DOI: 10.20472/IAC.2015.019.049

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THE WAYS OF INCREASING EFFICIENCY OF DECISION MAKING IN ARMENIAN COMPANIES

Abstract:

As we all know decision making is the mental process of choosing from a set of alternatives. Every decision-making process produces an outcome that might be an action, recommendation, or an opinion. In the evolution process of management many top organizations in the world use their own and well known approaches to the process of decision making.

In the past decade management approaches on decision making changed and vary from organization to organization and the need of making them more efficient decisions become the central problem in this area. Economic growth, emerging markets, competitiveness forces companies to find better solution to the problems. And the first step in this huge mass of work is to gather appropriate data analyze it and sort from it information which will appropriate, useful, cost effective, relevant and timely. That's why the need of computer softwares and systems which will assist top management in decision-making process becomes high. Decision Support System is one of the most popular and familiar with companies all over the world, and the use of which will help most of companies in Armenia to increase the efficiency of the decision that they made. As a result they will generate higher rates of revenues and profits, they will make a cost effective approach and control.

Decision support systems are interactive, computer-based systems that aid users in judgment and choice activities. They provide data storage and retrieval but enhance the traditional information access and retrieval functions with support for model building and model-based reasoning. They support framing, modeling, and problem solving. Decision support systems are typically used for strategic and tactical decisions faced by upper-level management—decisions with a reasonably low frequency and high potential consequences—in which the time taken for thinking through and modeling the problem pays off generously in the long run. So research shows that we should conclude that decision support systems integration in the Armenia companies is the number one solution to the increase of their own benefit and success, which will respectively increase business activity in Armenian market which will cause stable economic growth in the country.

Keywords:

Decision Support System, Efficiency, Management, Emerging Markets

JEL Classification: M00, M00

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Decision support systems are interactive, computer-based systems that aid users in judgment and choice activities. [1]They provide data storage and retrieval but enhance the traditional information access and retrieval functions with support for model building and model-based reasoning. They support framing, modeling, and problem solving. Decision support systems are typically used for strategic and tactical decisions faced by upper-level management—decisions with a reasonably low frequency and high potential consequences—in which the time taken for thinking through and modeling the problem pays off generously in the long run. So research shows that we should conclude that decision support systems integration in the Armenia companies is the number one solution to the increase of their own benefit and success, which will respectively increase business activity in Armenian market which will cause stable economic growth in the country.

Unfortunately, most organizations sacrifice speed by taking a more-is-better approach to decision-making collaborations. Whether moving to a matrix structure, adding another collaborative technology, or embarking on a program of cultural transformation, they simply look for more ways to connect people. Such initiatives can make leaders feel that they are increasing alignment and organizational focus on strategic objectives, when in fact they usually only create unmanageable collaborative demands and fail to bring about changes in behaviors and networks. A network perspective can rectify that unproductive approach. It helps leaders ensure that decision-making interactions deep within an organization are efficiently supporting strategic objectives.

Combining process mapping and network analysis techniques is a powerful way to systemically improve effectiveness and efficiency of core decision processes in organizations. Equally critical performance improvement opportunities are revealed by assessing the way in which a top team is enmeshed within information and decision-making networks. Top teams are the core of decision making in critical processes like strategic planning, resource allocation, and conflict resolution. They have substantial direct and indirect impacts on organizations. Yet too often efforts to improve executive

[1] Max Henrion, John S. Breese, and Eric J. Horvitz. Decision Analysis and Expert Systems. AI Magazine, 12(4):64{91, Winter 1991.

team decision making simply focus on symptoms – such as engaging in team building to enhance collaboration when the underlying problem is inadequate or biased information flow networks within and outside of the team. These kinds of solutions frequently result in excessive consensus seeking, lengthy decision cycles, and diffusion of effort and focus throughout an organization.

In an environment of fierce and rapidly shifting competition, companies have a smaller margin of error from poor decision-making processes. A network lens can add measurably to both decision speed and decision quality. In this article, we have shown how managerial decisions – in both framing of the problem space and execution of the decision – happen in an interactive way through networks distributed within and outside of a given team, committee, and even organization. Attending to these networks represents an important performance improvement opportunity to supplement what decision research has helped us understand about cognitive and small group decision biases.

Making decisions concerning complex systems (e.g., the management of organizational operations, industrial processes, or investment portfolios; the command and control of military units; or the control of nuclear power plants) often strains our cognitive capabilities. Even though individual interactions among a system’s variables may be well understood, predicting how the system will react to an external manipulation such as a policy decision is often difficult. What will be, for example, the effect of introducing the third shift on a factory floor? One might expect that this will increase the plant’s output by roughly 50 percent. Factors such as additional wages, machine weardown, maintenance breaks, raw material usage, supply logistics, and future demand need also be considered, however, as they all will impact the total financial outcome of this decision. Many variables are involved in complex and often subtle interdependencies and predicting the total outcome may be daunting.

There is a substantial amount of empirical evidence that human intuitive judgment and decision making can be far from optimal, and it deteriorates even further with complexity and stress. Because in many situations the quality of decisions is important, aiding the deficiencies of human judgment and decision making has been a major focus of science throughout history. Disciplines such as statistics, economics, and operations research developed various methods for making rational choices. More recently, these methods, often enhanced by a variety of techniques originating from information science, cognitive psychology, and artificial intelligence, have been implemented in the form of computer programs, either as stand-alone tools or as integrated computing environments for complex decision making. Such environments are often given the common name of decision support systems (DSSs). The concept of DSS is extremely broad, and its definitions vary, depending on the author’s point of view. To avoid exclusion of any of the existing types of DSSs, we will define them roughly as interactive computer-based systems that aid users in judgment and choice activities. Another name sometimes used as a synonym for DSS is knowledge-based systems, which refers to their attempt to formalize domain knowledge so that it is amenable to mechanized reasoning.

Decision support systems are gaining an increased popularity in various domains, including business, engineering, the military, and medicine. They are especially valuable in situations in which the amount of available information is prohibitive for the intuition of an unaided human decision maker and in which precision and optimality are of importance. Decision support systems can aid human cognitive deficiencies by integrating various sources of information, providing intelligent access to relevant knowledge, and aiding the process of structuring decisions. They can also support choice among well-defined alternatives and build on formal approaches, such as the methods of engineering economics, operations research, statistics, and decision theory. They can also employ artificial intelligence methods to address heuristically problems that are intractable by formal techniques. Proper application of decision-making tools increases productivity, efficiency, and effectiveness and gives many businesses a comparative advantage over their competitors, allowing them to make optimal choices for technological processes and their parameters, planning business operations, logistics, or investments.

While it is difficult to overestimate the importance of various computer-based tools that are relevant to decision making (e.g., databases, planning software, and spreadsheets), this article focuses primarily on the core of a DSS, the part that directly supports modeling decision problems and identifies best alternatives. We will briefly discuss the characteristics of decision problems and how decision making can be supported by computer programs. We then cover various components of DSSs and the role that they play in decision support. We will also introduce an emergent class of normative systems (i.e., DSSs based on sound theoretical principles), and in particular, decision- analytic DSSs. Finally, we will review issues related to user interfaces to DSSs and stress the importance of user interfaces to the ultimate quality of decisions aided by computer programs.

Decisions and Decision Modeling

Types of Decisions

A simple view of decision making is that it is a problem of choice among several alternatives. A somewhat more sophisticated view includes the process of constructing the alternatives (i.e., given a problem statement, developing a list of choice options). A complete picture includes a search for opportunities for decisions (i.e., discovering that there is a decision to be made). A manager of a company may face a choice in which the options are clear (e.g., the choice of a supplier from among all existing suppliers). She may also face a well-defined problem for which she designs creative decision options (e.g., how to market a new product so that the profits are maximized). Finally, she may work in a less reactive fashion and view decision problems as opportunities that have to be discovered by studying the operations of her company and its surrounding environment (e.g., how can she make the production process more efficient). There is much anecdotal and some empirical evidence that structuring decision problems and identifying creative decision alternatives determine the ultimate quality of decisions. Decision support systems aim mainly at this broadest type of decision making, and in addition to supporting choice, they aid in modeling and analyzing systems (such as complex organizations), identifying decision opportunities, and structuring decision problems.

Human Judgment and Decision Making

Theoretical studies on rational decision making, notably that in the context of probability theory and decision theory, have been accompanied by empirical research on whether human behavior complies with the theory. It has been rather convincingly demonstrated in numerous empirical studies that human judgment and decision making is based on intuitive strategies as opposed to theoretically sound reasoning rules. These intuitive strategies, referred to as judgmental heuristics in the context of decision making, help us in reducing the cognitive load, but alas at the expense of optimal decision making. Effectively, our unaided judgment and choice exhibit systematic violations of probability axioms (referred to as biases). Formal discussion of the most important research results along with experimental data can be found in an anthology edited by Kahneman, Slovic, and Tversky.[2] Dawes provides an accessible introduction to what is known about people's decision-making performance. [3]

One might hope that people who have achieved expertise in a domain will not be subject to judgmental biases and will approach optimality in decision making. While empirical evidence shows that experts indeed are more accurate than novices within their area of expertise, it also shows that they also are liable to the same judgmental biases as novices and demonstrate apparent errors and inconsistencies in their judgment. Professionals such as practicing physicians use essentially the same judgmental heuristics and are prone to the same biases, although the degree of departure from the normatively prescribed judgment seems to decrease with experience. In addition to laboratory evidence, there are several studies of expert performance in realistic settings, showing that it is inferior even to simple linear models (an informal review of the available evidence and pointers to literature can be found in the book by Dawes). For example, predictions of future violent behavior of psychiatric patients made by a panel of psychiatrists who had access to patient records and interviewed the patients were found to be inferior to a simple model that included only the past incidence of violent behavior. Predictions of marriage counselors concerning marital happiness were shown to be inferior to a simple model that just subtracted the rate of fighting from the rate of sexual intercourse (again, the marriage counselors had access to all data, including interviews with the couples). Studies yielding similar results have been conducted with bank loan officers, physicians, university admission committees, and so on.

Modeling Decisions

The superiority of even simple linear models over human intuitive judgment suggests that one way to improve the quality of decisions is to decompose a decision problem into simpler components that are well defined and well understood. Studying a complex system built out of such components can be subsequently aided by a formal, theoretically sound technique. The process of decomposing and formalizing a problem is often called modeling. Modeling amounts to finding an abstract representation of a real-world system that simplifies and assumes as much as possible about the system, and while retaining the system's essential relationships, omits unnecessary detail. Building a model of a decision problem, as opposed to reasoning about a problem in a holistic way, allows for applying scientific knowledge that can be transferred across problems and often across domains. It allows for analyzing, explaining, and arguing about a decision problem.[4]

The desire to improve human decision making provided motivation for the development of a variety of modeling tools in disciplines of economics, operations research, decision theory, decision analysis, and statistics. In each of these modeling tools, knowledge about a system is represented by means of algebraic, logical, or

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[2] Robyn M. Dawes. Rational Choice in an Uncertain World. Hartcourt Brace Jovanovich, Publishers, 1988.
[3] Daniel Kahneman, Paul Slovic, and Amos Tversky, editors. Judgment Under Uncertainty: Heuristics and Biases. Cambridge University Press, Cambridge, 1982.
[4] Detlof von Winterfeldt and Ward Edwards. Decision Analysis and Behavioral Research. Cambridge University Press, Cambridge, 1988.

statistical variables. Interactions among these variables are expressed by equations or logical rules, possibly enhanced with an explicit representation of uncertainty. When the functional form of an interaction is unknown, it is sometimes described in purely probabilistic terms; for example, by a conditional probability distribution. Once a model has been formulated, a variety of mathematical methods can be used to analyze it. Decision making under certainty has been addressed by economic and operations research methods, such as cash flow analysis, break- even analysis, scenario analysis, mathematical programming, inventory techniques, and a variety of optimization algorithms for scheduling and logistics. Decision making under uncertainty enhances the above methods with statistical approaches, such as reliability analysis, simulation, and statistical decision making. Most of these methods have made it into college curricula and can be found in management textbooks. Due to space constraints, we will not discuss their details further.

Components of Decision Models

While mathematically a model consists of variables and a specification of interactions among them, from the point of view of decision making a model and its variables represent the following three components: a measure of preferences over decision objectives, available decision options, and a measure of uncertainty over variables influencing the decision and the outcomes.

Preference is widely viewed as the most important concept in decision making. Outcomes of a decision process are not all equally attractive and it is crucial for a decision maker to examine these outcomes in terms of their desirability. Preferences can be ordinal (e.g., more income is preferred to less income), but it is convenient and often necessary to represent them as numerical quantities, especially if the outcome of the decision process consists of multiple attributes that need to be compared on a common scale. Even when they consist of just a single attribute but the choice is made under uncertainty, expressing preferences numerically allows for trade-offs between desirability and risk.

The second component of decision problems is available decision options. Often these options can be enumerated (e.g., a list of possible suppliers), but sometimes they are continuous values of specified policy variables (e.g., the amount of raw material to be kept in stock). Listing the available decision options is an important element of model structuring.

The third element of decision models is uncertainty. Uncertainty is one of the most inherent and most prevalent properties of knowledge, originating from incompleteness of information, imprecision, and model approximations made for the sake of simplicity. It would not be an exaggeration to state that real-world decisions not involving uncertainty either do not exist or belong to a truly limited.

Decision making under uncertainty can be viewed as a deliberation: determining what action should be taken that will maximize the expected gain. Due to uncertainty there is no guarantee that the result of the action will be the one intended, and the best one can hope for is to maximize the chance of a desirable outcome. The process rests on the assumption that a good decision is one that results from a good decision-making process that considers all important factors and is explicit about decision alternatives, preferences, and uncertainty.

It is important to distinguish between good decisions and good outcomes. By a stroke of good luck a poor decision can lead to a very good outcome. Similarly, a very good decision can be followed by a bad outcome. Supporting decisions means supporting the decision-making process so that better decisions are made. Better decisions can be expected to lead to better outcomes.

Decision Support Systems

Decision support systems are interactive, computer-based systems that aid users in judgment and choice activities. They provide data storage and retrieval but enhance the traditional information access and retrieval functions with support for model building and model-based reasoning. They support framing, modeling, and problem solving.

Typical application areas of DSSs are management and planning in business, health care, the military, and any area in which management will encounter complex decision situations. Decision support systems are typically used for strategic and tactical decisions faced by upper-level management—decisions with a reasonably low frequency and high potential consequences—in which the time taken for thinking through and modeling the problem pays off generously in the long run.

There are three fundamental components of DSSs.[5]

- Database management system (DBMS). A DBMS serves as a data bank for the DSS. It stores large quantities of data that are relevant to the class of problems for which the DSS has been designed and provides logical data structures (as opposed to the physical data structures) with which the users interact. A DBMS separates the users from the physical aspects of the database structure and processing. It should also be capable of informing the user of the types of data that are available and how to gain access to them.

- Model-base management system (MBMS). The role of MBMS is analogous to that of a DBMS. Its primary function is providing independence between specific models that are used in a DSS from the applications that use them. The purpose of an MBMS is to transform data from the DBMS into information that is useful in decision making. Since many problems that the user of a DSS will cope with may be unstructured, the MBMS should also be capable of assisting the user in model building.

- Dialog generation and management system (DGMS). The main product of an interaction with a DSS is insight. As their users are often managers who are not computer-trained, DSSs need to be equipped with intuitive and easy-to-use interfaces. These interfaces aid in model building, but also in interaction with the model, such as gaining insight and recommendations from it. The primary responsibility of a DGMS is to enhance the ability of the system user to utilize and benefit from the DSS. In the remainder of this article, we will use the broader term user interface rather than DGMS.

While a variety of DSSs exists, the above three components can be found in many DSS architectures and play a prominent role in their structure. Interaction among them is illustrated in Fig. 1. Essentially, the user interacts with the DSS through the DGMS. This communicates with the DBMS and MBMS, which screen the user and the user interface from the physical details of the model base and database implementation.

[5] Andrew P. Sage. Decision Support Systems Engineering. John Wiley & Sons, Inc., New York, 1991.

Summary

Decision support systems are powerful tools integrating scientific methods for supporting complex decisions with techniques developed in information science, and are gaining an increased popularity in many domains. They are especially valuable in situations in which the amount of available information is prohibitive for the intuition of an unaided human decision maker and in which precision and optimality are of importance. Decision support systems aid human cognitive deficiencies by integrating various sources of information, providing intelligent access to relevant knowledge, aiding the process of structuring, and optimizing decisions.

Normative DSSs offer a theoretically correct and appealing way of handling uncertainty and preferences in decision problems. They are based on carefully studied empirical principles underlying the discipline of decision analysis and they have been successfully applied in many practical systems. We believe that they offer several attractive features that are likely to prevail in the long run as far as the technical developments are concerned.

Because DSSs do not replace humans but rather augment their limited capacity to deal with complex problems, their user interfaces are critical. The user interface determines whether a DSS will be used at all and if so, whether the ultimate quality of decisions will be higher than that of an unaided decision maker.

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