

MANAGERIAL ACCOUNTING DECISION MAKING BY UTILIZING ARTIFICIAL INTELLIGENCE FOR PROFIT PLANNING

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Abstract

This study aims to evaluate the efficiency of decision-making in managerial accounting by utilizing artificial intelligence (AI) technology in profit planning, primarily through profit volume cost (CVP) analysis. Digitalization raises new questions for decision-making and triggers new practices of organizational decision-making at the managerial level. The qualitative narrative approach is used to conduct an in-depth literature review. The results show that the application of AI in managerial accounting decision-making can improve automation in the collection, processing, and analysis of financial data and convert it into more accurate management information. Thus, the study concluded that using AI in managerial accounting decision-making improves efficiency and allows for cost prediction with a higher degree of accuracy. The implications of these findings point to the importance of integrating AI technology in accounting practices to support better decision-making.

Keywords: *Artificial Intelligence, Decision-Making, Profit Planning*

1. Introduction

Profit is the primary objective of the majority of enterprises (J. Warren, 2023). Profit is the revenue generated by a company that exceeds the total expenses incurred (Hassanah & Daud, 2019; Rusmayanti, 2021). Profit is not only a goal that the company wants to

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achieve, but profit can also provide an assessment of the level of welfare of a company (Rusmayanti, 2021; Yudianto, 2019). To generate profits optimally, companies need to do profit planning (Rusmayanti, 2021). The existence of profit planning can maximize profit income because profit planning can be a guideline for controlling the direction of business activity (Rusmayanti, 2021; Yudianto, 2019).

Profit planning is one of the roles of managerial accounting to support management and the management process (C. S. Warren et al., 2020). Management uses information from the results of profit planning analysis as a planning tool (Triana et al., 2020) and decision-making (C. S. Warren et al., 2020). These activities also include sales planning and cost planning. Accounting information is used for decision-making and business evaluation. Accounting information systems (AIS) are extensively utilized by accounting departments to make decisions based on current, recent, and contemporary data (Yoshikuni et al., 2023) so that management can make quick and accurate decisions. AIS can improve most accounting practices with the utilization of technology (Agostino et al., 2022; Redden, 2018). The third phase of technological advancement, digitalization, has created tension in organizations (Horlach et al., 2016; Knudsen, 2020), specifically in the areas of finance and accountancy (Bhimani & Willcocks, 2014; Knudsen, 2020). On the other hand, digitalization simultaneously introduces novel organizational decision-making practices at the managerial level and raises new concerns regarding knowledge for decision-making (Knudsen, 2020).

The findings of Bygren's research (2016) show that digitalization has a direct impact on how companies must strategically manage their business, including the impact on strategies, actions, and processes (Bygren, 2016). Meanwhile, the outcomes of research by Gorla et al. (2010) say that information quality is measured based on accurate, relevant, complete, and timely indicators. In this research, it is stated that the efficiency of decision-making is measured through the process and quality of the final decision. Davenport and Ronanki in Vărzaru (2022). shows that organizations use AI to automate processes, collect data, process and interpret it, provide information, and connect in real time with all stakeholders. The results of the study concluded that AI provides many solutions in managerial accounting. In the future, AI-based intelligent systems will perform more activities involving decision-making processes than human resources. The results of Li et al.'s research (2020) suggest that the focus of work has shifted from mere financial accounting to providing information support for business decision-making, thus influencing the development of accounting theory, which then has implications for the structure of financial human resources knowledge.

The previous research gap was about how to measure the efficiency of managerial accounting decision-making based on artificial intelligence (AI) with the Cost Volume Profit (CVP) analysis method. Therefore, the purpose of this study is to measure the efficiency of managerial accounting decision-making by utilizing AI in profit planning

with CVP analysis. The measurement for this includes the process and quality of the final decision (Gorla et al., 2010), so this study provides input into improving operational efficiency to optimize the use of resources in decision-making. The importance of this research is because AI has sophisticated data analysis that can fill the gaps in manual analysis and the gaps in the human resources knowledge structure.

2. Literature Review

Profit planning, as articulated by Terry in Kusmiadi (1995), involves the selection and integration of information, the formulation and application of assumptions regarding the future, and the delineation of specific activities deemed essential for attaining a desired outcome (Kusmiadi, 1995). In line with Terry, Swastha (1996) also defines profit planning as a series of actions to achieve a desired result involving various alternative actions and policy formulation (Swastha, 1996). In contrast to Terry and Swastha, Machfoedz (2010) argues that profit planning, often referred to as planning budget or operation plan, is a plan from management that covers all phases of future operations to achieve company goals and consists of short-term plans and long-term plans. In line with this, Machfoedz (2010) (Machfoedz, 2010) and Yanto (2020) also define profit planning as a determination of steps to be taken by company management within a specific period specifically associated with profit that the Company wants to achieve (M. Yanto, 2020).

Meanwhile, Supriyono (2012) profit planning is a plan that is described quantitatively in financial and other quantitative measures and determines the profit objectives achieved by the company (Supriyono, 2012). In line with Supriyono, Budiwibowo (2012) also stated the same thing. Budiwobo also added that in profit planning, there are steps that the company must take to achieve goals such as profit targets. Then, this profit planning is a measuring tool that evaluates the actual results that have been implemented as a form of realization of planning. Siregar (2017) also defines profit planning as a company work strategy to accomplish a company-established objective (Siregar, 2017). According to him, effective planning requires participation and coordination from all parts of the entity involving the determination of company goals, which are measurable targets. Meanwhile, profit planning, defined by Yanto, is an initial stage that plays a significant role in the company because it can facilitate management in carrying out its business activities (M. Yanto, 2020).

Iswara et al. (2023) assert that profit planning is an indicator of a business's performance. Profit planning is crucial for the efficient operation of a firm, as it directly influences business performance (Hesti et al., 2024; Iswara et al., 2023). Profit planning is a strategy comprising procedures that a corporation must do to attain its principal objective: profit (Hesti et al., 2024; Rosianna et al., 2019; M. Yanto, 2020). From several definitions of profit planning that have been put forward, profit planning can be defined as a series of strategies derived from management decisions related to steps that will be

taken within a specific time frame to optimize profits and can affect the performance of a business.

The advantages and benefits of profit planning expressed by Mulyadi (2010) include: (1) Contribution to management in solving a problem as a directed approach. (2) Material for consideration in order to maintain the company's focus on its activities prior to reaching a decision, orderly and economical. (3) Orientation towards achieving profits to create awareness of saving and optimizing costs and use of resources. (4) Organizing operational plans from all levels of management to create an integrated plan. (5) Parameters for measuring the results of activities and evaluating policies that have been implemented, as well as guidelines for further policy innovation so that they can be more optimal. Factors that need to be taken into consideration by management in determining profit targets or objectives include (Carter & Usry, 2015): 1) Profit or loss that is the consequence of a particular sales volume. (2) The sales volume is necessary to cover all expenses, generate sufficient profits to fulfill future activity needs, and pay dividends. (3) The breaking-even point. (4) The sales volume that can be attained with the current operating capacity. (5) The operating capacity necessary to attain profit objectives. (6) Returning on capital employed.

CVP analysis is an asset for decision-making and planning, as it underscores the correlation between price, quantity sold, and costs (Hansen & Mowen, 2011; Iswara et al., 2023). CVP analysis integrates the company's financial data. It assists management in identifying various critical aspects, including (1) The quantity of products that must be sold in order to achieve the break-even point. (2) Impact of reducing Fixed Costs to the breakeven point. (3) The impact of price increases on profits. (4) What sales volume and product mix is needed to achieve the expected profit level with the resources owned? (5) The level of price or cost sensitivity to profits. Carter and Usry also stated that in setting profit targets, three procedures can be used: (1) Apriori method, profit objectives dominate planning. First of all, management determines the Level. (2) Returns are desired and attempted to be realized through planning. (3) In the posteriori method, profit objectives are under planning and identified as the result of planning. (4) Pragmatic Method: Management uses a profit standard that has been tested and proven through experience.

Meanwhile, according to Krismiaji, there are different approaches to determining profits, namely (Krismiaji, 2015): (1) Based on the return period of invested capital. This method requires determining the level of profit to be the starting point for planning. (2) Based on the product to be sold. This method requires that the formulated planning will be obtained in the form of profits. (3) Based on calculations according to standards. This method performs calculations from the planning process, which is measured by existing standards. Management calculates relative profits according to standards that are considered satisfactory to the company/organization.

The role of CVP analysis is to help companies determine precisely the components that will be changed to achieve profit targets effectively based on company conditions (Iswara et al., 2023; Yulistia, 2020). So, CVP analysis focuses on five things, including product prices (prices of products), production volume, variable costs per unit, total fixed costs (costs that remain unaffected by fluctuations in production quantity), and mix of products sold (product mix) in sales (Iswara et al., 2023). CVP analysis is carried out by making graphs. The steps for creating a cost-volume-profit graph were presented by Arfiansyah (2019) in Iswara et al., including: (1) Draw a line that is perpendicular to the volume axis to illustrate the complete magnitude of the fixed load. (2) The fixed cost line is drawn starting at the fixed cost point on the upward diagonal vertical axis by selecting some sales volume and plotting it with total expenses (fixed and variable) at the selected activity level. (3) The sales line is drawn starting from point zero. Then, create a point that shows total sales at the selected activity level. From the picture above, it can be seen that the break-even point is the intersection point between the total income line and the total expense line. The loss area is the area where the number of cost lines is greater than the number of sales lines. The profit area is the opposite where the sales line is above or more significant than total costs.

3. Research Methods

This study utilizes a narrative qualitative methodology alongside a literature evaluation, utilizing data from books and scholarly publications pertinent to profit planning. According to Cooper (2010), the primary objective of the literature review is to provide readers with information regarding research findings that are closely related to the subject of the study and to establish a connection between the research topic and the existing body of literature. Researchers use literature consistently based on the assumptions of the participants and do not make room for the personal views of researchers (Creswell, 2016). Data collection techniques through literature reviews that are related to the problem being studied consist of 20 books, 31 journal articles, and other relevant articles; thus, the data sources are secondary. The data analysis technique used is the Miles and Huberman data analysis technique, which consists of collecting relevant data from various sources through literature studies, data reduction, data presented visually or descriptively in the form of graphs, diagrams, and descriptive narratives, and concluding. The data analysis was performed for profit planning with cost volume profit (CVP) analysis and to evaluate the efficacy of MA decision-making for-profit planning using AI by evaluating the process and the quality of the final decision.

4. Results and Discussion

Artificial intelligence (AI) technology plays a significant role in the fourth technological revolution, influencing all disciplines and activities (Vărzaru, 2022). Figure 1

shows that the number of AI patents globally by field is growing, especially in the field of personal and computer devices.

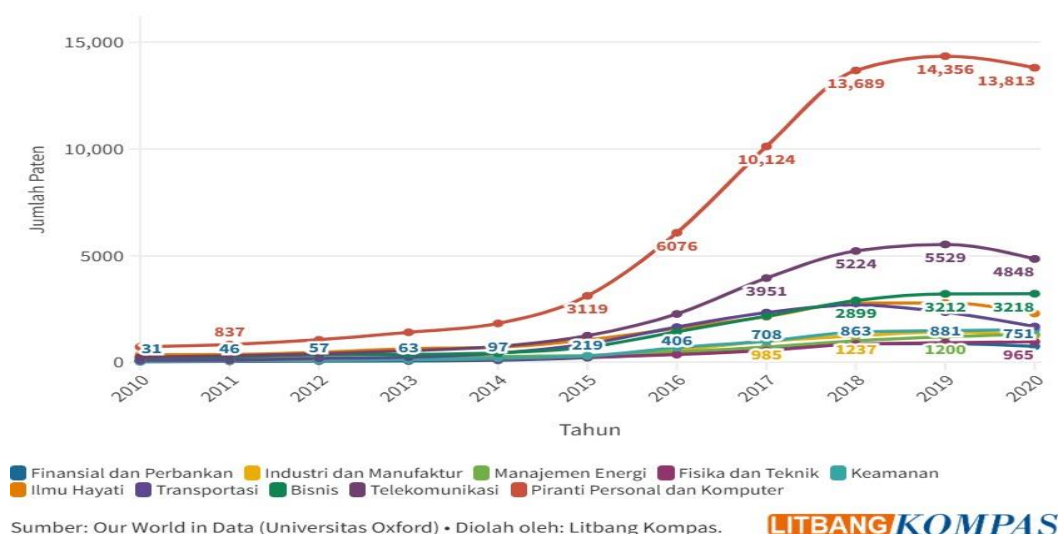


Figure 1 Number of AI Paten by Field

Source: Our World in Data (Oxford University) processed by Litbang Kompas (Yuniarto, 2024)

This trend cannot be disregarded by managerial accounting (MA), as AI is beginning to serve as an integration solution for all organizational information systems (Li et al., 2020; Vărzaru, 2022). In the MA sector, AI is employed for data acquisition, processing, interpretation, and the periodic formulation of operational decisions. Consequently, according to an integrated perspective, MA is an indispensable element of an organization's information system (Stoica & Ionescu-Feleagă, 2021). AI facilitates the computerization and automation of managerial accounting processes; this is achieved through the increased efficacy of the accounting workforce, rapid feedback, and speed. Artificial Intelligence in Managerial Accounting (AIMA) will be utilized to inform numerous hybrid MA activities (Moll & Yigitbasioglu, 2018) such as analysis, problem-solving, and communication, technology, and IT skills are also needed (Pan & Seow, 2016; Schmidt et al., 2020), including basic knowledge in management and accounting. Indeed, profit planning activities are included in this writing.

4.1 Profit Planning Analysis Method

4.1.1 Cost Volume Profit Analysis

CVP is a profit planning tool that considers the costs, volume, and profits of the company with the main focus on product price, production volume, variable costs per unit, total fixed costs, and product sales mix. Brigham & Houston (2014) stated that by carrying out an analysis, CVP will increase the profit point of profit planned by the company by using a management system that can make it easier for the company to run so that planning can be structured (Brigham & Houston, 2011).

According to Mulyadi (2015), CVP analysis is a technique for calculating the impact of

changes in selling prices, sales volume, and costs on profits to assist management in short-term profit planning (Mulyadi, 2015). In line with Mulyadi, Garrison et al. (2018) stated that CVP analysis is one of several tools that are very useful for managers in giving orders (Garrison et al.. Volume cost analysis is a tool for considering the impact of the relationship between cost magnitude and sales volume on company profits, with CVP analysis emphasizing the relationship between costs and sales volume, which will be a useful analytical tool in planning and decision-making to achieve the desired profit.

CVP is an innovative and strategic tool that can be used by business actors as the right tool to make the right decisions for a business (Hesti et al., 2024; Triana et al., 2020). Through cost-volume-profit (CVP) analysis, it can assist MSME business actors in planning the desired profits (Hesti et al., 2024; Iksan Hikmatullah et al., 2023; Sumarni, 2020). CVP has analytical tools that can help determine profit, including Break-Event-Point (BEP), Contribution Margin, Margin-of-Safety, and Degree-Of-Operating-Leverage. CVP contains three main components in a company's profit and loss/profit report, namely cost, volume, and profit analysis. CVP is a tool that can help management find out the relationship between selling price, sales volume, and costs to profit (Belmo & Neno, 2020; Hesti et al., 2024; Luntungan & Tinangon, 2021). By applying cost volume profit (CVP) analysis, variable operating costs, sales volume, and profit levels can be identified relevantly to generate short-term company profits (Agustini et al., 2024; Hesti et al., 2024).

4.1.2 Contribution Margin

The contribution margin (CM) is the remaining amount of sales revenue minus variable costs, which will be used to cover fixed costs and generate profits (Y. Yanto & Yuliani, 2017). CM is useful in short-term profit planning. If the contribution margin is more significant than fixed costs ($CM > FM$), then the company makes a profit; conversely, if ($CM < FM$), then the company will experience a loss. If ($CM = FM$), then the company will be at the break-even point. CM can be increased by policies such as changing selling prices, increasing sales quantity, and improving the structure of the combination of fixed costs and variable costs.

Riyanto (2010) suggests that CM can be used by management to determine whether or not the amount available is sufficient to cover the company's fixed expenses, from which a profit will then emerge (Riyanto, 2010). Meanwhile, the contribution margin, according to Lestari and Permana (2017), is sales revenue minus the total costs incurred (Lestari & Permana, 2021). The contribution margin ratio is the portion of each dollar of sales to cover fixed costs and generate profits. CM calculations are as follows:

$$\text{Contribution Margin} = \text{Penjualan} - T \quad (1)$$

$$\text{Contribution Margin Ration} = \frac{\text{Total CM}}{\text{Net Sales}} \times 100\% \quad (2)$$

4.1.1 Break-Even Point

Break Even Point (BEP) is a position where the company does not make a profit and does not suffer a loss. BEP, or break-even point, is essential for management when making

decisions to withdraw products or develop products. According to Djarwanto Rusdiana (2014), BEP is a break-even condition; that is, if a calculation of profit and loss for a certain period has been prepared, the company makes no profit and suffers no loss (Rusdiana, 2014). Meanwhile, Rudianto (2013) believes that BEP is an analysis technique used to determine the minimum sales volume that must be obtained to cover all costs that the company has incurred so that it does not experience losses but has not yet made a profit and the sales that must be achieved to obtain sure profits (Rudianto, 2018; M. Yanto, 2020). Kasmir (2019) also revealed that BEP is a critical financial analysis in company financial planning. Break-even analysis is used to determine whether sales results are equal to the costs incurred. Alternatively, the company operates on a condition of no profit and no loss, or profit equals zero (Kasmir, 2019).

Data needs to be prepared to calculate BEP, including (1) fixed costs and costs that do not change when production is not carried out, such as salary costs, equipment depreciation costs, and insurance costs. (2) Variable costs, costs that will increase as the amount of production increases, such as raw materials, fuel, and electricity. (3) Price per unit, the selling price of the goods or services produced. (4) Variable costs per unit, the average costs incurred per unit. (5) Contribution margin per unit, the difference between the selling price per unit and the variable cost per unit. (6) Contribution margin ratio, which is the contribution margin divided by sales. The weakness of BEP analysis is that there is only one type of goods produced or sold. If there is more than one type, the combination or composition of sales (*sales mix*) will remain constant (Maruta, 2018). Apart from that, another weakness of BEP is that being able to exceed a certain point can only be achieved by reducing the selling price per unit so that revenue will not be straight but curved. Then, *operating costs per unit will also increase if you maximize sales volume in full, with the leading cause being a decrease in labor efficiency or an increase in overtime wages*. The limited implementation period of BEP is also a weakness of profit planning analysis. BEP can only be used for one year's production activities.

BEP computations can be conducted using several approaches, including the equation, contribution margin, and graphical tools. The equation method is executed with the income statement approach. This calculation employs the equation approach.

$$BEP \text{ (Rupiah)} = \frac{\text{Total Fixed Cost}}{1 - \frac{\text{Variabel cost unit of production} \times \text{unit of product produced}}{\text{selling price unit} \times \text{unit of product sold}}} \quad (3)$$

$$BEP \text{ (Unit)} = \frac{\text{Total Fixed Cost}}{\text{Selling Price Unit} - \text{Variable cost unit}} \quad (4)$$

The unit contribution method is a streamlined approach to calculating the contribution margin value. The contribution margin is calculated by reducing the revenue from sales that have variable costs. To get the BEP, you may calculate it as follows:

$$BEP \text{ (Unit)} = \frac{\text{Fixed Cost}}{\text{Margin contribution unit}} \quad (5)$$

$$BEP \text{ (Rupiah)} = \frac{\text{Fixed Cost}}{\text{Contribution Margin Ratio}} \quad (6)$$

By employing graphical methods, managers can circumvent mathematical methods at various sales levels. This method will assist managers in assessing the effects of fluctuations in sales volume from the previous year and in predicting sales volume for the upcoming year.

4.1.2 Margin of Safety

Management conducting BEP analysis will obtain information regarding the Margin of Safety (MOS). According to Machfoedz and Mahmudi (2011), MOS is an analytical method that assesses the security of a company's sales (Machfoedz & Mahmudi, 2011; M. Yanto, 2020). MOS will establish a maximum threshold limit for sales decline as long as the company has not experienced a loss and a threshold limit for sales decline that does not result in company losses. In contrast, Sugiono (2016) maintains that MOS is the break-even point and the level of sales that are targeted. In other words, it delineates the maximum allowable decline in sales from the target in order to prevent the company from incurring losses (Sugiono, 2016).

$$\text{Margin of Safety} = \text{Total Penjualan} - BEP \quad (4)$$

$$\text{Margin of Safety Ratio} = \frac{MOS}{\text{Net Sales}} \times 100\% \quad (5)$$

4.1.3 Operating Leverage

Herman (2013) in Yanto (2020), Operating leverage is a metric that quantifies the extent to which a company utilizes fixed costs (Herman, 2013; M. Yanto, 2020). Operating Leverage (OL) that a company has is high in its cost structure if fixed costs are more significant than total costs. If OL is low, then variable costs are more significant in the cost structure. OL can affect a company's BEP level because increases in fixed costs must be balanced with increases in sales volume so that operating costs can be covered.

$$\text{Degree of Operating Leverage} = \frac{\text{Total Contribution Margin}}{\text{Profit}} \quad (6)$$

4.2 Profit Planning Using Artificial Intelligence

4.2.1 Process Cost Volume Profit

The accuracy and timeliness of financial reports can be enhanced by the presence of an Accounting Automation System (AAS), which can help reduce errors in calculations, accounting records, and operations. In the context of improved data management, AAS also contributes to a more efficient process of storing, managing, and safeguarding financial data, which enables current and periodic accounting, reporting, and analysis. Automation of accounting processes can assist businesses in minimizing expenses associated with manual data entry, paper-based document processes, and error correction. Companies can allocate time for other critical tasks, including strategic planning, social activities, analysis, and quality management decisions, by automating accounting activities (Chipriyanova & Krasteva-Hristova, 2023). The advantages of AAS demonstrate

its potential as a decision support system (DSS) by automating the accumulation, processing, and analysis of financial data and transforming it into management information. DSS offers decision-making information by presenting intricate data, analyzing problematic situations, and developing potential models.

Modern technology solutions, such as AI and Machine Learning, can be effectively integrated into AAS to create a DSS-like AI-powered system that can automate data input, expense categorization, and financial report preparation. These activities involve the automatic entry of data from a variety of financial resources and documents into an accounting system, the automatic categorization of expenses based on suppliers, categories, and amounts, and the automatic generation of financial reports such as balance sheets and income statements. Algorithm Machine learning can rapidly and accurately identify patterns that may suggest fraudulent activity by analyzing vast quantities of financial data. In addition to assisting businesses in the management of their cash flows, machine learning algorithms can also analyze historical financial data to predict future cash flows. Simultaneously, AI and machine learning can analyze economic data and forecast future trends and outcomes. It enables companies to strategize more efficiently.

The process in traditional CPV uses DSS, which is used in conjunction with AI and *Machine Learning*. In terms of decision, there are differences, shown in Figure 3 and Figure 4.

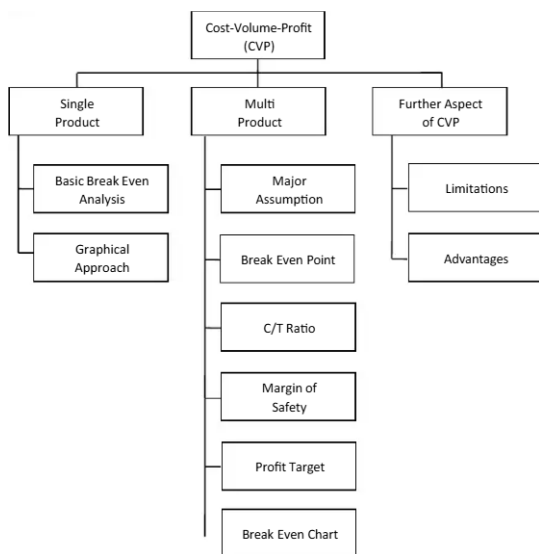


Figure 2 CVP Concept Map
(Mulyadi, 2015 & CCM)

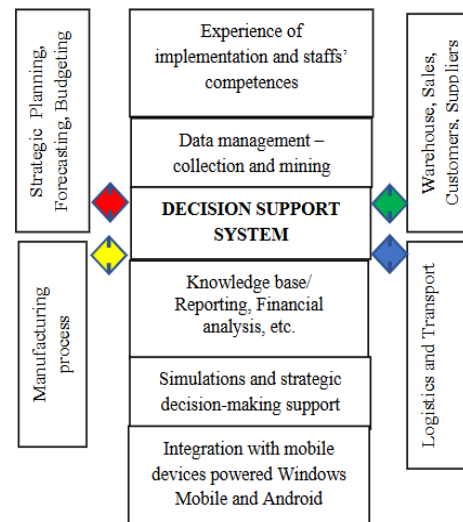


Figure 3 Model Decision Support Systems
(Chipriyanova & Krasteva, 2023)

Therefore, the automation of the collection, processing, and analysis of financial data, as well as its transformation into management information, is facilitated by managerial accounting decision-making supported by DSS with AI support and Machine Learning (Davenport & Ronanki in Vărzaru, 2022 and Bygren, 2016).

4.2.2 Quality of Final Decision

The results obtained with AI based on exponential indicators are more accurate, thereby ensuring the accuracy of financial decisions (Jia et al., 2022). The implementation of AI technology in management accounting has the potential to revolutionize the estimation of costs, the management of budgets, and the formulation of decisions. By leveraging AI on complex data and intricate patterns, it enables cost predictions with a higher level of accuracy and provides the transparency needed in the accounting ecosystem, as stated by Gorla et al. (2010) above. AI has the potential to enhance the quality of capital allocation decisions and the efficiency of resource utilization by utilizing predictions that are derived from a variety of intricate scenarios. AI has delivered tangible advantages, including the improvement of accountants' abilities to collect, process, and interpret intricate data. Nevertheless, AI lacks the capabilities of human intelligence; human oversight is still deployed to guarantee the accuracy and impartiality of AI decisions.

Even though it has speed and automation for decision-making, AI cannot replace the central role of humans in decision-making because AI cannot yet replace human creativity and reasoning based on emotions and feelings (Vărzaru, 2022). The measurement of decision-making efficiency conveyed by Gorla et al. (2010) consists of the process and quality of the final decision. In terms of processes, the digitalization of decision-making with AI and Machine Learning can contribute to the automation of data collection, data processing, and data analysis. Figures 3 and 4 show the differences between the CVP concept map and DSS, which integrates AI and machine learning. AI and Machine Learning can shorten the data process because it can be automated.

The results of this study align with the research of Bygren (2016) and Ronarki in Vărzaru (2022), which states that digitalization can directly impact companies or organizations strategically because it can provide real-time information for all stakeholders. As Davenport & Ronanki in Vărzaru (2022) and Bygren (@016), DSS powered by AI and Machine Learning can process and provide information directly after the data collection and input process is complete. Regarding the quality of the decisions made, it is necessary to consider and involve humans because AI cannot replace or even balance humans' emotions and feelings. So, this study differs from the conclusion of Ronarki's research in Vărzaru (2022) because AI cannot carry out more activities than human resources in the decision-making process because of its weakness in creativity and human reasoning based on emotions and feelings.

4 Conclusions

Managerial accounting decision-making using DSS with AI and Machine Learning supports the automation of financial data collection, processing, and analysis and its transformation into more accurate management information. Although it has speed and

automation for decision-making, AI cannot replace the primary role of humans in decision-making because AI cannot replace human creativity and reason based on emotions and feelings. However, to optimize the use of AI in decision-making, it is necessary to improve the knowledge structure of financial so that it has implications for improving operational efficiency. This research uses a literature review method sourced from secondary data, which researchers can then develop with empirical data so that they can develop a more objective understanding and conclusions.

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