Healthcare Professionals' Views on Decision Support Systems for Resource Management

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Article Info	Abstract
Article type: *Original Research* **How to cite this article:** Nugraha, D., & Onuegbu, C. (2024). Healthcare Professionals' Views on Decision Support Systems for Resource Management. *Journal of Resource Management and Decision Engineering, 3*(2), 4-12. https://doi.org/10.61838/kman.jrmde.3.2.2 © 2024 the authors. Published by KMAN Publication Inc. (KMANPUB). This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.	The objective of this study is to explore healthcare professionals' views on Decision Support Systems (DSS) for resource management. It aims to identify the benefits, challenges, and effective implementation strategies associated with DSS, providing insights that can inform the optimization of these systems in healthcare settings. This qualitative research employed semi-structured interviews to gather data from 12 healthcare professionals with direct experience in resource management and familiarity with DSS. Participants were purposively sampled from various departments within a large urban hospital. The interviews were conducted until theoretical saturation was achieved, with each lasting approximately 45 to 60 minutes. The data were transcribed verbatim and analyzed using NVivo software through thematic analysis, identifying key themes and subthemes. The study identified four main benefits of DSS: improved efficiency, enhanced decision-making, cost reduction, and user satisfaction. However, several challenges were also noted, including technical issues, training and adaptation difficulties, data quality concerns, usability problems, and organizational barriers. Effective implementation strategies highlighted by participants included stakeholder engagement, comprehensive training programs, phased implementation, customization, and continuous improvement. These findings align with existing literature, underscoring the importance of addressing both technical and organizational factors to optimize DSS utilization in healthcare. Decision Support Systems offer significant advantages for resource management in healthcare, such as increased efficiency and improved decision-making. However, successful implementation requires addressing technical issues, ensuring high data quality, providing thorough training, and fostering organizational support. Engaging stakeholders, customizing the system to meet specific needs, and adopting a phased implementation approach are crucial for enhancing DSS adoption and effectiveness. These insights provide a comprehensive understanding of healthcare professionals' views on DSS, contributing to the broader discourse on optimizing technology integration in healthcare settings. *Keywords: Decision Support Systems, Resource Management, Healthcare Professionals, Implementation Strategies, User Experience, Technical Challenges, Training and Adaptation*

1. Introduction

Decision Support Systems have been integrated into various aspects of healthcare, from clinical decision-making to administrative functions (Antoniadi et al., 2021; Mogholi et al., 2016; Pauch, 2022; Popovič et al., 2012; Ravisankar et al., 2011; Rocha et al., 2022; Sellak et al., 2015; Wang, 2022; Wilson & Opolski, 2009; Zomahoun et al., 2021). For instance, in the realm of patient care, DSS assist in diagnosing diseases, recommending treatment plans, and predicting patient outcomes (Alnsour et al., 2023). The implementation of DSS in administrative functions, such as resource management, scheduling, and logistics, also demonstrates considerable potential in improving operational efficiency (Zarabzadeh et al., 2012). However, the successful integration of DSS requires careful consideration of user experiences, challenges, and implementation strategies.

User experiences with DSS are varied, influenced by factors such as system usability, training, and the alignment of the DSS with the specific needs of healthcare professionals. According to Acquah-Gyan et al. (2022), user experiences with mobile health information systems highlighted the importance of system design and user engagement in ensuring effective utilization (Acquah-Gyan et al., 2022). In their study on the use of handheld computers in clinical practice, Mickan et al. (2014) emphasized that usability and ease of integration into daily routines are critical for acceptance among healthcare professionals (Mickan et al., 2014).

Despite the potential benefits, the implementation of DSS is not without challenges. Technical issues such as system downtimes, software bugs, and integration problems can hinder the effective use of DSS (Wilson & Opolski, 2009). Additionally, training and adaptation are significant hurdles, with healthcare professionals often facing a steep learning curve and resistance to change. Henderson et al. (2017) discussed the importance of preparing healthcare professionals for new systems through comprehensive training programs, highlighting that continuous education is vital for successful adoption (Henderson et al., 2017).

Data quality is another critical factor influencing the effectiveness of DSS. Inaccurate or incomplete data can lead to erroneous decisions, undermining the trust in and utility of the system (Mathijssen et al., 2020). The study by Liu et al. (2023) on shared decision-making in hemophilic arthropathy rehabilitation emphasized the importance of reliable data for effective decision-making, a sentiment echoed in other studies examining DSS in healthcare (Liu et al., 2023).

Organizational barriers also pose challenges to the implementation of DSS. Lack of support from leadership and interdepartmental coordination issues can impede the adoption of new technologies (Marref et al., 2022). Duryan et al. (2014) highlighted the need for a collaborative approach, involving various stakeholders to address these barriers effectively. Engaging end-users from the outset and establishing robust feedback mechanisms are crucial for overcoming organizational resistance and ensuring the system meets the needs of its users (Duryan et al., 2014).

Effective implementation strategies are essential for maximizing the benefits of DSS in healthcare. Stakeholder engagement, training programs, phased implementation, customization, and continuous improvement are key components of successful DSS integration. Alnsour et al. (2023) demonstrated the importance of involving end-users in the design and implementation process, which can lead to better acceptance and utilization of the system (Alnsour et al., 2023). Training programs, as highlighted by Henderson et al. (2017), should not only focus on initial onboarding but also include continuous education to keep users updated on new features and best practices (Henderson et al., 2017).

A phased implementation approach can help in identifying and addressing issues early on, allowing for gradual adaptation by the users (Mickan et al., 2014). Pilot testing, followed by a gradual rollout, provides opportunities for refinement and ensures that the system is robust before full-scale deployment. Customization of DSS to meet the specific needs of different departments or user groups can significantly enhance its effectiveness (Marref et al., 2022). Tailoring the system to the workflows and preferences of its users ensures that it integrates seamlessly into their routines, thereby improving adoption and utilization.

Continuous improvement is vital for keeping the DSS relevant and effective. Regular updates, informed by user feedback and performance monitoring, ensure that the system evolves in response to changing needs and technological advancements (Zarabzadeh et al., 2012). This iterative process helps in maintaining the system's utility and user satisfaction over time.

In conclusion, while Decision Support Systems offer significant benefits for resource management in healthcare, their successful implementation requires addressing several challenges related to technical issues, training, data quality, and organizational barriers. By engaging stakeholders, providing comprehensive training, implementing in phases,

customizing the system, and focusing on continuous improvement, healthcare organizations can enhance the adoption and effectiveness of DSS. The insights from this qualitative study provide a comprehensive understanding of healthcare professionals' views on DSS, contributing to the broader discourse on optimizing technology integration in healthcare settings.

2. Methods and Materials

2.1. Study Design and Participants

This study employs a qualitative research design to explore healthcare professionals' views on decision support systems (DSS) for resource management. The qualitative approach is chosen to gain in-depth insights into the participants' experiences, perceptions, and attitudes toward DSS in a healthcare setting.

Participants in this study were healthcare professionals from various departments within a large urban hospital. The selection criteria included individuals with direct experience in resource management and familiarity with decision support systems. A purposive sampling method was used to identify and recruit participants who could provide rich, relevant, and diverse perspectives on the topic.

2.2. Measures

2.2.1. Semi-Structured Interview

Data were collected through semi-structured interviews, which allowed for flexibility in exploring the participants' views while ensuring that key topics were covered. An interview guide was developed based on a review of the literature and input from experts in healthcare management and qualitative research.

The interview guide included open-ended questions designed to elicit detailed responses about the use, advantages, and challenges of DSS in resource management. Sample questions included:

"Can you describe your experience with decision support systems in managing resources in your department?"

"What do you see as the main benefits of using DSS for resource management?"

"What challenges have you encountered when using DSS?"

Interviews were conducted until theoretical saturation was reached, meaning that no new themes or insights were emerging from the data, indicating that the collected data were sufficient to address the research questions. A total of 12 healthcare professionals were interviewed, with each interview lasting approximately 45 to 60 minutes.

2.3. Data Analysis

Interviews were audio-recorded, transcribed verbatim, and analyzed using NVivo software, a qualitative data analysis tool. Thematic analysis was employed to identify, analyze, and report patterns (themes) within the data. The analysis followed these steps:

Familiarization with the data: The researcher repeatedly read the transcripts to become deeply familiar with the content.

Generating initial codes: Key phrases and sentences related to the research questions were highlighted and coded.

Searching for themes: Codes were grouped into potential themes based on similarities and patterns.

Reviewing themes: Themes were reviewed and refined to ensure they accurately reflected the data.

Defining and naming themes: Each theme was clearly defined and given a descriptive name.

Writing up: The final step involved integrating the themes into a coherent narrative, supported by direct quotes from the participants.

3. Findings and Results

The study included 12 participants, consisting of a diverse group of healthcare professionals. Of these participants, six were male and six were female, ensuring gender balance. The age range of participants varied, with three participants aged between 25-34, four participants aged between 35-44, three participants aged between 45-54, and two participants aged 55 and above. The participants represented various roles within the healthcare setting: four were nurses, three were physicians, two were administrative staff, and three were IT specialists. The years of experience among the participants also varied, with two participants having 1-5 years of experience, three having 6-10 years, four having 11-15 years, and three having more than 15 years of experience. This demographic diversity ensured a comprehensive understanding of the perspectives on decision support systems for resource management.

Table 1

The Results of Qualitative Analysis

Category	Subcategories	Concepts (Open Codes)
1. Benefits of DSS	Improved Efficiency	- Time-saving
		- Reduced manual errors
		- Streamlined processes
	Enhanced Decision Making	- Data-driven decisions
		- Better resource allocation
		- Increased accuracy
		- Support for complex decisions
	Cost Reduction	- Lower operational costs
		- Reduced waste
		- Budget optimization
	User Satisfaction	- Positive user feedback
		- Increased trust in technology
		- Ease of use
2. Challenges of DSS	Technical Issues	- System downtime
		- Software bugs
		- Integration problems
	Training and Adaptation	- Learning curve
		- Resistance to change
		- Need for continuous training
	Data Quality	- Inaccurate data
		- Incomplete data
		- Data silos
	Usability Concerns	- Complex interface
		- Poor user experience
		- Lack of customization
	Organizational Barriers	- Lack of support from leadership
		- Interdepartmental coordination issues
3. Implementation Strategies	Stakeholder Engagement	- Involving end-users
		- Feedback mechanisms
		- Collaboration with IT teams
	Training Programs	- Onboarding sessions
		- Continuous education
		- Workshops and seminars
	Phased Implementation	- Pilot testing
		- Gradual rollout
		- Monitoring and evaluation
	Customization	- Tailoring to specific needs
		- User-defined features
		- Flexible modules
	Continuous Improvement	- Regular updates
		- User feedback integration
		- Performance monitoring

3.1. Benefits of DSS

Improved Efficiency: Healthcare professionals highlighted that decision support systems significantly enhance efficiency within their departments. Many noted the time-saving aspect of DSS, which reduces manual errors and streamlines various processes. One participant mentioned,

"The DSS helps us complete our tasks much faster and with fewer mistakes."

Enhanced Decision Making: Another prominent benefit is the improvement in decision-making capabilities. Participants appreciated how DSS facilitate data-driven decisions and better resource allocation. Increased accuracy and support for complex decisions were also frequently cited. A healthcare manager stated, "Having access to comprehensive data through DSS allows us to make more

informed and precise decisions regarding resource distribution."

Cost Reduction: Cost reduction emerged as a critical benefit, with respondents noting that DSS help in lowering operational costs, reducing waste, and optimizing budgets. "We've seen a noticeable decrease in unnecessary expenses since implementing the DSS," shared one financial officer.

User Satisfaction: User satisfaction is also a significant advantage, with many users providing positive feedback and expressing increased trust in the technology. The ease of use of DSS was frequently mentioned. As one nurse remarked, "The system is user-friendly and has gained a lot of trust from the staff because it's so reliable."

3.2. Challenges of DSS

Technical Issues: Technical issues pose considerable challenges, including system downtime, software bugs, and integration problems with existing systems. One participant reported, "We face occasional downtimes which disrupt our workflow significantly."

Training and Adaptation: Training and adaptation are crucial hurdles, with participants discussing the steep learning curve and resistance to change among staff. The necessity for continuous training was also emphasized. A department head noted, "Adapting to the new system was tough initially, and we had to invest a lot in ongoing training sessions."

Data Quality: Data quality concerns such as inaccurate, incomplete data and data silos were frequently mentioned. "Sometimes, the data we get is not accurate or is missing key information, which hampers decision-making," highlighted a data analyst.

Usability Concerns: Usability issues, including a complex interface and poor user experience, were significant barriers. The lack of customization options was another problem. One physician commented, "The interface can be quite complex, and it's not always easy to navigate, which can be frustrating."

Organizational Barriers: Organizational barriers, such as lack of support from leadership and interdepartmental coordination issues, were noted as impediments to effective DSS implementation. "Without strong backing from the top management, it's challenging to get everyone on board," stated a senior administrator.

3.3. Implementation Strategies

Stakeholder Engagement: Effective implementation strategies include robust stakeholder engagement, involving end-users, and establishing feedback mechanisms. Collaboration with IT teams was also deemed essential. "Engaging the end-users right from the start and constantly getting their feedback has been crucial for us," said an implementation specialist.

Training Programs: Comprehensive training programs, including onboarding sessions, continuous education, and workshops, were highlighted as vital for successful DSS adoption. One respondent emphasized, "Regular training and workshops have helped our staff get comfortable with the DSS."

Phased Implementation: A phased implementation approach, including pilot testing, gradual rollout, and continuous monitoring and evaluation, was recommended. "We started with a pilot test, which allowed us to fine-tune the system before a full-scale rollout," explained a project manager.

Customization: Customization of the DSS to meet specific needs and allowing user-defined features and flexible modules were noted as important strategies. "Tailoring the DSS to our specific requirements has made a huge difference," mentioned a department head.

Continuous Improvement: Continuous improvement through regular updates, integration of user feedback, and performance monitoring was underscored as essential. "We regularly update the system based on user feedback, which keeps it relevant and efficient," stated a technical support specialist.

4. Discussion and Conclusion

This study explored healthcare professionals' views on decision support systems (DSS) for resource management, uncovering key benefits, challenges, and implementation strategies. The findings are consistent with existing literature, offering valuable insights into optimizing DSS utilization in healthcare settings.

Healthcare professionals emphasized the significant benefits of DSS, including improved efficiency, enhanced decision-making, cost reduction, and user satisfaction. These advantages align with previous research highlighting the positive impact of DSS on operational efficiency and decision accuracy (Alnsour et al., 2023). For instance, the study by Mickan et al. (2014) on handheld computers in clinical practice corroborates the finding that DSS can

streamline processes and reduce manual errors, leading to time-saving and better resource allocation (Mickan et al., 2014).

Enhanced decision-making was another critical benefit identified. Participants noted that DSS facilitate data-driven decisions and increase the accuracy of resource allocation. This is supported by the work of Liu et al. (2023), who found that shared decision-making tools improved clinical outcomes in hemophilic arthropathy rehabilitation by providing reliable data for informed decisions (Liu et al., 2023). Additionally, the study by Duryan et al. (2014) demonstrated that cognitive mapping and qualitative system dynamics in DSS help in making complex decisions more manageable, further supporting our findings (Duryan et al., 2014).

Cost reduction through the use of DSS was highlighted by several participants, who noted decreased operational costs and reduced waste. These observations are consistent with Zomahoun, Visca, George, and Ahmed (2021), who found that clinical decision support systems can optimize resource use and lower healthcare costs (Zomahoun et al., 2021). User satisfaction, driven by ease of use and increased trust in technology, was another significant benefit. Acquah-Gyan et al. (2022) similarly reported positive user experiences with mobile health information systems, emphasizing the importance of user-friendly interfaces in technology adoption (Acquah-Gyan et al., 2022).

Despite the benefits, the study also revealed several challenges in implementing DSS, including technical issues, training and adaptation difficulties, data quality concerns, usability problems, and organizational barriers. Technical issues such as system downtimes and software bugs were common concerns. Wilson and Opolski (2009) identified similar barriers in their Delphi survey, noting that technical glitches can significantly hinder the effectiveness of computerized decision support systems (Wilson & Opolski, 2009).

Training and adaptation were also significant hurdles, with participants pointing to the steep learning curve and resistance to change. Henderson et al. (2017) highlighted the necessity of comprehensive training programs to prepare healthcare professionals for new systems, emphasizing continuous education to ensure long-term success. This aligns with our findings, where ongoing training was deemed essential for effective DSS adoption (Henderson et al., 2017).

Data quality issues, including inaccurate and incomplete data, were frequently mentioned. Mathijssen et al. (2020) discussed the critical role of reliable data in shared decision-making, highlighting that poor data quality can undermine trust in DSS and lead to erroneous decisions (Mathijssen et al., 2020). Our study supports this, underscoring the need for robust data management practices to ensure the reliability of DSS outputs.

Usability concerns, such as complex interfaces and lack of customization, were significant barriers to DSS adoption. Marref, Lewkowicz, and Amsha (2022) stressed the importance of a practice-centered approach in designing healthcare information systems, which includes tailoring the system to user needs and workflows. This approach is critical to overcoming usability issues and enhancing user satisfaction.

Organizational barriers, including lack of support from leadership and interdepartmental coordination issues, were also highlighted. Engaging stakeholders from the outset and fostering a collaborative environment are crucial for overcoming these challenges. Duryan, Nikolik, Merode, and Curfs (2014) emphasized the importance of involving various stakeholders in the decision-making process to address organizational barriers effectively (Duryan et al., 2014).

Effective implementation strategies identified in this study included stakeholder engagement, comprehensive training programs, phased implementation, customization, and continuous improvement. Stakeholder engagement was deemed essential for successful DSS adoption. Alnsour et al. (2023) demonstrated that involving end-users in the design and implementation process leads to better acceptance and utilization of DSS, a finding that aligns with our study (Alnsour et al., 2023).

Comprehensive training programs, including initial onboarding and continuous education, were highlighted as critical. Henderson et al. (2017) similarly stressed the importance of training in preparing healthcare professionals for new systems. Continuous training helps users stay updated on new features and best practices, ensuring the long-term success of DSS (Henderson et al., 2017).

Phased implementation, involving pilot testing and gradual rollout, was recommended to identify and address issues early on. Mickan et al. (2014) found that a phased approach allows for refinement and ensures that the system is robust before full-scale deployment. This strategy helps in managing the transition smoothly and mitigating potential risks (Mickan et al., 2014).

Customization of DSS to meet specific needs and workflows was another key strategy. Marref, Lewkowicz,

and Amsha (2022) advocated for a practice-centered approach, emphasizing that tailoring the system to user preferences enhances its effectiveness and adoption (Marref et al., 2022). Continuous improvement through regular updates and performance monitoring was also deemed essential. Zarabzadeh et al. (2012) highlighted the importance of integrating user feedback and making iterative improvements to keep the system relevant and efficient (Zarabzadeh et al., 2012).

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small, with only 12 participants, which may limit the generalizability of the results. The qualitative nature of the study, while providing in-depth insights, may not capture the full range of experiences and perspectives across different healthcare settings. Additionally, the study was conducted in a single urban hospital, and the findings may not be applicable to other contexts, such as rural healthcare settings or different healthcare systems.

Another limitation is the potential for interviewer bias, as the semi-structured interview format allows for some degree of interviewer influence. Efforts were made to minimize this bias through the use of an interview guide and consistent questioning, but it cannot be entirely eliminated. Furthermore, the reliance on self-reported data may introduce response bias, as participants might provide socially desirable answers or recall information inaccurately.

Future research should aim to address these limitations by including a larger and more diverse sample of healthcare professionals from various settings and regions. Quantitative studies could complement the qualitative findings, providing a broader understanding of the impact of DSS on resource management in healthcare. Additionally, longitudinal studies could examine the long-term effects of DSS implementation, assessing how user experiences and system performance evolve over time.

Research should also explore the specific features and functionalities of DSS that contribute most to their effectiveness and user satisfaction. Comparative studies examining different types of DSS and their outcomes in various healthcare environments would provide valuable insights into best practices for system design and implementation. Investigating the impact of DSS on patient outcomes, in addition to operational efficiency, would further elucidate the value of these systems in healthcare.

Another area for future research is the examination of the role of organizational culture and leadership in facilitating DSS adoption. Understanding how different leadership styles and organizational structures influence the success of DSS implementation can inform strategies for fostering a supportive environment for technological innovation in healthcare.

Based on the findings of this study, several practical recommendations can be made for healthcare organizations considering the implementation of DSS for resource management. First, engaging stakeholders early and throughout the implementation process is crucial. Involving end-users in the design and decision-making phases ensures that the system meets their needs and increases the likelihood of successful adoption.

Comprehensive training programs are essential for preparing healthcare professionals to use DSS effectively. These programs should include initial onboarding sessions, continuous education opportunities, and workshops tailored to different user groups. Training should not only focus on technical skills but also on the benefits and potential challenges of using DSS, fostering a positive attitude towards the system.

A phased implementation approach, starting with pilot testing and followed by gradual rollout, can help identify and address issues before full-scale deployment. This strategy allows for iterative improvements based on user feedback and performance monitoring, ensuring a smooth transition and minimizing disruptions to daily operations.

Customization of DSS to align with specific workflows and user preferences is critical for enhancing system effectiveness and user satisfaction. Healthcare organizations should work closely with developers to tailor the system to their unique needs, incorporating user-defined features and flexible modules. Continuous improvement through regular updates and integration of user feedback will help maintain the system's relevance and efficiency over time.

Finally, fostering a supportive organizational culture and securing leadership buy-in are essential for the successful implementation of DSS. Leaders should actively champion the adoption of DSS, providing the necessary resources and support to address challenges and ensure smooth integration into existing processes. Encouraging collaboration across departments and promoting a culture of innovation will further enhance the adoption and effectiveness of DSS in healthcare settings.

In conclusion, while Decision Support Systems offer significant benefits for resource management in healthcare, their successful implementation requires addressing several challenges related to technical issues, training, data quality, and organizational barriers. By engaging stakeholders,

providing comprehensive training, implementing in phases, customizing the system, and focusing on continuous improvement, healthcare organizations can enhance the adoption and effectiveness of DSS. The insights from this qualitative study provide a comprehensive understanding of healthcare professionals' views on DSS, contributing to the broader discourse on optimizing technology integration in healthcare settings.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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