Decision Support System for Strategic Planning in Educational Organization: A Survey

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ABSTRACT
Strategic planning models and the provision of information for decision making in complex strategic circumstances are research topics of great interest. This research addresses the issue of supporting strategic planning decision-making in educational foundations by building a Decision Support System (DSS) to be used by decision-makers in carrying out their strategic planning process. The DSS is integrated in the entire organisation's information system database. This research provides an overview of DSS, the college planning process, the development of DSS through the use of artificial intelligence, and a framework for planning activities at different levels of the organisation to develop strategic plans. Based on the strategic planning process model, a DSS framework is proposed, along with decision support approaches for various DSS modules. DSS provides the best support (at individual, group, and organisational levels) for all stages of strategic planning decision-making. By applying DSS, it is possible to create more perfect circumstances to achieve sustainable future-orientated institutional goals.

Keywords: AI, database, organisation, information system

INTRODUCTION
The government is responsible for ensuring the organisation and provision of quality education that is accessible to the public. The development of the educational in the world, especially in Indonesia, really depends on strong management and has sufficient funding, so it is necessary to have management that can make quick and precise decisions to improve the development of education in creating an innovative and creative educational environment in making decisions. The idea of providing education to children emerged in the mid-19th century when most of today's industrialised countries began to expand primary education. Over the past few decades, the proportion of national income allocated to education has been positive. Public expenditure on education as GDP (Gross Domestic Product) in ASEAN (Association of Southeast Asian Nations) countries is depicted in Figure 1. When measured by GDP per capita, income worldwide is generally positive. This means that the total amount of funds spent on education around the world, including in Indonesia, is also positive in absolute terms.

Fig. 1 Total government education spending from 2010 to 2019
(https://ourworldindata.org/global-education)
The government continues to encourage strategic efforts to improve the quality of education at all levels, from primary to tertiary levels (Strategi_News, 2022). To help students become more competitive and help shape digital transformation for the good of themselves and society, lecturers need to think about how to provide students with easy access to the latest technology in a smart way (Metro_Tempo, 2022).

In the digital era, those in charge of higher education management have a duty to raise a number of important issues in the education system so that their institutions can be more flexible (Pramana et al., 2021). Foundations that are no longer willing to support educational institutions will be closed, The fact that monthly operational costs are greater than the amount of income received each month causes the foundation to experience financial losses because the foundation is unable to manage its finances (Metro_Tempo, 2022) properly. In today's increasingly complex and competitive business world, it is important to be able to make good and timely decisions (Kitsios & Kamariotou, 2018). The biggest problems are the competition for limited resources, the lack of a strategic systems approach to planning to understand the changing market and look at opportunities, threats, and internal strengths and weaknesses, and the shifting goals of lecturers and students towards greater participation in decision-making and a strong culture of transparency. Obtaining a competitive advantage is the primary goal of any strategic planning endeavour (Balyer & Öz, 2018).

Normally, issues such as the organisation's long-term direction, mission, competitive advantage, and strategic fit with the business environment, as well as business resources and competencies, are associated with strategic decisions made by an organisation (Kitsios & Kamariotou, 2018). Strategic planning needs to include not only analyses and critical thinking but also formal processes in order to be useful. Rethinking how strategic planning is done will not make an inefficient process better. The application of DSS, which assists management at both the strategic and operational levels of the organisation, is a significant challenge that organisations must address. The application of DSS has the potential to contribute to improved performance, strengthened educational leadership, increased effectiveness, school renewal, and goal achievement, thereby assisting educational institutions in overcoming the stagnation they experience (Watson, 2018). The approach taken by DSS in educational institutions for strategic planning purposes is an important factor determining the possibility of effective information provision in such institutions. The main objective of this study is to define the main approaches to DSS for strategic planning of institutions. The authors of this study believe that the creation of DSS will help analysts in preparing and making decisions regarding rational strategic planning. The abbreviation "DSS" refers to a category of computer programs designed to assist the decision-making, planning, and problem-solving processes of an organisation (Kitsios & Kamariotou, 2018). Information Technology (IT) can be used both to gather information and to support decision making to choose the right strategy (Joshi & Fadewar, 2018).

The decision-making process is an important component of any organisational process. A decision support system is a computer-aided system that assists decision-makers in arriving at a particular decision (Yuxiang, 2020). Natural language understanding, non monotonic reasoning, machine vision, pattern recognition, and other applications all benefit greatly from the application of machine learning, particularly in the areas of knowledge systems and decision science. Registration decisions can potentially benefit from the application of machine learning techniques (Esquivel & Esquivel, 2021).

Identifying the set of problems that require a decision is referred to as the deep research phase of the decision-making process. Finding solutions and the feasibility of those solutions is referred to as the design phase of the decision-making process. Finally, selecting the best alternative is referred to as the choice phase (Yuxiang, 2020). Machine learning methods offer solutions to problems that are difficult to formalise and can be used to support decision-making when applied appropriately. One of the challenges facing machine learning is the challenge of evaluating the impact of individual features on predicted outcomes. The use of interpretable machine learning algorithms allows us to find solutions to such problems (Muhamedyev et al., 2020).

**LITERATURE REVIEW**

**Decision Support System**

Increased processing of complex problems is possible through the separation of the problem into modules, which are then processed by the collaborative efforts of intelligent individuals using their own individual knowledge, goals, skills, and plans. These systems are well suited to represent hierarchically distributed decision-making processes as a result of the separation of strategic knowledge and domain knowledge achieved through a multi-board architecture (Tadeusiewicz et al., 2006).

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DSS is an informative computerised system that provides comprehensive information needed to define, analyse, and evaluate alternatives and make appropriate choices. In addition, it provides the possibility to make the development of prepared information reports with the aim to choose the most rational way to neutralise specific problems facing management. Such DSS should fulfill the requirement of universality to help managers of public institutions prepare alternatives and make planning decisions in order to create better conditions for rational strategic planning. This will help create better conditions for rational strategic planning. Individual decision support, group decision support, negotiation support, and expert systems form a DSS that, from the perspective of intelligent support specifications, is the most reasonable list of decision support systems (Alowaigl et al., 2021).

The use of a decision support system is a must and the system must be maintained and recommended to other institutions that currently do not have a decision support system so that these institutions are able to keep up with developments and make the right decisions for their circumstances (Alowaigl et al., 2021).

In the decision-making process, the SMART (Simple Multi-Attribute Rating Technique) method takes much less computational time than the AHP (Analytic Hierarchy Process) approach. The standard deviation of SMART is lower than AHP, which means it is more reliable and consistent. In conclusion, the SMART method has better performance than other methods due to its high accuracy and shorter computation time, so this method is simple and easy to apply in the decision-making process in the educational environment (Kitsios & Kamariotou, 2018).

The principle model of strategic planning, the implementation method of its components, and the type of relationship between actors are important factors that determine the requirements of strategic planning DSS (Kitsios et al., 2020). The following are some of the requirements for successful strategic planning:

1. Broad involvement of top management
2. Strong communication and decision-making facilitation
3. A thorough and logical planning method
4. Broad consensus on the importance of strategic planning

The use of computerised decision support is a component of solutions to improve planning and control, particularly in organisations that are larger and more diverse in their operations. (Telem, 1990).

Simplified Decision Process (SDP) has the highest percentage compared to the other two categories of decision-making strategies, namely intuition, DSS software, and SDP. However, the extent to which each decision-making approach is applicable depends heavily not only on the specific situation at hand, but also on the capabilities and preferences of the person making the decision. The fact that the passage of time is also a factor in determining which decision-making strategy to implement should not come as a surprise to anyone. When faced with circumstances where quick decision-making is absolutely necessary, the only possible option is to follow intuition. (Yoo & Digman, 1987).

Decision Support System

Intelligence and decision support are two characteristics attributed to IDSS (Intelligent Decision Support System) in today's world. It has become one of the most important issues for IDSS to incorporate the benefits of machine learning into the IDSS construct given the proliferation of new technologies in the field of Artificial Intelligence (AI) (Esquivel & Esquivel, 2021).

Machine learning techniques can be used to complement enrolment-related decisions, as well as to quantify the degree of correlation that exists between enrolment and these factors. The LR (Logistic Regression) model has an accuracy rate of 80.5% in predicting whether or not an applicant is accepted into the programme based on a set of indicated features (Muhamedyev et al., 2020).

The system (Yuxiang, 2020) evaluates land suitability and makes plant recommendations based on the results of applying a fuzzy concept machine learning approach. When compared with other existing methods, such as modelling methods for estimating and forecasting the business (MME-FA), machine learning approaches, and Forecasting Model for Business Intelligence (FMBI), the effectiveness of predicting demand data on businesses with network model artificial neural systems determines the best training approach Machine Learning Approaches (MLA).

In (Farid et al., 2019), the problem of creating an intelligent decision support system for use in higher education that utilises dashboard techniques to support strategic planning decision making was addressed. The effectiveness of this newly developed system is measured based on the extent to which the system affects educational institutions.

Logistic Regression (LR) based predictive modelling, with the aim of predicting admission decisions of prospective students. LR creates a discriminative classifier that assigns a value to one of two categories based on experimental results (Muhamedyev et al., 2020). It was found that utilising SDP in the educational decision-making...
process, which integrates intuitive and systematic techniques by dividing into simple secondary problems that can be processed intuitively without computer assistance, resulted in decisions comparable to DSS-mediated conclusions. SDP works by sorting out simple secondary problems that can be processed intuitively without the aid of a computer.

Research (Watson, 2018) established that there are three distinct areas relating to the application of artificial intelligence in the venture capital field. the capacity of natural language processing tools based on deep learning, such as Named Entity Recognition, to utilise the technology as efficiently as possible in the process of searching for business opportunities that may have investment potential. Machine learning and statistical analysis can be useful decision-making tools, especially when an accurate level of decisiveness is required. These features require a rapid decision-making process to be applied to any potential changes that need to be implemented in the model, and they impact all stages of project implementation, starting from the laboratory-scale stage and continuing through to the pre-project, pilot stage (Watson, 2018).

METHOD

An innovative "citation-based literature mapping tool" called Research Rabbit is accessible online. The application is designed to help researchers find references more efficiently when they start organising articles, small projects, or literature reviews. The idea is simple: they start with one or more papers (called starter papers), and the software will identify other papers related to the topic of interest (which is determined by the starter papers they selected earlier).

The app was created to help them in their research without making them switch between different search modes and databases, which takes time and often leads to more citation mining.

The software searches publicly accessible sources on the Internet and selects papers based on their similarity. However, the software seems to operate only with scientific papers, therefore it is less likely to identify other sources of information, such as books, that are not journal articles.

We used 23 articles with the keywords DSS (Decision Support System), strategic planning, intelligence, ML for applications, as shown in Figure 2, 3 and 4

![Fig. 2. Relation of article set and time](image)
RESULT

In this section, we outline existing surveys on the issue under study and highlight the differences between them and our suggested survey. The examined surveys and their characteristics are given in the references. The contribution only provides the structure of SISP (Strategic Information System Planning) using DSS (Decision Support System) in logistics through a formal process and comparison of AHP (Analytic Hierarchy Process) and SMART (Simple Multi-Attribute Assessment Technique) approaches in an educational environment. This research is based on a non-experimental study, which may introduce bias into the results. The paper is mostly concerned with DSS and ML (Machine Learning) in the context of foresight in the education and manufacturing sectors, with little focus on machine learning. The paper presents an overview of DSS in general, with a focus on databases and models in the education quality management sector.

DISCUSSIONS

This DSS is being used to provide information system to the management about the existing activities, it is expected to be a program that can be continued with better technology and information to the educational organisation. With the convenience of DSS access to this Education Performance Information system, campus management is easier to monitor decisions and realtime results. It is hoped that this system will become a pilot in other educational worlds and can be developed in an integrated manner throughout so that the performance of educational organisations can work properly. The contributions in (Kamariotou & Kitsios, 2018) and (Joshi & Fadewar, 2018) only give the structure of SISP (Strategic Information System Planning) employing DSS (Decision Support System) in logistics through a formal process and a comparison of AHP (Analytical Hierarchy Process) and SMART (Simple Multi-Attribute Rating Technique) approaches in educational environments, respectively.

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The focus of citation (Ibrahim et al., 2014) is on incorporating an interpretation algorithm into a multicriteria decision support system. This paper is valuable for explaining modeling results and supporting decision making with interpreters of machine learning models; nevertheless, it is based on a non-experimental study, which could introduce bias into the results. In (Watson, 2018), the authors highlighted three distinct application areas for artificial intelligence in the venture capital industry.

Yuxiang provides an overview of DSS in the overall framework of machine learning-based operation mode, without focusing explicitly on an SP (Strategic Planning) scenario. In addition, neither research databases nor research questions are indicated.

CONCLUSION

According to the research and test results that have been carried out on the contribution in can provide the structure of SISP (Strategic Information System Planning) using DSS (Decision Support System) in logistics through the formal process and comparison of AHP (Analytic Hierarchy Process) and SMART (Simple Multi-Attribute Assessment Technique) approaches in the educational environment.

The citation focuses on the incorporation of interpretation algorithms into multicriteria decision support systems. The present paper is valuable for explaining the modelling results and supporting decision-making with machine learning model interpreters; however, the paper is based on a non-experimental study, which may affect the results. Provides an overview of DSS within the overall framework of machine learning-based operation modes, without focusing explicitly on SP (Strategic Planning) scenarios. In particular, no research database or research questions are indicated. use of machine learning for DSS in education quality management

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REFERENCES


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