

: Are computerized decision aids decision support systems?

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Some are, some aren't. The phrase *computerized decision aid* refers to a diverse set of computer-based support tools built using a variety of decision techniques. Some aids are complex and sophisticated and hence should be classified as decision support systems. Other computer tools termed computerized decision aids are simpler and naive. For example, a web page with decision aiding information or a simple web-based checklist can be termed a decision aid. In the scientific literature, one encounters research about computerized decision aids (cf., Arkes et al., 2007; Larson et al., 2005). Often this literature is relevant to decision support researchers. Simple decision aiding tools may be very useful, but they should not be classified as decision support systems (DSS). Researchers should examine a tool or system's complexity as part of decision support classification.

The phrase decision aid has a longer history in the academic literature than the term decision support system and the term decision aid is used very broadly in both the academic and practitioner literature. A decision aid provides assistance or help for reaching a conclusion and making a choice among alternatives. In English, the verb "aid" means to give support or assistance and hence the overlap and sometimes confusion with the concept decision support system.

At Google.com a search for "decision aid" returns 386,000 results and "decision support system" returns 8,260,000 results. One definition on the Web of a "decision aid" is "an object used to assist a person in deriving optimal decisions, such as a particular medical diagnosis, when to change a component on an aircraft, or which site to investigate on a scouting mission in time of war. Decision aids are computer-based, i.e., algorithms, software and/or hardware (cf., <http://www.intota.com>)." The Mayo clinic definition is "a tool used to inform patients about available treatments, along with potential benefits, risks and costs, during clinical encounters. Decision aids use a shared, informed approach to clinical decision-making (cf., www.mayo.edu/center-for-innovation/projects/decision-aids)."

Christophe David suggests a decision aid is all about "helping people to make choices between several options (actions), based on several aspects (criteria), taking into account the individual preferences. In practice, this means helping people to find the compromise they prefer, considering their own perception of the world." The website Request for Proposal templates (rfp-templates.com) notes "Broadly

: Are computerized decision aids decision support systems?

speaking, a decision-support systems (DSS) is simply a computer system that helps you make a decision by leveraging the multi-criteria decision-making model. DSS provide a means for decision-makers to make decisions on the basis of more complete information and analysis. Among the main advantages of the use of DSS are the following: 1) Increased number of alternatives examined, 2) Better understanding of the business, 3) Fast response to unexpected situations, 4) Improved communication, 5) Cost savings, 6) Better decisions, 7) More effective teamwork, 8) Time savings and 9) Better use of data resources." This site is really selling simple computerized decision aids and their DSS definition is drastically narrowed and incorrect. Also, the broad benefits they claim for DSS are exaggerated.

My **DECision AID** project involved creating a computerized collection of heuristics and a multicriteria models (Power and Rose, 1976; [Power, 1998](#)). Most decision aids focus on the convergent phase of the decision process and help a specific decision maker come closer to making a decision or choice among alternatives. Decision aids range from a simple heuristic like mark-up pricing to a very complex tool based upon a multicriteria model, algebraic model or even a complex genetic algorithm. The heuristics used in computerized decision aids are rules of thumb, generally based on expert experience or common sense. When mathematical models are incorporated in decision aids they become more complex and more sophisticated.

Computerized decision aids are also sometimes called recommender systems. According to Wietsma and Ricci "recommender systems provide decision aid and information filtering functions ... (and are) exploited in eCommerce web sites to suggest products and provide to consumers information for facilitating the decision process."

What are examples of computerized decision aids?

A quick review of web pages finds: a Diagnostic Decision Aid for Pediatric Sinusitis, a patient decision aid for choice of surgical treatment, a decision aid for nitrogen fertilizer management in cotton, Weed Management Decision Aids, a decision aid for nutrient management for forest trees in Hawaii, Oregon Water Quality Decision Aid (OWQDA), Maintenance Error Decision Aid (MEDA), interactive multimedia decision aid on hormone replacement therapy, decision aid

: Are computerized decision aids decision support systems?

for the management of diseases and pests of grapes, Tactical Decision Aid for selecting munitions and establishing an attack plan, True Seed Cost Decision Aid, and Dust Tactical Decision Aid (TDA).v

The Corn/Soybean Planting Decision Aid "is designed to help grain farmers decide whether to plant corn or soybeans. This program begins by asking the farmer to input their estimate of their county marketing assistance loan rate (LR) for soybeans. This information along with information on variable cash production costs, yields, estimates of local basis levels and storage costs is used to calculate a breakeven futures market price required for an all-fall or January delivery for corn in order for corn production to be equal to soybean production based on returns above variable cash costs." (cf., www.uky.edu/Ag/AgEcon/pubs/software/cornvsoybean.html).

The MMR decision aid was designed to help people decide whether to immunize a child with the Measles, Mumps and Rubella (MMR) vaccine (see URL <http://www.ncirs.usyd.edu.au/decisionaid/index.html>). Programmer Danny Goodman has a decision aiding application on the Web called The Decision Helper -- <http://www.dannyg.com/javascript/dhnocookie/dhLoad.htm> .

Gomaa et al. note "Auditors may benefit from the use of decision aids at all stages of the engagement, to provide guidance to engagement teams and promote consistency of decision making across engagements and over time. Decision aids may appear in many forms, including advanced IT applications such as expert systems, neural networks, or decision support systems and less advanced tools such as algorithms, procedures, and standard forms."

Computerized decision aids have been developed and studied for many years. The results have generally been positive, but the adoption and use in medicine has been disappointing. Barry (2015) briefly explores the decision aid paradox including the poor fit with the traditional workflow of clinical care.

Where can one learn more about computerized decision aids?

There is a EURO Working Group on Multicriteria

: Are computerized decision aids decision support systems?

Decision Aiding (EWG-MCDA) (check <http://www.cs.put.poznan.pl/ewgmcda/>). The International Society on Multiple Criteria Decision Making (ISMCDM) has also been influential in promoting the development of computerized decision aids (check <http://www.mcdmsociety.org/>). The 1st International Conference on MCDM was held in 1975 and was organized by Prof. Stanley Zionts.

LAMSADE, the Laboratory for Analysing and Modelling Decision-Aid Systems, was an excellent starting point for learning more about research on multi-criteria, model-based decision aids. The site explained that "Decision Aiding is a multi-disciplinary research area merging contributions from fields as different as: cognitive psychology, operational research, social choice theory, discrete mathematics, formal logic, organisational studies, economics and management, and measurement theory." The Decision Aiding research area of LAMSADE was "founded by the seminal work of Bernard Roy and has an almost 30 years record of activities."

In conclusion, complex, sophisticated computerized decision aids are a subcategory of decision support systems. But in general, DSS are computerized decision aids. Some computerized decision aids may be so simple that we do not want to categorize them as decision support systems. Computerized decision aids are generally knowledge-driven or model-driven DSS. A common mathematical framework for building a computerized decision aid is a multi-criteria model. So visualize a Venn diagram with 2 intersecting categories. Some DSS are computerized decision aids. Some DSS are not. Some computerized decision aids are not DSS. The two categories intersect.

References

Arkes, Hal R., Victoria A. Shaffer, Mitchell A. Medow, "Patients Derogate Physicians Who Use a Computer-Assisted Diagnostic Aid," *Medical Decision Making*, 2007, Vol. 27, pp. 189—202.

Barry, M.J., "Resolving the Decision Aid Paradox," *JAMA Internal Medicine*, Vol. 175, No. 5, 2015.

David, C.,

: Are computerized decision aids decision support systems?

<http://www.christophedavid.org/w/c/w.php/DecisionAid/Introduction>

Gomaa, M., J. Hunton, and E. Vaassen, "Auditors' Reliance on a Decision Aid: the Effect of Audit Quality Pressure Variations," Abstract, URL www.cs.unimaas.nl/auditing-symposium/Auditors_Reliance_on_a_Decision_Aid.pdfv

Humphreys, P., O. Svenson, A. Vári, *Analysing and Aiding Decision Processes*, North-Holland, 1983.

Larson, James A., Roland K. Roberts, Burton C. English, Rebecca L. Cochran and Bradly S. Wilson, "A computer decision aid for the cotton yield monitor investment decision," *Computers and Electronics in Agriculture* Volume 48, Issue 3, September 2005, Pages 216-234.

Leyva Lopez, Juan Carlos, "Multicriteria decision aid application to a student selection problem," *Pesqui. Oper.* . Jan./Apr. 2005, vol.25, no.1 [cited 16 July 2006], p.45-68. Available from World Wide Web: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-74382005000100004&lng=en&nrm=iso. ISSN 0101-7438.

Jordan Lowe, D., Reckers, P. M. J., & Whitecotton, S. M., The effects of decision-aid use and reliability on jurors' evaluations of auditor liability. *Accounting Review*, 77(1), 2002, 185-202.

Niemeyer, K. "Hardware and Software of the IABG Gaming Centre," pp. 337-344 in R. Huber *Military Strategy and Tactics: Computer Modeling of Land War Problems*, Springer, 1975.

O'Connor, A., "Using patient decision aids to promote evidence-based decision making," *Evidence Based Medicine*, 2001;6:100-102 at URL <http://ebm.bmj.com/content/6/4/100.full>

Power, D. J. "Designing and Developing A Computerized Decision Aid - A Case Study", World Wide Web,

: Are computerized decision aids decision support systems?

<http://dssresources.com/papers/decisionaids.html>, version 2.0, April 14, 1998.

Power, D. and G. Rose, "Improving decision making behavior using the Hewlett-Packard 2000-Access system," American Institute for Decision Sciences Proceedings, 1976, 8, pps. 47-49.

Power, D. and G. Rose, "An evaluation of DECAID, a decision formulation CAL program." American Institute for Decision Sciences Proceedings, 1977, 9, pps. 118-119.

Viek, C., "Historical Development of SPUDM 1969-1997: Research Conference on Subjective Probability, Utility and Decision Making," 2012 at URL <http://eadm.eu/wp-content/uploads/2014/05/Viek2012.pdf>

Wietsma, R. and F. Ricci, "Product Reviews in Mobile Decision Aid Systems," eCommerce and Tourism Research Laboratory, ITC-irst, http://www.medien.ifi.lmu.de/permid2005/pdf/ReneWietsma_Permid2005.pdf.

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[Abstract for Arkes, Hal R., Victoria A. Shaffer, Mitchell A. Medow, "Patients Derogate Physicians Who Use a Computer-Assisted Diagnostic](#)

: Are computerized decision aids decision support systems?

Aid". *Medical Decision Making*. 2007 Mar-Apr;27(2):189-202.

Objective. To ascertain whether a physician who uses a computer-assisted diagnostic support system (DSS) would be rated less capable than a physician who does not. **Method.** Students assumed the role of a patient with a possible ankle fracture (experiment 1) or a possible deep vein thrombosis (experiment 2). They read a scenario that described an interaction with a physician who used no DSS, one who used an unspecified DSS, or one who used a DSS developed at a prestigious medical center. Participants were then asked to rate the interaction on 5 criteria, the most important of which was the diagnostic ability of the physician. In experiment 3, 74 patients in the waiting room of a clinic were randomly assigned to the same 3 types of groups as used in experiment 1. In experiment 4, 131 3rd- and 4th-year medical students read a scenario of a physician-patient interaction and were randomly assigned to 1 of 4 groups: the physician used no DSS, heeded the recommendation of a DSS, defied a recommendation of a DSS by treating in a less aggressive manner, or defied a recommendation of a DSS by treating in a more aggressive manner. **Results.** The participants always deemed the physician who used no decision aid to have the highest diagnostic ability. **Conclusion.** Patients may surmise that a physician who uses a DSS is not as capable as a physician who makes the diagnosis with no assistance from a DSS. **Key words:** decision support techniques; diagnosis computer assisted; patient satisfaction.

Abstract for Jordan Lowe, D., Reckers, P. M. J., & Whitecotton, S. M. (2002).

This study provides evidence on how auditors' use of decision aids affects jurors' evaluation of auditor legal liability, based on an experiment in which actual jurors responded to a hypothetical audit lawsuit. The results suggest that decision aids can have positive, negative, or neutral effects on auditors' legal liability, depending on how auditors use the decision aid and the reliability of the decision aid. For high-reliability aids, jurors attributed more responsibility for an audit failure to the auditor when the auditor overrode the recommendation of a decision aid than when the auditor did not use the decision aid. However, jurors attributed lower responsibility to an auditor who relied on the recommendation of a highly reliable decision aid, even though the aid turned out to be incorrect. In contrast to the high-reliability conditions, auditors' use of the decision aid had virtually no impact on jurors' liability judgments when the reliability of the decision aid was low.

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