International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 10 Issue: 03 | March - 2026 SJIF Rating: 8.659 ISSN: 2582-3930

Decision Support Systems and Expert Systems

Dr. Dahlia Sam1 Prof Dr MGR Educational and Research Institute Maduravoyal Chennai TN

Prof Dr. Brindha Tirugnanasambandam1 M.A.M School of Engineering Siruganur Tiruchirapalli-621105

Abstract : Decision support system- DSS From 1960 and 1970 the DSS gained prominence with notable applications like the laundry equipment production planning initially explored by by academics and practioners. DSS experienced significant development and application leading to widespread adoption across various domains. Definition DSS artists decision makers in addressing unstructured or semi structured problems integrating data and analytical models. It combines information Systems, management science and operations research.

Tools like chatGPT are ground breaking aids for productivity and creativity they have started to creep out internet corners. On the defensive side, cyber security is keeping up the AI driven systems which scans billions of signals daily emails logins, code changes to spot trouble before wreck havoc, companies are even sparring with AI powered ' red teams ' that stimulate attacks trying to outsmart their defenses. For example: generative models can design new attacks that don't fit any known pattern, leaving security systems one behind. Indian agencies like the Indian computer emergency response team and national information infrastructure protection center are actively working on suitable measures to counter the worrisome impact of generative AI. Indians digital public infrastructure adhaar UPI COWIN is marvel by any standard. Startups tech industries and fintech firms are walking a light rope with AI driven security risks juggling the thrill of innovation with the need for caution. Indians new digital personal data protection Act 2023 also known as DPDP act, can overhaul data handling, touching on privacy and security. Consider how quickly generative models like chatGPT churn out realistic but fake content the legal framework are trying to catch up. Decision making has become increasingly intricate in todays rapidly evolving world, spanning diverse domains such as business health care finance and technology.

Decision support system- Definition DSS artists decision makers in addressing unstructured or semi structured problems integrating data and analytical models. It combines information Systems, management science and operations research.

Characteristic of decision support system

While examining current systems there are 4 key traits

1 Focus on less structured problems : The decision support systems issues commonly faced are target less structured issues commonly faced by upper level managers at various levels. They are less suitable for addressing the needs of lower level management

2 IMS information management science : DSS makes use of management science methodologies with various functions enabling decision makers employ quantities analysis techniques efficiently.

3 Acting as an interface : There is a user friendly interface to facilitate interactive currage catering to individuals who may not be proficient in a particular area.

4 Levels of flexibility and adaptability :Decision support system consists dialogue data and models. The dialogue subsystem serves as the interface for executing DSS fundamentals. The model subsystem contains a library of models and routines for their maintenance and integrate the management to facilitate user control and data provision.

Components of DSS Data management model management knowledge engine user interface and decision maker utilizes system insights to aid decision makers in evaluating alternatives and making informed decisions. In current landscape effective decision making is vital for organizational success.

DSS: The data driven models are based on external and internal databases decision is made. The data mining and machine learning techniques are used to predict patterns and make decisions

The model as such is a data mining and machine learning techniques are used to predict and make decisions . A model driven is utilized to meet predetermined set of user needs. These models are used to evaluate various scenario s and ensure they meet user needs information is provided to user incorporating the company's business procedure and knowledge base. Knowledge driven is through knowledge management through knowledge base. The communication driven are based on tools that enable communication among multiple individual working on different tasks facilitating communication.

The document driven retrives the data I this type of information management system. Users can search for company websites for policies procedures.

Limitations of decision support systems :There is an vulnerable to errors on the dependence on data quality. There are sensitivity changes in assumptions or conditions. The DSS may overlook qualitative factors and intuition of human potentially missing nuances in decision making.

DSS may limit in addressing components beyond their scope. The DSS may over reliance on technology when there is a blind reliance on DSS . ADOPTION of DSS may face resistance to change. Advanced key components of decision support systems

A category of computational models are regression models, time series analysis, decision trees, simulation models, optimization models. The functionality of computational models are each model used for their unique capabilities for modeling relationships, forecasting trends, optimizing decisions, classifying data, simulating scenarios.

Data processing techniques : Data cleaning, data mining, text mining, sentiment analysis and spatial analysis, data integration, data transformation. These above mentioned techniques are used in removing errors and inconsistency from data combining data from multiple sources converting data into a suitable format, finding out patterns and relationships, find textual opinions and attitudes and analysing geographic data.

The automation tools leverage on work flow platforms, rule based systems, expert systems, natural language processing techniques(NLP) machine learning algorithm and artificial intelligence technologies. These tools automate data analysis decision making and recommendation generation tasks freeing up decision makers time and resources and process, model transparency and Interpretability.

Evolution of AI driven decision making with decision support systems, recommender systems and AI

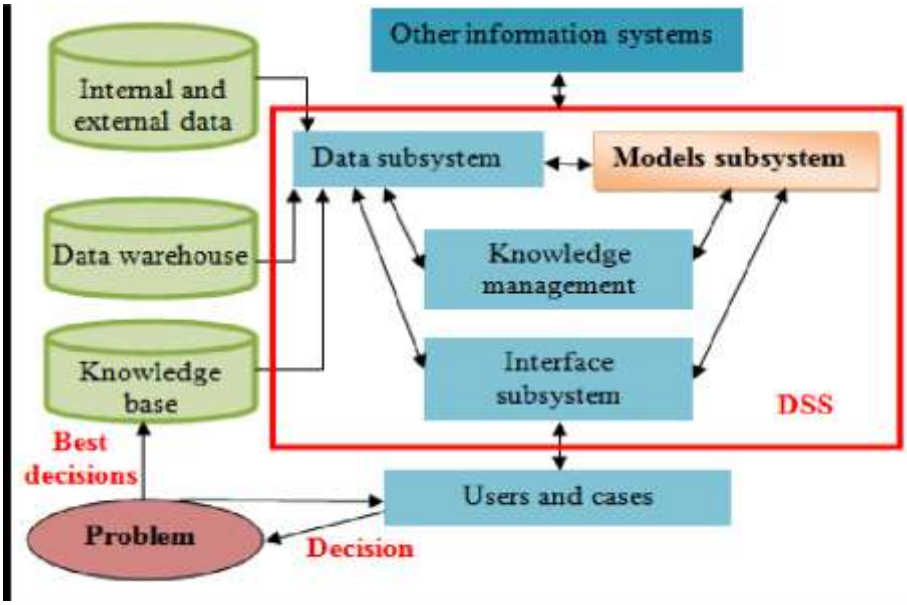
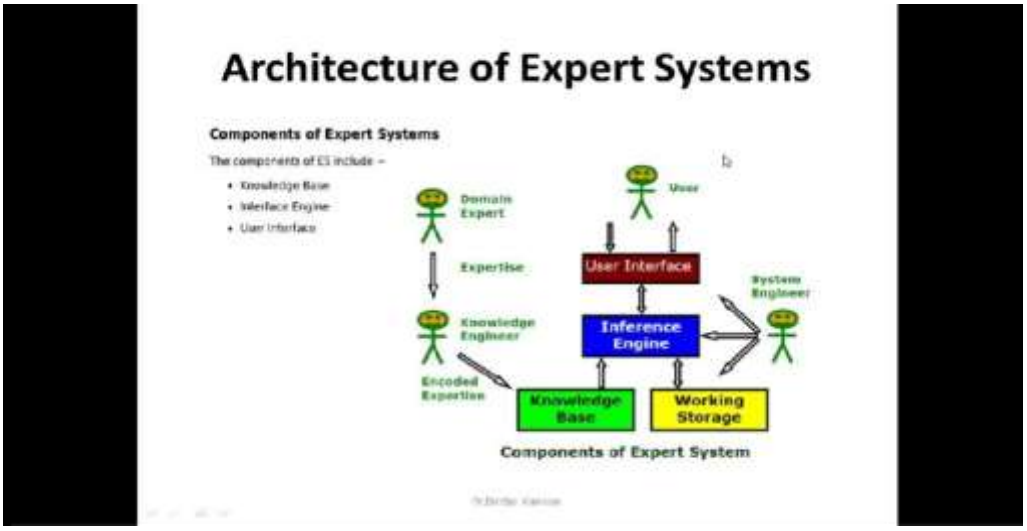


Figure 1 DSS architecture

Basic DSS DSS architecture: Expert systems Expert systems a product of advancement in AI in laboratory settings it's practical applications are becoming prevalent. Contemporary AI endeavors encompass various areas, includes problem solving with expert systems in AI. An expert systems is a software applications in AI designed for various areas in problem solving, demonstrating high Proficiency in specialized knowledge. The characteristics of expert systems are included well defined domain, heuristic problem solving, utilization of different information types explanation capability, clear separation of components and natural language interface.

Figure 2 The basic ES architecture



The ES architecture

The structure of expert systems (ES) typically consists of 3 main components.

The main components of ES are inference engine, knowledge acquisition and learning module user interface explanation module special interface, case history and a knowledge base.

Conceptual view of DSS and ESS

Architectural similarities between DSS and ES. The architectural aspect of a decision support systems. The architectural aspects consists of input data sources such as databases spreadsheets and external systems. The processing logic consists of analytic tools, decision models and rule based reasoning. The user interaction of architectural aspects of interactive Interfaces for data exploration analysis and decision making support systems. The output consists of decision alternatives recommendations and analytical insights. The expert systems are knowledge bases, data bases and external data sources. The processing logic are inference engines knowledge representation and reasoning mechanisms. The expert systems consists of question-answer dialogues expert consultation and recommendation presentation.

The comparative analysis of DSS, ES are DSS assists in decision making process provides interactive support for decision analysis also an user involvement of users provide input and feedback the development methodologies are data driven, model driven rule based. The ES provide an objective of mimics humans expertise provides expert advice recommendations with low user involvement relies on domain expertise, the development methodologies are knowledge acquisition rule based reasoning, inference. The methodologies are in contrast to the development methodologies used for each technology such as data driven approaches for DSS, knowledge acquisition for ES.

The decision support systems DSS typically employ data driven approach for development. The methods involve collecting processing and analysing large volumes of data to derive insights and support decision making process. It uses data mining statistical analysis predictive modeling to extract meaningful insights patterns and Itrends from data. The development of DSS involves integrating data from various sources, designing user friendly interface for data exploration and decision models to assist users in making informed decisions.

Expert systems

Development involvement in knowledge acquisition and representation. Knowledge acquisition methodologies are used to capture domain specific expertise from human experts and encode it into a knowledge base within ES. This involve interactive documentation review or knowledge elimination techniques to extract rules heuristics and problem solving strategies used by experts. Once they obtain knowledge it is represented in a formal language or structure within the ES, such as rule production semantics network or ontological to new problem and develope user friendly methodologies.

DSS-Decision support system - Future incorporate advanced analytics such as ml, predictive modeling and natural language processing to provide more accurate and insightful decision support systems in real time decision making personalization and customization ethical and transparent decision support.

Expert systems Hybrid AI systems are increasingly integrate AI techniques such as ml and natural language processing. Context aware expertise explainable expert reasoning and collaborative expert systems in diverse domain.

Conclusion: This predict conduct a comprehensive AI based decision support systems expert systems to examine to cutting edge technologies like AR , block chain and inernet of things with AI to produce a dynamic framework.

References

Bibri, S. E., Alexandre, A., Sharifi, A., and Krogstie, J. 2023. Environmentally sustainable smart cities and their converging AI, IoT, and big data technologies and solutions: an integrated approach to an extensive literature review. Energy Informatics. 6 (1), 9

Binyamin, S. S., Slama, S. A. B., and Zafar, B. 2024. Artificial intelligence-powered energy community management for developing renewable energy systems in smart homes. Energy Strategy Reviews. 51, 101288

Borangiu, T., Morariu, O., Răileanu, S., Trentesaux, D., Leitão, P., and Barata, J. 2020. Digital transformation of manufacturing. Industry of the future with cyber-physical production systems. Romanian Journal of Information Science and Technology. 23 (1), 3-37

Bousdekis, A., and Mentzas, G. 2021. Enterprise integration and interoperability for big data- driven processes in the frame of industry 4.0. Frontiers in big Data. 4, 644651

Dr. Dahlia Sam1 Prof Dr MGR Educational and Research Institute Maduravoyal Chennai TN IS A CIENTIST and interests in MGR university

Author Dr T.Brindha is currently working as an Associate professor in M.A.M School of Engineering for Computer Science Department, Artificial Intelligence and Data Science, Trichy, Tamil Nadu, INDIA. Her interested areas include Data Base and Management Systems, Computer Networks, Object Oriented Analysis and Design, Artificial Intelligence, Big-Data, Cloud Computing, Python, Bio-informatics. She has publications in reputed journals and conferences.