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Chapter 1 : The Importance of Statistics in Management Decision Making | Your Business

Statistics provide managers and teams with the details and data necessary to make smarter decisions for the future of a company. Data lets an enterprise focus on the big picture, back judgments.

In general, the forces of competition are imposing a need for more effective decision making at all levels in organizations. Progressive Approach to Modeling: Modeling for decision making involves two distinct parties, one is the decision-maker and the other is the model-builder known as the analyst. Therefore, the analyst must be equipped with more than a set of analytical methods. Specialists in model building are often tempted to study a problem, and then go off in isolation to develop an elaborate mathematical model for use by the manager i. Unfortunately the manager may not understand this model and may either use it blindly or reject it entirely. The specialist may feel that the manager is too ignorant and unsophisticated to appreciate the model, while the manager may feel that the specialist lives in a dream world of unrealistic assumptions and irrelevant mathematical language. Such miscommunication can be avoided if the manager works with the specialist to develop first a simple model that provides a crude but understandable analysis. After the manager has built up confidence in this model, additional detail and sophistication can be added, perhaps progressively only a bit at a time. This progressive model building is often referred to as the bootstrapping approach and is the most important factor in determining successful implementation of a decision model. Moreover the bootstrapping approach simplifies otherwise the difficult task of model validating and verification processes. What is a System: Systems are formed with parts put together in a particular manner in order to pursuit an objective. The relationship between the parts determines what the system does and how it functions as a whole. Therefore, the relationship in a system are often more important than the individual parts. In general, systems that are building blocks for other systems are called subsystems The Dynamics of a System: A system that does not change is a static i. Many of the systems we are part of are dynamic systems, which are they change over time. Whether a system is static or dynamic depends on which time horizon you choose and which variables you concentrate on. The time horizon is the time period within which you study the system. The variables are changeable values on the system. In deterministic models , a good decision is judged by the outcome alone. However, in probabilistic models, the decision-maker is concerned not only with the outcome value but also with the amount of risk each decision carries As an example of deterministic versus probabilistic models, consider the past and the future: Nothing we can do can change the past, but everything we do influences and changes the future, although the future has an element of uncertainty. Managers are captivated much more by shaping the future than the history of the past. Uncertainty is the fact of life and business; probability is the guide for a "good" life and successful business. In very few decision making situations is perfect information - all the needed facts - available. Most decisions are made in the face of uncertainty. Probability enters into the process by playing the role of a substitute for certainty - a substitute for complete knowledge. Probabilistic Modeling is largely based on application of statistics for probability assessment of uncontrollable events or factors , as well as risk assessment of your decision. The original idea of statistics was the collection of information about and for the State. The word statistics is not derived from any classical Greek or Latin roots, but from the Italian word for state. Probability has a much longer history. Probability is derived from the verb to probe meaning to "find out" what is not too easily accessible or understandable. The word "proof" has the same origin that provides necessary details to understand what is claimed to be true. Probabilistic models are viewed as similar to that of a game; actions are based on expected outcomes. The center of interest moves from the deterministic to probabilistic models using subjective statistical techniques for estimation, testing, and predictions. In probabilistic modeling, risk means uncertainty for which the probability distribution is known. Therefore risk assessment means a study to determine the outcomes of decisions along with their probabilities. Decision-makers often face a severe lack of information. Probability assessment quantifies the information gap between what is known, and what needs to be known for an optimal decision. The

probabilistic models are used for protection against adverse uncertainty, and exploitation of propitious uncertainty. Difficulty in probability assessment arises from information that is scarce, vague, inconsistent, or incomplete. A statement such as "the probability of a power outage is between 0. At times, the task may prove too challenging. Difficulties in decision making arise through complexities in decision alternatives. The limited information-processing capacity of a decision-maker can be strained when considering the consequences of only one course of action. Yet, choice requires that the implications of various courses of action be visualized and compared. In addition, unknown factors always intrude upon the problem situation and seldom are outcomes known with certainty. Almost always, an outcome depends upon the reactions of other people who may be undecided themselves. It is no wonder that decision-makers sometimes postpone choices for as long as possible. Then, when they finally decide, they neglect to consider all the implications of their decision. Emotions and Risky Decision: Most decision makers rely on emotions in making judgments concerning risky decisions. Many people are afraid of the possible unwanted consequences. However, do we need emotions in order to be able to judge whether a decision and its concomitant risks are morally acceptable. This question has direct practical implications: Even though emotions are subjective and irrational or a-rational , they should be a part of the decision making process since they show us our preferences. Since emotions and rationality are not mutually exclusive, because in order to be practically rational, we need to have emotions. This can lead to an alternative view about the role of emotions in risk assessment: Most people often make choices out of habit or tradition, without going through the decision-making process steps systematically. Decisions may be made under social pressure or time constraints that interfere with a careful consideration of the options and consequences. When people lack adequate information or skills, they may make less than optimal decisions. Even when or if people have time and information, they often do a poor job of understanding the probabilities of consequences. Even when they know the statistics; they are more likely to rely on personal experience than information about probabilities. The fundamental concerns of decision making are combining information about probability with information about desires and interests. Business decision making is almost always accompanied by conditions of uncertainty. Clearly, the more information the decision maker has, the better the decision will be. Treating decisions as if they were gambles is the basis of decision theory. This means that we have to trade off the value of a certain outcome against its probability. To operate according to the canons of decision theory, we must compute the value of a certain outcome and its probabilities; hence, determining the consequences of our choices. The origin of decision theory is derived from economics by using the utility function of payoffs. It suggests that decisions be made by computing the utility and probability, the ranges of options, and also lays down strategies for good decisions: This Web site presents the decision analysis process both for public and private decision making under different decision criteria, type, and quality of available information. This Web site describes the basic elements in the analysis of decision alternatives and choice, as well as the goals and objectives that guide decision making. Objectives are important both in identifying problems and in evaluating alternative solutions. The systematic study of decision making provides a framework for choosing courses of action in a complex, uncertain, or conflict-ridden situation. The choices of possible actions, and the prediction of expected outcomes, derive from a logical analysis of the decision situation. You might have already noticed that the above criteria always result in selection of only one course of action. However, in many decision problems, the decision-maker might wish to consider a combination of some actions. Visit the Game Theory with Applications Web site for designing such an optimal mixed strategy. An Integrated Approach, Wiley, Rehabilitating Epistemology, Kluwer Academic Publishers, From Data to a Decisive Knowledge Knowledge is what we know well. Information is the communication of knowledge. In every knowledge exchange, there is a sender and a receiver. The sender make common what is private, does the informing, the communicating. Information can be classified as explicit and tacit forms. The explicit information can be explained in structured form, while tacit information is inconsistent and fuzzy to explain. Know that data are only crude information and not knowledge by themselves. Data is known to be crude information and not knowledge by itself. The sequence

from data to knowledge is: Data becomes information, when it becomes relevant to your decision problem. Information becomes fact, when the data can support it. Facts are what the data reveals. However the decisive instrumental i. Fact becomes knowledge, when it is used in the successful completion of a decision process. Once you have a massive amount of facts integrated as knowledge, then your mind will be superhuman in the same sense that mankind with writing is superhuman compared to mankind before writing. The following figure illustrates the statistical thinking process based on data in constructing statistical models for decision making under uncertainties.

Chapter 2 : Tools for Decision Analysis

Statistical Thinking for Managerial Decisions This document is a course in statistics appreciation; i.e., acquiring a feeling for the statistical way of thinking.

Using the model to find the solution: It is a simplified representation of the actual situation It need not be complete or exact in all respects It concentrates on the most essential relationships and ignores the less essential ones. It is more easily understood than the empirical i. It can be used again and again for similar problems or can be modified. Fortunately the probabilistic and statistical methods for analysis and decision making under uncertainty are more numerous and powerful today than ever before. The computer makes possible many practical applications. A few examples of business applications are the following: An auditor can use random sampling techniques to audit the accounts receivable for clients. A plant manager can use statistical quality control techniques to assure the quality of his production with a minimum of testing or inspection. A financial analyst may use regression and correlation to help understand the relationship of a financial ratio to a set of other variables in business. A market researcher may use test of significace to accept or reject the hypotheses about a group of buyers to which the firm wishes to sell a particular product. A sales manager may use statistical techniques to forecast sales for the coming year. What are the objectives of the study or the questions to be answered? What is the population to which the investigators intend to refer their findings? Is the study a planned experiment i. How is the sample to be selected? Are there possible sources of selection, which would make the sample atypical or non-representative? If so, what provision is to be made to deal with this bias? What is the nature of the control group, standard of comparison, or cost? Remember that statistical modeling means reflections before actions. Is the method of classification or of measurement consistent for all the subjects and relevant to Item No. Are the observations reliable and replicable to defend your finding? Are the data sufficient and worthy of statistical analysis? If so, are the necessary conditions of the methods of statistical analysis appropriate to the source and nature of the data? The analysis must be correctly performed and interpreted. Which conclusions are justifiable by the findings? Are the conclusions relevant to the questions posed in Item No. The finding must be represented clearly, objectively, in sufficient but non-technical terms and detail to enable the decision-maker e. Is the finding internally consistent; i. Can the different representation be reconciled? When your findings and recommendation s are not clearly put, or framed in an appropriate manner understandable by the decision maker, then the decision maker does not feel convinced of the findings and therefore will not implement any of the recommendations. You have wasted the time, money, etc. What is Business Statistics? The main objective of Business Statistics is to make inferences e. The condition for randomness is essential to make sure the sample is representative of the population. It provides knowledge and skills to interpret and use statistical techniques in a variety of business applications. A typical Business Statistics course is intended for business majors, and covers statistical study, descriptive statistics collection, description, analysis, and summary of data , probability, and the binomial and normal distributions, test of hypotheses and confidence intervals, linear regression, and correlation. Statistics is a science of making decisions with respect to the characteristics of a group of persons or objects on the basis of numerical information obtained from a randomly selected sample of the group. Statisticians refer to this numerical observation as realization of a random sample. However, notice that one cannot see a random sample. A random sample is only a sample of a finite outcomes of a random process. At the planning stage of a statistical investigation, the question of sample size n is critical. For example, sample size for sampling from a finite population of size N, is set at: Clearly, a larger sample provides more relevant information, and as a result a more accurate estimation and better statistical judgement regarding test of hypotheses. Under-lit Streets and the Crimes Rate: It is a fact that if residential city streets are under-lit then major crimes take place therein. Click on the image to enlarge it and THEN print it. Activities Associated with the General Statistical Thinking and Its Applications The above figure illustrates the idea of statistical inference from a random

sample about the population. The major task of Statistics is the scientific methodology for collecting, analyzing, interpreting a random sample in order to draw inference about some particular characteristic of a specific Homogenous Population. For two major reasons, it is often impossible to study an entire population: The process would be too expensive or too time-consuming. The process would be destructive. In either case, we would resort to looking at a sample chosen from the population and trying to infer information about the entire population by only examining the smaller sample. Very often the numbers, which interest us most about the population, are the mean m and standard deviation s, any number -- like the mean or standard deviation -- which is calculated from an entire population, is called a Parameter. If the very same numbers are derived only from the data of a sample, then the resulting numbers are called Statistics. Frequently, Greek letters represent parameters and Latin letters represent statistics as shown in the above Figure. The uncertainties in extending and generalizing sampling results to the population are measures and expressed by probabilistic statements called Inferential Statistics. Therefore, probability is used in statistics as a measuring tool and decision criterion for dealing with uncertainties in inferential statistics. An important aspect of statistical inference is estimating population values parameters from samples of data. An estimate of a parameter is unbiased if the expected value of sampling distribution is equal to that population. The sample mean is an unbiased estimate of the population mean. The sample variance is an unbiased estimate of population variance. This allows us to combine several estimates to obtain a much better estimate. The Empirical distribution is the distribution of a random sample, shown by a step-function in the above figure. The empirical distribution function is an unbiased estimate for the population distribution function F x. Given you already have a realization set of a random sample, to compute the descriptive statistics including those in the above figure, you may like using Descriptive Statistics JavaScript. To reduce this uncertainty and having high confidence that statistical inferences are correct, a sample must give equal chance to each member of population to be selected which can be achieved by sampling randomly and relatively large sample size n. Given you already have a realization set of a random sample, to perform hypothesis testing for mean m and variance s2, you may like using Testing the Mean and Testing the Variance JavaScript, respectively. Statistics is a tool that enables us to impose order on the disorganized cacophony of the real world of modern society. The business world has grown both in size and competition. Corporate executive must take risk in business, hence the need for business statistics. Business statistics has grown with the art of constructing charts and tables! It is a science of basing decisions on numerical data in the face of uncertainty. Business statistics is a scientific approach to decision making under risk. In practicing business statistics, we search for an insight, not the solution. Business statistics can take a normal business situation, and with the proper data gathering, analysis, and re-search for a solution, turn it into an opportunity. While business statistics cannot replace the knowledge and experience of the decision maker, it is a valuable tool that the manager can employ to assist in the decision making process in order to reduce the inherent risk, measured by, e. Here are some applicable reasons. Business Statistics must provide justifiable answers to the following concerns for every consumer and producer: That is, what is a good estimate for m? That is, what is a good estimate for s? Common Statistical Terminology with Applications Like all profession, also statisticians have their own keywords and phrases to ease a precise communication. However, one must interpret the results of any decision making in a language that is easy for the decision-maker to understand. This lack of communication between statisticians and the managers is the major roadblock for using statistics. A population is any entire collection of people, animals, plants or things on which we may collect data. It is the entire group of interest, which we wish to describe or about which we wish to draw conclusions. In the above figure the life of the light bulbs manufactured say by GE, is the concerned population. Qualitative and Quantitative Variables: Any object or event, which can vary in successive observations either in quantity or quality is called a"variable. A qualitative variable, unlike a quantitative variable does not vary in magnitude in successive observations. The values of quantitative and qualitative variables are called"Variates" and"Attributes", respectively. A characteristic or phenomenon, which may take different values, such as weight, gender since they are different from individual to individual.

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The fascinating fact about inferential statistics is that, although each random observation may not be predictable when taken alone, collectively they follow a predictable pattern called its distribution function. For example, it is a fact that the distribution of a sample average follows a normal distribution for sample size over In other words, an extreme value of the sample mean is less likely than an extreme value of a few raw data. A subset of a population or universe. An experiment is a process whose outcome is not known in advance with certainty. An experiment in general is an operation in which one chooses the values of some variables and measures the values of other variables, as in physics. A statistical experiment, in contrast is an operation in which one take a random sample from a population and infers the values of some variables.

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Chapter 3 : The Importance of Statistics in Management Decision Making | www.nxgvision.com

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This interactive Data Analytics for Managerial Decision Making training course in Dubai will highlight the added value that data analytics can offer a professional as a decision support tool in management decision making. It will show the use of data analytics to support strategic initiatives; to inform on policy information; and to direct operational decision making. The training course will emphasize applications of data analytics in management practice; focus on the valid interpretation of data analytics findings; and create a clearer understanding of how to integrate quantitative reasoning into management decision making. Exposure to the discipline of data analytics will ultimately promote greater confidence in the use of evidence-based information to support management decision making. This AZTech training course will feature: Discussions on applications of data analytics in management The importance of data in data analytics Applying data analytical methods through worked examples Focusing on management interpretation of statistical evidence How to integrate statistical thinking into the work domain What are the Goals? By the end of this AZTech training course, participants will be able to: Appreciate data analytics in a decision support role Explain the scope and structure of data analytics Apply a cross-section of useful data analytics Interpret meaningfully and critically assess statistical evidence Identify relevant applications of data analytics in practice Who is this Training Course for? This AZTech training course is suitable to a wide range of professionals but will greatly benefit: This training course will utilise a variety of proven adult learning techniques to ensure maximum understanding, comprehension and retention of the information presented. The daily workshops will be highly interactive and participative. This involves regular discussion of applications as well as hands-on exposure to data analytics techniques using Microsoft Excel. Delegates are strongly encouraged to bring and analyse data from their own work domain. This adds greater relevancy to the content. Emphasis is also placed on the valid interpretation of statistical evidence in a management context. Program Content Day One: Setting the Statistical Scene in Management Introduction; The quantitative landscape in management Thinking statistically about applications in management identifying KPIs The integrative elements of data analytics Data: The raw material of data analytics types, quality and data preparation Exploratory data analysis using excel pivot tables Using summary tables and visual displays to profile sample data Day Two: Evidence-based Observational Decision Making Numeric descriptors to profile numeric sample data Central and non-central location measures Quantifying dispersion in sample data Examine the distribution of numeric measures skewness and bimodal Exploring relationships between numeric descriptors Breakdown analysis of numeric measures Day Three: Statistical Decision Making â€" Drawing Inferences from Sample Data The foundations of statistical inference Quantifying uncertainty in data â€" the normal probability distribution The importance of sampling in inferential analysis Sampling methods random-based sampling techniques Understanding the sampling distribution concept Confidence interval estimation Day Four: Statistical Decision Making â€" Drawing Inferences from Hypotheses Testing The rationale of hypotheses testing The hypothesis testing process and types of errors Single population tests tests for a single mean Two independent population tests of means Matched pairs test scenarios Comparing means across multiple populations Day Five: Material published by AZTech shown here is copyrighted. Any unauthorized copying, distribution, use, dissemination, downloading, storing in any medium , transmission, reproduction or reliance in whole or any part of this course outline is prohibited and will constitute an infringement of copyright.

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Chapter 4 : The Advantages and Disadvantages of Statistical Analysis

Get this from a library! Instructor's manual to accompany Statistical analysis for managerial decisions. [Johannes Cornelius Gerardus Boot; Edwin Burk Cox].

Statistical Computing Traditional methods for statistical analysis â€" from sampling data to interpreting results â€" have been used by scientists for thousands of years. Affordable storage, powerful computers and advanced algorithms have all led to an increased use of computational statistics. Popular statistical computing practices include: Statistical programming â€" From traditional analysis of variance and linear regression to exact methods and statistical visualization techniques, statistical programming is essential for making data-based decisions in every field. Econometrics â€" Modeling, forecasting and simulating business processes for improved strategic and tactical planning. This method applies statistics to economics to forecast future trends. Operations research â€" Identify the actions that will produce the best results â€" based on many possible options and outcomes. Scheduling, simulation, and related modeling processes are used to optimize business processes and management challenges. Matrix programming â€" Powerful computer techniques for implementing your own statistical methods and exploratory data analysis using row operation algorithms. Statistical visualization â€" Fast, interactive statistical analysis and exploratory capabilities in a visual interface can be used to understand data and build models. Statistical quality improvement â€" A mathematical approach to reviewing the quality and safety characteristics for all aspects of production. But why is there so much talk about careers in statistical analysis and data science? It could be the shortage of trained analytical thinkers. Or it could be the demand for managing the latest big data strains. Or applying statistics to win more games of Axis and Allies. It is often these early passions that lead statisticians into the field. As adults, those passions can carry over into the workforce as a love of analysis and reasoning, where their passions are applied to everything from the influence of friends on purchase decisions to the study of endangered species around the world. Learn more about current and historical statisticians: Celebrating statisticians commemorates statistics practitioners from history. Join our statistics procedures community, where you can ask questions and share your experiences with SAS statistical products.

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Chapter 5 : Statistical Analysis For Managerial Decisions | Download eBook PDF/EPUB

This course is designed to introduce the student to statistical methodology useful for data analysis and managerial decision-making. Emphasis will be placed on applications through working.

Knowledge of the fundamentals of statistical methods, techniques, and tools. An examination of how managers organize, analyze, and interpret data for decision making. Focus is on developing skills in using statistical tools to make effective business decisions in all areas of public and private-sector decision making, including accounting, finance, marketing, production management, and human resource management. Topics include collecting data; describing, sampling, and presenting data; probability; statistical inference; regression analysis; forecasting; and risk analysis. Microsoft Excel is used extensively for organizing, analyzing, and presenting data. See all MGMT courses. The discount for Federal employees and their spouses and eligible dependents will be applied to out-of-state tuition and specialty graduate programs. It does not apply to doctoral programs. This discount cannot be combined with the Completion Scholarship for Maryland community college students or the Pennsylvania Completion Scholarship. Undergraduate and standard graduate program tuition for students who meet the criteria for Maryland residency will be the applicable in-state rate. Public Health Service and National Oceanic and Atmospheric Administration; and the spouses and dependents of these student groups will be the applicable military or specialty rate. View important information about the education debt, earnings, and completion rates of students enrolled in certificate programs. All students are required to pay tuition for all courses in which they are enrolled. They may be changed, or other charges may be included, as a result of the Board of Regents decisions. Notwithstanding any other provision of this or any other university publication, the university reserves the right to make changes in tuition, fees and other charges at any time such changes are deemed necessary by the university and the USM Board of Regents. Requests for services for example, transcripts, diplomas, registration will be denied until all debts are paid. Please see the USM residency policy for specific details about residency requirements. Financial aid and tuition remission for University System of Maryland employees cannot be applied to noncredit courses. Golden ID benefits may not be applied to fees, noncredit courses, specialty graduate programs, or doctoral programs. GI Bill is a registered trademark of the U. Department of Veterans Affairs. More information about education benefits offered by VA is available on the U. The UCSP requirement may be waived if you previously earned a graduate degree from a regionally accredited institution. For more information, contact your academic advisor.

Chapter 6 : Statistics Tutoring from MBA, PhD & CPA Statistics Tutors: Graduate Tutor

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Chapter 7 : QMB Statistical Analysis for Managerial Decisions I - Acalog ACMSâ„¢

Focus is on developing skills in using statistical tools to make effective business decisions in all areas of public and private-sector decision making, including accounting, finance, marketing, production management, and human resource management.

Chapter 8 : Statistical Analysis - What is it? | SAS

Data and statistics can be used to concretely define and measure this uncertainty and predict when the next shipment is

coming. Managerial decision-making with this statistical insight can avoid steering production, costs and customer service into bad avenues.

Chapter 9 : Dr. Arsham's Statistics Site

The important elements to consider when using statistics in business decision analysis, particularly in process improvement, are the accuracy of collected data and information, the choice of statistical design or statistical model to analyze that data, the clear presentation of findings and conclusions, and finally, managerial recommendations.