for many other techniques which are used to optimize the proximity of related functions and minimize unnecessary transportation in industrial facilities. He also created the Mag Count method of measuring the difficulty of handling (transporting) any solid material prior to knowing how it will be moved. He developed the industry-standard color code used to classify industrial space and the related type-of-work symbols. Corresponding black-and-white hatch patterns based on the heraldic tincture code are also part of his methodology.

He is currently writing revolutionary book on planning virtual anything with Shekar Natarajan.



Henry Ford

1863 –1947, U.S.A

The American founder of the Ford Motor Company and father of modern assembly lines used in mass production

His introduction of the Model T automobile revolutionized transportation and American industry. He was a prolific inventor and was awarded 161 U.S. patents. As owner of the Ford Motor Company, he became one of the richest and best-known people in the world. He is credited with "Fordism", that is, the mass production of large numbers of inexpensive automobiles using the assembly line, coupled with high wages for his workers. Ford had a global vision, with consumerism as the key to peace. Ford did not believe in accountants; he amassed one of the world's largest fortunes without ever having his company audited under his administration.

Henry Ford's intense commitment to lowering costs resulted in many technical and business innovations, including a franchise system that put a dealership in every city in North America, and in major cities on six continents. Ford left most of his vast wealth to the Ford Foundation but arranged for his family to control the company permanently.

Agner Krarup Erlang

1878 – 1929, Denmark

Danish mathematician, statistician and engineer, who invented Queuing Theory and the fields of traffic engineering

Erlang created the field of telephone networks analysis. His early work in scrutinizing the use of local, exchange and trunk telephone line usage in a small community, to understand the theoretical requirements of an efficient network led to the creation of the Erlang formula, which became a foundational element of present day telecommunication network studies. While working for the CTC, Erlang was presented with the classic problem of determining how many circuits were needed to provide an acceptable telephone service. His thinking went further by finding how many telephone operators were needed to handle a given volume of calls. Most telephone exchanges then used human operators and cord boards to switch telephone calls by means of jack plugs.

Out of necessity, Erlang was a hands-on researcher. He would conduct measurements and was prepared to climb into street manholes to do so. He was also an expert in the history and calculation of the numerical tables of mathematical functions, particularly logarithms.

He devised new calculation methods for certain forms of tables.

Alan B. Pritsker

1933—2000, USA

One of the founders of the field of Computer Simulation

American engineer, pioneer in the field of Operations research, and one of the founders of the field of Computer Simulation Over the course of a fifty-five-year career, he made numerous contributions to the field of Simulation and to the larger fields of Industrial Engineering and Operations Research.

In March 2001 an article entitled "Alan Pritsker's Multifaceted Career: Theory, Practice, Education, Entrepreneurship, and Service " appeared in a special issue of IIE Transactions honoring Alan Pritsker for his numerous contributions to the profession over five decades. Another prominent aspect of Alan Pritsker's contributions to the growth of the field of simulation was his role in founding and leading several commercial enterprises dedicated to the development and dissemination of simulation technology.

Alan Pritsker's service to the profession spanned a broad range of activities sustained over four decades. Perhaps his most prominent contributions in service were made through his leadership of the Winter Simulation Conference (WSC). He served as a member of the WSC Board of Directors representing AIIE from 1970 to 1973. He also served on the WSC Board of Directors representing TIMS–College on Simulation and Gaming from 1981 to 1987; and he served as Board Chair from 1984 to 1985.

Taiichi Ohno

1912 – 1990, Japan

Father of the Toyota Production System

Prominent Japanese businessman. He is considered to be the father of the Toyota Production System, which became Lean Manufacturing in the U.S. He wrote several books about the system, the most popular of which is *Toyota Production System: Beyond Large-Scale Production*. Born in Dalian, China, and a graduate of the Nagoya Technical High School (Japan), he was an employee first of the Toyoda family's Toyoda Spinning, moved to the motor company in 1943, and gradually rose through the ranks to become an executive. In what is considered to be a slight, possibly because he spoke publicly about the production system, he was denied the normal executive track and was sent instead to consult with suppliers in his later career.

Ohno's principles influenced areas outside of manufacturing, and have been extended into the service arena. For example, the field of sales process engineering has shown how the concept of Just in Time (JIT) can improve sales, marketing, and customer service processes.

Shigeo Shingo

1909-1990, Japan

Distinguished himself as one of the world's leading experts on Manufacturing Practices and the Toyota Production System.

Shingo invented the Toyota Production System, he did document the system and added two words to the Japanese and English languages—Poka-yoke
(mistake-proofing, not 'fool-proofing', which Shingo rejected as a term)
and
single-minute exchange of dies (SMED)

Shingo's influence extended into fields outside of manufacturing.
For example, his concepts of SMED, mistake-proofing, and "zero quality control"
(eliminating the need for inspection of results)
have all been applied in the field of sales process engineering

Lillian Gilbreth (1878 – 1972), USA
First female professor in the engineering school
Mother of Modern Management

Frank Gilbreth (1868-1924), USA
Known for his work on the efficiency of motion. He developed many of the concepts and applications that are now part of modern management techniques

Founders of the modern Motion Study technique, which may be defined as the study of the body motions used in performing an operation, to improve the operation by eliminating unnecessary motions, simplifying necessary motions, and then establishing the most favorable motion sequence for maximum efficiency.

They studied body motions to increase production, reduce fatigue, and instruct operators in the best method of performing an operation. They developed the technique of filming motions to study them, in a technique known as Micro-Motion Study.
Additionally, they developed the Cycle graphic analysis and Chronocyclegraphic Analysis techniques for studying the motion paths made by an operator.

Although the work of the Gilbreths is often associated with that of Frederick Winslow Taylor, there was a substantial philosophical difference between the Gilbreths and Taylor. The symbol of Taylorism was the stopwatch; Taylor was primarily concerned with reducing process times. The Gilbreths, on the other hand, sought to make processes more efficient by reducing the motions involved. They saw their approach as more concerned with workers' welfare than Taylorism, which workers themselves often perceived as primarily concerned with profit. This difference led to a personal rift between Taylor and the Gilbreths which, after Taylor's death, turned into a feud between the Gilbreths and Taylor's followers. After Frank's death, Lillian Gilbreth took steps to heal the rift (Price 1990); however, some friction remains over questions of history and intellectual property.

Frank Gilbreth, who never went to college, was interested in efficiency in the workplace. His enthusiasm for the subject was contagious. Frank and Lillian together began their study of scientific management principles.
Frank started a consulting business and Lillian worked at his side. But where Frank was concerned with the technical aspects of worker efficiency, Lillian was concerned with the human aspects of time management. Her ideas were not widely adopted during her lifetime, but they indicated the direction that modern management would take. She recognized that workers are motivated by indirect incentives (among which she included money) and direct incentives, such as job satisfaction.

Her work with Frank helped create job standardization, incentive wage-plans, and job simplification. Finally, she was among the first to recognize the effects of fatigue and stress on time management.