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Management Science –A new view in New Era

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ABSTRACT

Managers today are inundated by data. Often, the correct interpretation of these data can mean the difference between being on the cutting edge of a market and being left behind by the competition. To solve the complex business problems faced by organizations in the 21st century, managers are increasingly turning to management science — the application of statistical techniques, scientific method, and mathematical modeling — to analyze and solve the problems of the organization. Management science can help managers solve a wide range of problems in the workplace and to make better decisions concerning the operation and strategy of the business. Management science offers managers many tools to help analyze and interpret the data with which they are bombarded every day. Some of these tools include data mining, decision support systems, and forecasting techniques.

Keywords: Customer Relationship Management; Data Mining; Decision Support System (DSS); Forecasting; Model; Probability; Scientific Method; Time Series Data

Overview

Management is the process of efficiently and effectively accomplishing work through the coordination and supervision of others. Effective management is much more than the effective application of such soft skills as management style, communication ability, and administrative prowess, however. Management also comprises the decisions that managers make to help gain or maintain a market share or to increase profitability within the marketplace. Although management decisions can be made subjectively based on a given manager's experience, the amounts of data that must be processed in order to do this well continue to increase with the proliferation of information technology and systems. As a result, managers are increasingly turning to management science — the application of statistical methods, scientific method, and mathematical modeling — to analyze and solve the problems of the organization.

21st Century Applications of Management Science

Management science has many practical applications in 21st century businesses. The use of probability theory, statistical techniques, and research methodology can help managers solve a wide range of problems in the workplace including optimizing cost/benefit tradeoffs in product design, improving the quality of services or products, forecasting the needs and trends of the marketplace, and improving the effectiveness of supply chain management. By applying mathematical statistical techniques to the real problems of the business world, managers can make better decisions concerning the operation and strategy of the business.

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Management science allows organizations to apply scientific method in order to solve many problems in the business world. For example, descriptive statistics are useful in summarizing and describing data. In addition, management science also includes the application of business statistics to real world problems. This discipline is an applied form of mathematics and is a valuable tool for helping analyze and interpret data. In particular, the use of inferential statistics, a collection of techniques that allow one to make inferences about the data, including the ability drawing conclusions about a population from a sample.

Another tool of management science is building models, or the development of abstract representations of situations, systems, or subsystems. Model development typically occurs in two phases. First, a conceptual model is developed to describe the situation or system. Initial conceptual models tend to be broad or general representations without much detail but which span the range of variables to be considered. Models typically must be tested and refined until they represent the real world to the degree desired by the analyst or decision maker. Models are iteratively refined using observations of the real world so that they better reflect the underlying reality of the situaiton. When the conceptual model adequately reflects the major parameters of the real world, data can be gathered and quantitative techniques used to turn the conceptual model into a mathematical model.

Applications

In the 21st century, human beings are constantly bombarded with data that need to be sorted, analyzed, and interpreted. In the business world, the correct interpretation of data can mean the difference between being on the cutting edge of a market or being left behind by the competition. Management science offers managers many tools to help analyze and interpret the data with which they are bombarded every day. Data mining allows managers to examine large amounts of data for previously unseen patterns and relationships in order to help forecast the future of an industry or the needs of a market. Decision support systems help managers make reasoned decisions about the semi-structured and unstructured problems with which they are faced every day. Forecasting uses statistical tools to recognize trends and patterns in the data and provides managers with the empirical data necessary to help shape the growth and focus of the organization.

Data Mining

Data mining is the process of analyzing large collections of data to establish patterns and determine previously unknown relationships between the data. The results of data mining efforts are used to predict future behavior. Data mining can be used to help the business better understand the needs and desires of current and potential customers and to identify and acquire high-value customers. The information produced by data mining efforts can also be used to optimize store layout for increased sales by shelving items that are frequently purchased together in close proximity. In addition, data mining can be used to increase the profitability of the store or chain, increase return on investment, decrease the costs of advertising and promotions, monitor performance of the store or business, and detect fraud, waste, and abuse. By detecting previously unrecognized patterns in data, data mining can help managers to make better decisions regarding business

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problems, develop novel approaches to meeting current organizational objectives, or create a more profitable strategic plan for the future of the organization.

Data Mining & Customer Relationship Management

Although data mining is used to examine the relationships within a wide variety of data across many disciplines, one of the primary uses of data mining in business is to find unknown relationships within sets of customer data. Among other things, data mining is frequently used in business for customer relationship management. This is the process of identifying prospective customers, acquiring data concerning these prospective and current customers, building relationships with customers, and influencing their perceptions of the organization and its products or services. For example, a data mining effort might examine the types of products purchased on line by owners of home computers. One source of data that is increasingly mined for information comes from retail scanners. The customer cards issued by various retail stores (e.g., supermarkets, pet supply stores, drug stores) that many people carry in their wallets that give them discounts or points toward rewards also can be used to collect information that is used in data mining efforts. For example, a grocery store might use data mining software to analyze the purchases made by consumers over the course of a week to determine what items are purchased together. For example, if the store finds that the purchases of fresh sweet corn fluctuate with the purchase of ribs during the summer, they might place pre-shucked corn next to the ribs in the refrigerated meat case. This knowledge would also help the store determine whether or not to purchase more corn for the weeks when ribs were on sale. Alternatively, data mining could be used by the store or chain to push other products. Grocery stores often issue customers coupons at the checkout counter or send them to customer homes based on what purchases they have made. For example, previous purchases of Brand X paper towels might result in the generation of a discount coupon for a future purchase of Brand X paper towels or for a future purchase of the store's brand of paper towels.

Data mining applications can be based on a number of different techniques. The most commonly used of these is classification, which is used to analyze data in a database and build a model to predict future behavior. Among the tools used in data classification are neural networks and decision trees. Neural networks are mathematical structures that are capable of learning. This technique is most effective when there is a large amount of data to be analyzed and the relationships between the data are either complex or imprecise. Decision trees are used to classify data into a limited number of classes. Decision trees classify data based on if-then statements and although they tend to be faster than neural nets, also are more appropriate to data with less complex relationships. Another approach to data mining is clustering. This technique subdivides the database into groups of records that share common traits. The structure of these clusters is unknown before the analysis begins. This means that the clusters usually need to be interpreted before they can be put into use in the real world. Data mining can also be done based on sequence discovery, or the establishment of relationships or associations between items over time. (For example, consumers who purchase maternity clothing this year are more likely than are those who do not to purchase diapers next year.)

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Decision Support Systems

To help managers make the unique, complex decisions that frequently arise in today's businesses, many organizations use decision support systems. These are interactive computer-based systems that support managers in their decision making processes. Decision support systems help managers better understand the issues underlying the situation and to make decisions in situations where the extent to which certain variables influence the activity or outcome are not initially clear or only part of the information is available in advance (i.e., unstructured situations). To be of use in answering unstructured questions, decision support systems must be flexible so that the impact of various variables and conditions can be tested and the analysis be returned to the user in a form that is useful for the specific situation. In addition, unstructured problems typically require an iterative process: The answers to the questions are not ends in themselves, but raise other questions for consideration that need to be run through the decision support system.

Decision support systems can help managers by providing the information and structure needed to make a rational decision. A decision support system creates a quantitative model of the situation and then processes data to show the impact of the variables under consideration on the outcomes. Decision support systems can also help decision makers answer questions concerning conditions under which an outcome might occur, what might happen if the value of a variable changes, or how many potential customers have certain characteristics.

Types of Decision Support Systems

There are several different general types of decision support systems including model-driven systems, data-driven systems, knowledge-driven systems, and group support systems. Model-driven decision support systems use various financial, optimization, or simulation models as aids for managerial decision making. Data-driven decision support systems process time series data and access simple file systems using query and retrieval tools. More advanced data-driven systems allow the manipulation of data or analytical processing. Knowledge-driven systems are expert systems that frequently include the application of artificial intelligence to the decision making process. These decision support systems are person/computer systems with specialized problem solving abilities that can make suggestions or recommendations to the user.

Forecasting

Managerial science can also help managers forecast future requirements of the marketplace or the industry so that they can better position the organization to effectively compete and survive. Businesses frequently need to know the trends of the marketplace in order to best position themselves to leverage this knowledge into profits. For example, a production manager may need to know if there will be a continuing need for widgets and how much raw material is needed to meet the anticipated demand. A marketing manager may need to know whether changing demographics in the marketplace mean that a new marketing strategy will be needed. A shipping manager may need to know whether or not the price of oil will continue to rise and how this cost affects the outsourcing for the production of gizmos. A

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human resources manager may need to know whether or not the turnover in the organization will continue and if new sources of qualified employees need to be found. Managers can answers questions such as these through forecasting — the science of estimating or predicting patterns and variations about many aspects of the business including buying, selling, production, and hiring.

Causes of Variation in Economic Activity

Managers are interested in a number of causes of variation in economic activity: Trends, business cycles, and seasonal fluctuations as well as irregular and random fluctuations. Trends are persistent, underlying directions in which something is moving in either the short, intermediate, or long term. Many trends in established industries tend to be linear rather than cyclic, and steadily grow or shrink over a period of years. For example, in the US, there is an increasing trend towards the outsourcing and offshoring of technical support and customer service in the high tech industry. Trends in new industries, on the other hand, tend to be curvilinear as the demand for the new product or service grows after its introduction then declines after the product or service becomes integrated into the economy.

Although managers can make forecasts subjectively based on experience or other factors, management science allows forecasts to be made based on quantitative analysis of data through the development of structural and economic models. Structural models are based on sets of mathematical functions designed to represent the causal relationships within the organization's environment. For example, before investing in a new venture, an organization might need to know the future price of its current product in order to forecast its profits and the resultant availability of funds for the new venture. Managers could be supported in this decision through the development of a specification model that contains the factors affecting the supply and demand for the current product and the relationship between these factors. Another approach to business forecasting is the use of deterministic models. This type of model assumes that the variable of interest is a deterministic function of time and does not include the effects of any underlying data uncertainty or variability in the time series. Forecasting can also be done based on *ad hoc* forecasting formulas developed from past history. This type of model typically uses weighted moving averages. Although this approach simplifies computation, there is no way to determine whether the formula chosen is the most appropriate. This means that there can be no concomitant confidence in the worth of the resultant forecasts. Forecasting can also be done through the use of time series analysis. Time series data are gathered on a specific characteristic over a period of time. To be useful, these data must be collected at intervals of regular length. As opposed to the *ad hoc* approach to forecasting (where it is impossible to tell whether or not the formula chosen is the most appropriate for the situation) in time series analysis, one can study the structure of the correlation of variables over time to determine the appropriateness of the model. The model can be refined as necessary to make it more representative of the real world situation.

Terms & Concepts

Artificial Intelligence (AI): The branch of computer science concerned with

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development of software that allows computers to perform activities normally considered to require human intelligence. Artificial intelligence applications include the development of expert systems that allow computers to make complex, real world decisions; programming computers to understand natural human languages; development of neural networks that reproduce the physical connections occurring in animal brains; and development of computers that react to visual, auditory, and other sensory stimuli (i.e., robotics).

Customer Relationship Management: The process of identifying prospective customers, acquiring data concerning these prospective and current customers, building relationships with customers, and influencing their perceptions of the organization and its products or services.

Data Mining: The process of analyzing large collections of data to establish patterns and determine previously unknown relationships. The results of data mining efforts are used to predict future behavior.

Decision Support System (DSS): A computer based information system that helps managers make decisions about semi-structured and unstructured problems. Decision support systems can be used by individuals or groups and can be stand-alone or integrated systems or web-based.

Forecasting: In business, forecasting is the science of estimating or predicting future trends. Forecasts are used to support managers in making decisions about many aspects of the business including buying, selling, production, and hiring.

Information Technology: The use of computers, communications networks, and knowledge in the creation, storage, and dispersal of data and information. Information technology comprises a wide range of items and abilities for use in the creation, storage, and distribution of information.

Management: The process of efficiently and effectively accomplishing work through the coordination and supervision of others.

Management Style: The way in which a manager supervises his/her employees. Different management styles (e.g., coercive, permissive, persuasive) are appropriate depending on the ability and needs of the workers, the situation in which they are working, and the personality of the manager.

Model: A representation of a situation, system, or subsystem. Conceptual models are mental images that describe the situation or system. Mathematical or computer models are mathematical representations of the system or situation being studied.

Probability: A branch of mathematics that deals with estimating the likelihood of an event occurring. Probability is expressed as a value between 0 and 1.0, which is the mathematical expression of the number of actual occurrences to the number of possible occurrences of the event. A probability of 0 signifies that there is no chance that the event will occur and 1.0 signifies that the event is certain to occur.

Scientific Method: A cornerstone of organizational behavior theory in which a systematic approach is used to understand some aspect of behavior in the workplace by individuals, teams, or organizations. The scientific method is based on controlled and systematic data collection, interpretation, and verification in a search for reproducible

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results. In organizational behavior theory, the goal is to be able to apply these results to real world applications.

Strategic Plan: A document based on the process of determining the long-term goals of an organization and developing a plan to use the company's resources — including materials and personnel — in reaching these goals.

Supply Chain Management: The process of efficiently connecting the parties in a value chain in order to reduce costs, improve customer service, develop the organization's knowledge base, increase efficiency, and create barriers to competitors. Supply management includes managing the flow of materials, information, and money within and between organizations in a supply chain.

Time Series Data: Data gathered on a specific characteristic over a period of time. Time series data are used in business forecasting. To be useful, time series data must be collected at intervals of regular length.

References

Black, K. (2006). *Business statistics for contemporary decision mak*ing (4th ed.). New York: John Wiley & Sons.

Lucas, H. C. Jr. (2005). *Information technology: Strategic decision making for managers*. New York: John Wiley and Sons.

Menon, S. & Ramesh, S. (2001). Data mining. *Encyclopedia of Operations Research & Management Science*, 191-194.

http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=21891287&site=ehost-live

Senn, J. A. (2004). *Information technology: Principles, practices, opportunities* (3rd ed.). Upper Saddle River, NJ: Pearson/Prentice Hall.