

# STATISTICAL SIGNIFICANCE

*Efficiency, Efficiency, Efficiency: Statisticians have developed powerful analytical tools that allow one to extract robust conclusions from data samples. As a result, industry, agriculture, and pharmaceutical companies have improved their productivity and competitiveness immensely.*

## Economic Productivity

### SEARCH ENGINE ADVERTISEMENT PRICING:

Auction theory is used to help monetize search-based advertising. Ads are ordered according to their expected revenue to the search engine and, if an ad is clicked, that advertiser pays the bid of the advertiser whose ad is immediately below.

**MONITORING OUR ECONOMIC HEALTH:** Government agencies use statistical methods extensively to determine the myriad measures of our economy, from the trade deficit and gross national product to the consumer price index and unemployment rate. The impartial construction of economic indicators is critical for policymakers assessing our nation's economy.

### IMPROVING EFFICIENCY:

Guinness Brewing Company hired William Gossett in 1899 for his chemistry training, but Gossett made his greatest contribution by developing a statistical technique to better estimate the amount of yeast in a solution based on a small sample. With the new information, Guinness was able to produce its now-famous products more efficiently. Gossett's method remains one of the most widely used results in statistics.



### Quality Assurance in Manufacturing

W. E. Deming pioneered statistical methods to help manufacturers evaluate the overall quality of their products by sampling only some of the units. An important component of Total Quality Management, statistical process control prescribes the monitoring of the specifications of the product throughout the process to maintain and improve its quality. Companies that followed Deming's advice and the work of his counterparts thrived in an increasingly globally competitive market. The modern business tool known as Six Sigma is a direct descendant of Deming's work.

**SOFTWARE/WEB DEVELOPMENT:** Microsoft has developed sophisticated software to run controlled 'live' experiments to objectively evaluate software features. Users are randomly assigned to control and treatment groups, and then their behavior is analyzed using various statistical methods. The results are quickly applied to integrate or discard the feature, thereby accelerating and improving software and web development.

**INVENTORY CONTROL AND STAFFING:** Companies use sophisticated methods developed by statisticians to manage their inventories, thereby ensuring products and supplies are always on hand while minimizing storage costs and over-purchasing. Similarly, transfer functions and advanced statistical software are used to estimate staffing for call centers to minimize wait-time and dead-weight (staff idle time) cost.

"Statistics Powers Competitiveness" is part of Statistical Significance, a series from the American Statistical Association documenting the contributions of statistics to our country and society. For more in this series, visit [www.amstat.org/outreach/statsig.cfm](http://www.amstat.org/outreach/statsig.cfm). The American Statistical Association is the foremost professional society of statisticians, representing 19,000 scientists in industry, government, and academia: [www.amstat.org](http://www.amstat.org). This Statistical Significance was produced under the supervision of the ASA Section on Business and Economic Statistics.