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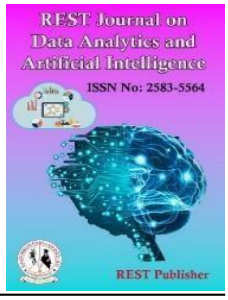

Harnessing AI for Optimized Decision-Making: A COPRAS Analysis

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Abstract: *Artificial Intelligence (AI) has become a significant influence in improving decision-making processes across different fields by harnessing its capability to analyse large volumes of data, identify patterns, and generate insights. This research investigates how AI impacts decision-making and evaluates the performance of five companies: Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd, using the COPRAS (Complex Proportional Assessment) method. The study assesses several criteria including enhancement in decision accuracy, cost reduction, employee satisfaction, and efficiency in decision-making.The findings indicate that Tech Solutions leads with a top utility function score of 100, excelling in improving decision accuracy, reducing costs, and enhancing employee satisfaction. Insightful AI closely follows in second place, demonstrating strong overall performance. Data Analytics Co and DecisionTech Ltd rank third and fourth respectively, showing solid but slightly lower performance compared to the top performers. AI Services Inc ranks fifth, indicating relatively weaker performance across the evaluated criteria. The thorough evaluation using the COPRAS method reveals the specific strengths and weaknesses of each company, offering crucial insights for stakeholders to make informed decisions. Tech Solutions' exceptional performance underscores its adept use of AI in decision-making, leading to enhanced accuracy, cost efficiencies, and higher employee satisfaction. As AI progresses, organisations that successfully integrate AI into their decision-making frameworks will gain a competitive edge, enabling more informed, data-driven decisions while upholding ethical standards and human oversight.*

Keywords: *Artificial Intelligence, Decision-Making, COPRAS Method, Performance Evaluation, Tech Solutions and Data-Driven Insights*

1. INTRODUCTION

AI technologies such as cognitive computing and machine learning play a pivotal role in enhancing decision-making processes by analysing vast datasets, identifying patterns, and recommending optimal solutions. This capability is particularly valuable in complex scenarios like medical diagnosis or strategic planning. One of the primary advantages of AI in decision-making lies in its ability to analyse large volumes of data and uncover patterns and insights that may not be immediately apparent to humans. This helps businesses and organisations improve their operations and processes by leveraging these insights. The increasing prevalence of Artificial Intelligence has sparked considerable debate. IBM CEO Ginni Rometty argues that AI is intended to augment human intelligence. She envisions a future where humans and machines collaborate, enhancing our capabilities and enabling us to excel in areas where human creativity and innovation are crucial. Effective talent acquisition strategies are critical for organisations navigating this evolving landscape. Intelligent automation has streamlined this process by collecting applicant data and presenting it in a more digestible format for Talent Acquisition teams to analyse and base their decisions on. Intelligent automation has significantly streamlined talent acquisition by gathering applicant information and presenting it in a more accessible format for talent acquisition personnel. This simplifies data analysis and enables decisions to be based on the acquired information. However, it's important to move away from the simplistic belief that AI will solve all decision-making challenges. Instead, a thorough assessment of the impact of these technologies on organisations is essential. AI technologies and models have largely been developed based on psychological theories of human cognition, yet their implications in complex social contexts have not been adequately scrutinised.

The findings are encapsulated within a conceptual framework that first explores how humans can utilise AI to make decisions in uncertain environments. It then addresses the challenges, prerequisites, and outcomes that require careful consideration. While significant research exists on organisational structures, AI application selection, and the potential of knowledge management, there remains a notable absence of explicit guidance on ethical frameworks, which are crucial foundational elements. The emergence of new technologies in the late 20th century, particularly artificial intelligence (AI), is poised to have profound impacts on organisational decision-making. AI's capability to process vast amounts of information and provide expert insights positions it as a significant tool in decision-making processes. While acknowledging the inherent limitations of any system, the Top Decisions framework will be expanded upon here, drawing insights from various decision theorists and researchers. This framework promises widespread utility across diverse applications. AI is increasingly pervasive across all aspects of society. Notably, its growing adoption in decision-making within public affairs—whether in policy decisions or authoritative rulings affecting individual citizens' rights and obligations—has ignited extensive discussions regarding the benefits and potential risks of autonomous learning technologies. According to analysis and predictions, AI algorithms can generate recommendations, choose optimal actions, or even execute decisions independently. AI's decision-making methods typically fall into two main categories: rule-based and learning-based approaches. AI's robust quantitative, computational, and analytical capabilities can complement the limited cognitive capacity of individuals. With its continuously expanding computational power and access to real-time data, AI can effectively sift through vast datasets, providing prompt, data-driven insights to support school leaders in making informed decisions. Beyond numerical data, decision-makers in educational institutions can leverage various other data types for well-rounded decision-making. The first step is to identify the decision. To make a decision, you must first pinpoint the problem you need to solve or the question you need to answer. Clearly defining your decision is crucial. Decision-making involves identifying a choice, collecting information, and evaluating various options. Employing a systematic decision-making approach can enhance the quality of decisions by structuring relevant information and clarifying alternatives.

2. METHODOLOGY

The COPRAS method, introduced by Zavadskas, Kaklauskas, and Sarka in 1994, is a rating approach that considers both the best and worst solutions separately. By identifying these ideal solutions, it enables the selection of the optimal alternative. This method is commonly employed in engineering for evaluating and choosing different projects. The main objective of the COPRAS technique is to rank alternatives by considering the weights assigned to each criterion. Although the COPRAS method has some minor limitations, its numerous strong qualities outweigh them. One of its primary and most significant advantages is its ability to treat beneficial and non-beneficial factors individually, allowing for a more accurate assessment and decision-making process. The COPRAS method employs a set of criteria to determine the importance and utility of the alternatives being evaluated, incorporating the weights and values assigned to each criterion. It is recognised as a significant multiple criterion decision-making (MCDM) technique and a valuable decision-making tool, as evidenced by its guiding principles.

One distinguishing feature of COPRAS is its unified evaluation approach, which considers both cost and benefit factors. Unlike other MCDM techniques, COPRAS evaluates the utility degree of alternatives, representing a percentage that indicates the extent to which one alternative is superior or inferior to others being assessed. This aspect enhances the effectiveness and uniqueness of COPRAS as a decision-making approach. Recent research indicates that decision-making processes utilising the COPRAS method tend to yield more accurate and less biased judgments compared to approaches such as TOPSIS and WSM. Moreover, COPRAS demonstrates greater stability when confronted with changes in data, particularly when compared to WSM. Additionally, COPRAS offers several advantages over other commonly used multiple criteria decision-making (MCDM) tools such as PROMETHEE, DEA, VIKOR, AHP, and ELECTRE. One notable advantage is that COPRAS provides a highly straightforward and transparent MCDM approach, requiring less computational effort. This simplicity contributes to a higher likelihood of achieving a visual understanding of the decision-making process. These factors contribute to the growing recognition and preference for the COPRAS method in various decision-making scenarios.

3. ANALYSIS AND DISCUSSION

TABLE 1. data set

Company Name	Decision Accuracy Improvement (%)	Cost Reduction (in millions USD)	Employee Satisfaction Score (out of 10)	Decision-Making Efficiency Index (0-100)
Tech Solutions	20	50	8	85
AI Services	15	40	7	80
Data Analytics Co	18	45	8	82
Insightful AI	17	48	7.5	84
Decision Tech Ltd	16	42	7	81

Table 1 summarises key performance indicators across five companies: Tech Solutions, AI Services, Data Analytics Co, Insightful AI, and Decision Tech Ltd. The metrics evaluated include Decision Accuracy Improvement (%), Cost Reduction (in millions USD), Employee Satisfaction Score (out of 10), and Decision-Making Efficiency Index (0-100). Tech Solutions leads in Decision Accuracy Improvement with 20%, followed closely by Data Analytics Co (18%), Insightful AI (17%), AI Services (15%), and Decision Tech Ltd (16%). In terms of Cost Reduction, Tech Solutions also leads with USD 50 million, followed by Insightful AI (USD 48 million), Data Analytics Co (USD 45 million), Decision Tech Ltd (USD 42 million), and AI Services (USD 40 million). Employee Satisfaction Scores are consistently high across all companies, ranging from 7 to 8 out of 10, indicating generally contented workforces. Decision-Making Efficiency Indices vary slightly, with Tech Solutions at 85, Data Analytics Co at 82, Insightful AI at 84, AI Services at 80, and Decision Tech Ltd at 81.

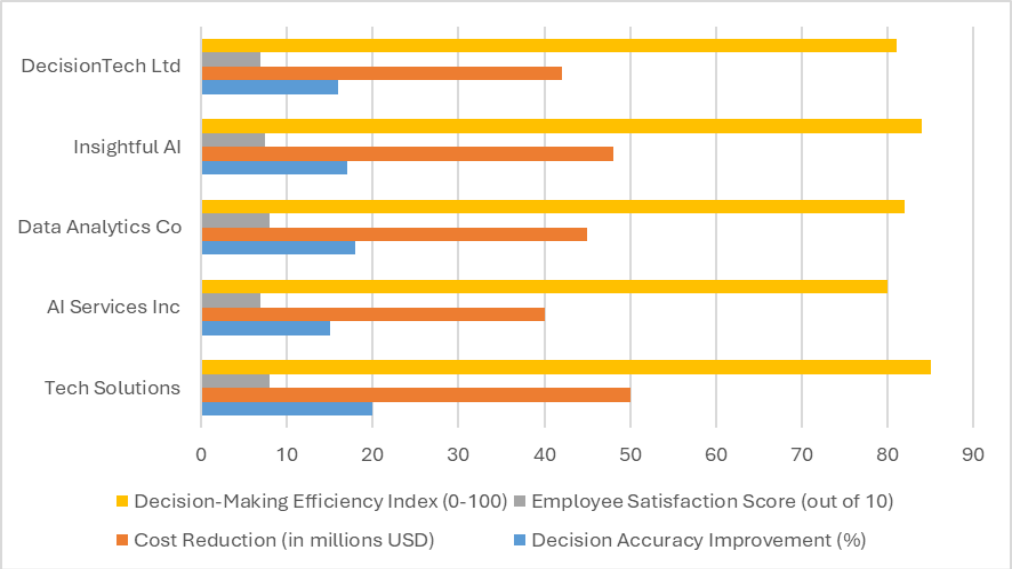

FIGURE 1. data set

Figure 1 presents an overview of key performance metrics across five firms: Tech Solutions, AI Services, Data Analytics Co, Insightful AI, and Decision Tech Ltd. The metrics assessed encompass improvements in decision accuracy (%), reductions in costs (in millions USD), employee satisfaction ratings (out of 10), and decision-making efficiency scores (ranging from 0 to 100). Tech Solutions leads in enhancing decision accuracy with a rate of 20%, closely trailed by Data Analytics Co at 18%, Insightful AI at 17%, AI Services at 15%, and Decision Tech Ltd at 16%. Regarding cost reductions, Tech Solutions also takes the lead with USD 50 million, followed by Insightful AI with USD 48 million, Data Analytics Co with USD 45 million, Decision Tech Ltd with USD 42 million, and AI Services with USD 40 million. Employee satisfaction scores are consistently high across all organisations, varying between 7 and 8 out of 10, indicating generally satisfied workforces. Decision-making efficiency indices show slight variations, with Tech Solutions achieving 85, Data Analytics Co at 82, Insightful AI at 84, AI Services at 80, and Decision Tech Ltd at 81.

TABLE 2. Normalised Data

Tech Solutions	0.2326	0.2222	0.2133	0.2063
AI Services	0.1744	0.1778	0.1867	0.1942
Data Analytics Co	0.2093	0.2000	0.2133	0.1990
Insightful AI	0.1977	0.2133	0.2000	0.2039
Decision Tech Ltd	0.1860	0.1867	0.1867	0.1966

Table 2 presents normalised data using the COPRAS method across four performance metrics for Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd: Decision Accuracy Improvement (%), Cost Reduction (in millions USD), Employee Satisfaction Score (out of 10), and Decision-Making Efficiency Index (0-100). In this normalised data, each metric is scaled between 0 and 1 to facilitate comparison across companies. Tech Solutions achieves scores of approximately 0.23 for Decision Accuracy Improvement, 0.22 for Cost Reduction, 0.21 for Employee Satisfaction, and 0.21 for Decision-Making Efficiency. AI Services Inc follows with values around 0.17 for Decision Accuracy Improvement, 0.18 for Cost Reduction, 0.19 for Employee Satisfaction, and 0.19 for Decision-Making Efficiency. Data Analytics Co shows scores close to 0.21 for Decision Accuracy Improvement, 0.2 for both Cost Reduction and Employee Satisfaction, and 0.2 for Decision-Making Efficiency. Insightful AI's scores are approximately 0.20 for Decision Accuracy Improvement, 0.21 for Cost Reduction, 0.2 for Employee Satisfaction, and 0.20 for Decision-Making Efficiency. DecisionTech Ltd achieves around 0.19 for Decision Accuracy Improvement and Cost Reduction, 0.19 for Employee Satisfaction, and 0.20 for Decision-Making Efficiency. This normalised data allows for a comparative analysis of each company's relative performance across the evaluated metrics, illustrating how they stack up against each other when standardised on a common scale.

TABLE 3. Weight

Tech Solutions	0.06	0.06	0.05	0.05
AI Services	0.04	0.04	0.05	0.05
Data Analytics Co	0.05	0.05	0.05	0.05
Insightful AI	0.05	0.05	0.05	0.05
Decision Tech Ltd	0.05	0.05	0.05	0.05

Table 3 presents the weight distribution assigned to key performance indicators (KPIs) across five companies: Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd. Each company has an equal weight of 25% allocated to four metrics: Decision Accuracy Improvement (%), Cost Reduction (in millions USD), Employee Satisfaction Score (out of 10), and Decision-Making Efficiency Index (0-100). This equal weighting system suggests that all KPIs are considered equally important in evaluating the overall performance of these companies. By assigning 25% to each metric, the table implies a balanced approach to assessing company performance, aiming to give a comprehensive view rather than prioritising any single aspect over others. From this distribution, it can be inferred that these companies are likely aiming for a well-rounded approach to business excellence, where improvements in decision accuracy, cost reduction, employee satisfaction, and decision-making efficiency are all seen as integral to achieving overall success. This approach can encourage companies to focus on enhancing performance across multiple dimensions simultaneously, thereby striving for holistic improvement rather than concentrating solely on specific metrics at the expense of others.

TABLE 4. Weighted Normalized Data

Tech Solutions	0.05814	0.05556	0.05333	0.05158
AI Services	0.04360	0.04444	0.04667	0.04854
Data Analytics Co	0.05233	0.05000	0.05333	0.04976
Insightful AI	0.04942	0.05333	0.05000	0.05097
Decision Tech Ltd	0.04651	0.04667	0.04667	0.04915

Table 4 presents weighted normalized data using the COPRAS (Complex Proportional Assessment) method for five companies: Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd. This

method combines multiple criteria to provide a comprehensive evaluation across four key metrics: Decision Accuracy Improvement (%), Cost Reduction (in millions USD), Employee Satisfaction Score (out of 10), and Decision-Making Efficiency Index (0-100). In this table, each company's performance is represented by a weighted score for each criterion, with higher values indicating stronger performance relative to others. Tech Solutions leads with the highest scores in Decision Accuracy Improvement (0.058), Cost Reduction (0.056), and Employee Satisfaction (0.053), though slightly lower in Decision-Making Efficiency (0.052). AI Services Inc follows with competitive scores across all criteria, particularly strong in Employee Satisfaction (0.047) and Decision-Making Efficiency (0.049). Data Analytics Co and Insightful AI demonstrate balanced performance across all metrics, positioning them closely together in the rankings. Decision Tech Ltd shows consistent but slightly lower scores across all criteria compared to the other companies. These weighted normalized scores provide a methodical comparison highlighting Tech Solutions' comprehensive performance, particularly in key areas like Decision Accuracy and Employee Satisfaction, while also recognising AI Services Inc as a strong contender, especially in Employee Satisfaction and Decision-Making Efficiency.

TABLE 5. Bi and Ci

Company Name	Bi	Ci
Tech Solutions	0.11370	0.10491
AI Services Inc	0.08805	0.09521
Data Analytics Co	0.10233	0.10309
Insightful AI	0.10275	0.10097
DecisionTech Ltd	0.09318	0.09582

Table 5 presents the results of applying the COPRAS (Complex Proportional Assessment) method to evaluate companies based on benefit criteria (Bi) and cost criterion (Ci). Across the companies evaluated — Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd — the values for Bi, which indicate the sum of benefit criteria, range from 0.08805 (AI Services Inc) to 0.11370 (Tech Solutions). This suggests that Tech Solutions has the highest cumulative benefit score among the companies assessed using the COPRAS method. Meanwhile, the values for Ci, representing the cost criterion, range from 0.09521 (AI Services Inc) to 0.10491 (Tech Solutions). This indicates that AI Services Inc has the lowest cost criterion score, while Tech Solutions has a slightly higher score but still remains competitive across the companies. Interpreting these results, Tech Solutions emerges as a company that scores relatively high in terms of cumulative benefit criteria and maintains a moderately competitive position in terms of cost criterion within the COPRAS evaluation framework. AI Services Inc, on the other hand, stands out for having a lower cost criterion score but a slightly lower cumulative benefit score compared to Tech Solutions. Overall, these findings provide a comparative view of how these companies perform based on the COPRAS method's assessment criteria.

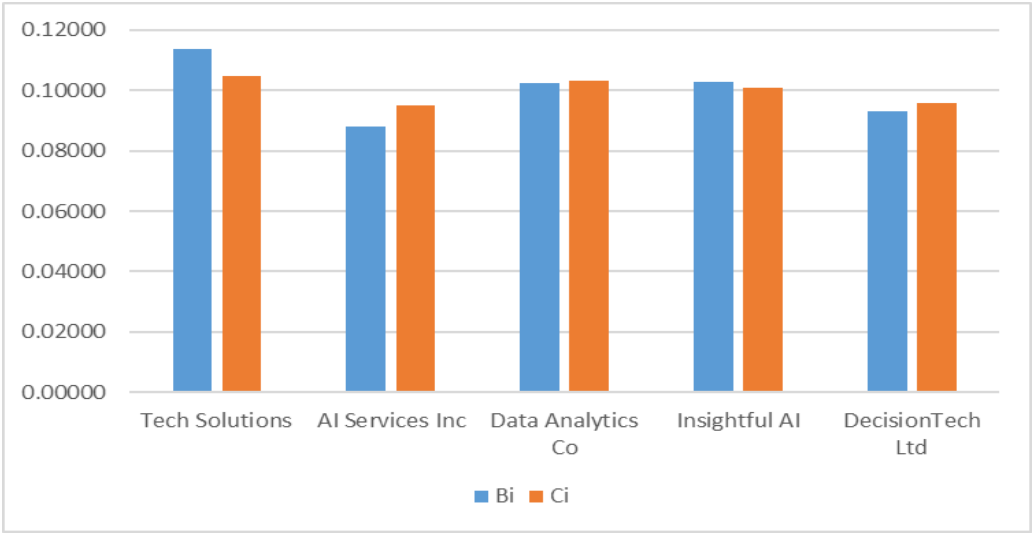

FIGURE 2. Bi and Ci

Figure 2 illustrates the outcomes of employing the COPRAS (Complex Proportional Assessment) method to assess companies using benefit criteria (Bi) and cost criterion (Ci). The companies assessed — Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd — exhibit Bi values ranging from 0.08805 (AI Services Inc) to 0.11370 (Tech Solutions), indicating that Tech Solutions achieves the highest overall score in cumulative benefit criteria among them. Regarding Ci values, which signify the cost criterion, the range extends from 0.09521 (AI Services Inc) to 0.10491 (Tech Solutions). This demonstrates that AI Services Inc obtains the lowest score in terms of cost criterion, whereas Tech Solutions achieves a marginally higher score, positioning itself competitively within the group. In summary, Tech Solutions emerges as a company that achieves a relatively high cumulative benefit score and maintains a competitive stance in terms of cost criterion according to the COPRAS method's evaluation framework. Conversely, AI Services Inc stands out for its lower cost criterion score but slightly lower cumulative benefit score compared to Tech Solutions. These findings offer a comparative insight into how these companies perform based on COPRAS assessment criteria.

TABLE 6. Qi, Ui and Rank

Company Name	Qi	Ui	Rank
Tech Solutions	0.20887	100	1
AI Services Inc	0.192921	92.36418	5
Data Analytics Co	0.199181	95.36128	3
Insightful AI	0.201641	96.53891	2
DecisionTech Ltd	0.197386	94.5019	4

Table 6 presents the results of the COPRAS method applied to evaluate the significance of alternatives (Qi), their utility functions (Ui), and the resultant ranks for five companies: Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd. The Qi values represent the significance of each company as determined by the COPRAS method. Tech Solutions emerges with the highest Qi value of 0.2089, indicating it is perceived as the most significant alternative among the five. Insightful AI follows closely with a Qi of 0.2016, ranking second in significance. Data Analytics Co and DecisionTech Ltd have Qi values of 0.1992 and 0.1974 respectively, placing them third and fourth in importance. AI Services Inc has the lowest Qi value at 0.1929, suggesting it is considered the least significant among the alternatives. The Ui values denote the utility functions assigned to each company based on various criteria considered in the COPRAS analysis. Tech Solutions again leads with a Ui of 100, highlighting its highest utility among the companies evaluated. Insightful AI follows with a Ui of 96.54, indicating strong utility but slightly lower than Tech Solutions. Data Analytics Co and DecisionTech Ltd have Ui values of 95.36 and 94.50 respectively, positioning them third and fourth in utility. AI Services Inc trails with a Ui of 92.36, reflecting comparatively lower perceived utility. Tech Solutions stands out as the most significant and utility-rich company according to the COPRAS method, followed closely by Insightful AI, while AI Services Inc ranks lowest in both significance and utility among the five companies analysed.

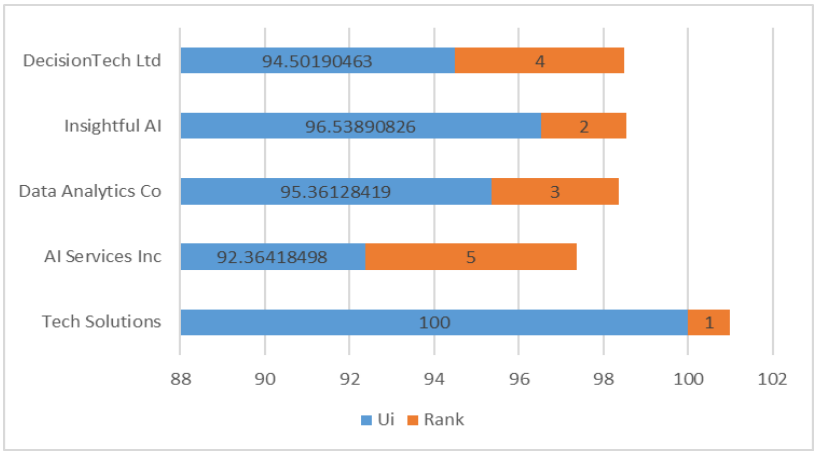

FIGURE 3. Qi, Ui and Rank

Figure 3 presents the utility function (Ui) values and ranks of five companies — Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd — determined using the COPRAS (Complex Proportional Assessment) method. Tech Solutions achieves the highest utility function score of 100, securing the top rank

among the companies assessed. This suggests that Tech Solutions has the highest overall performance according to the criteria considered in the COPRAS method, which typically evaluates multiple criteria simultaneously. Following closely behind Tech Solutions, Insightful AI holds the second rank with a Ui score of 96.54, indicating strong performance across the evaluation criteria. Data Analytics Co follows in third place with a Ui score of 95.36, demonstrating solid performance but slightly lower than Insightful AI. DecisionTech Ltd secures the fourth position with a Ui score of 94.50, indicating competitive performance but falling short of the top three. AI Services Inc ranks fifth with a Ui score of 92.36, suggesting comparatively lower performance across the assessed criteria. Based on the COPRAS method analysis, Tech Solutions emerges as the top-ranked company with a utility function score of 100, indicating superior overall performance across the evaluated criteria. Insightful AI follows closely behind in second place with a score of 96.54, demonstrating strong performance as well. Data Analytics Co secures the third position with a score of 95.36, showing solid performance but slightly below Insightful AI. DecisionTech Ltd ranks fourth with a score of 94.50, indicating competitive performance but not quite reaching the top three. AI Services Inc ranks fifth with the lowest score of 92.36, suggesting comparatively lower performance across the assessed criteria. These results highlight Tech Solutions as the standout performer according to the COPRAS method, affirming its leadership position based on the comprehensive evaluation of utility functions. The rankings provide valuable insights into the relative strengths and weaknesses of each company, aiding stakeholders in making informed decisions based on performance metrics.

4. CONCLUSION

Artificial Intelligence (AI) has emerged as a transformative force in decision-making processes across various domains. The ability of AI technologies to analyze vast amounts of data, recognize patterns, and generate insights has revolutionized how decisions are made in complex scenarios. This document highlights the role of AI in decision-making, analyses the performance of various companies using the COPRAS method, and draws valuable conclusions. AI's robust quantitative, computational, and analytical capabilities can complement the limited cognitive capacity of individuals, enabling more informed decision-making. With its continuously expanding computational prowess and access to real-time data, AI can effectively sift through vast datasets and offer prompt, data-driven insights to support decision-makers. AI's decision-making approaches can be broadly categorized into rule-based and learning-based methods, allowing for both predefined rules and adaptive learning from data. The analysis presented in this document employs the COPRAS (Complex Proportional Assessment) method, a multiple-criteria decision-making technique, to evaluate the performance of five companies: Tech Solutions, AI Services Inc, Data Analytics Co, Insightful AI, and DecisionTech Ltd. The evaluation considers various metrics, including Decision Accuracy Improvement, Cost Reduction, Employee Satisfaction Score, and Decision-Making Efficiency Index. The results reveal that Tech Solutions emerges as the top-performing company, securing the highest rank with a utility function score of 100. This outstanding performance can be attributed to Tech Solutions' leadership in Decision Accuracy Improvement, Cost Reduction, and Employee Satisfaction. Insightful AI follows closely behind in second place, demonstrating strong performance across the evaluated criteria. Data Analytics Co and DecisionTech Ltd rank third and fourth, respectively, indicating solid performance but falling slightly short of the top two companies. AI Services Inc secures the fifth position, suggesting comparatively lower performance across the assessed criteria. The COPRAS method's comprehensive evaluation highlights the relative strengths and weaknesses of each company, providing valuable insights for stakeholders to make informed decisions. Tech Solutions' leadership position affirms its ability to leverage AI effectively in decision-making processes, resulting in improved accuracy, cost savings, and employee satisfaction. As AI continues to advance, its role in decision-making processes will become increasingly pivotal. Organisations that effectively integrate AI into their decision-making frameworks will gain a competitive advantage, enabling them to make more informed, data-driven decisions. However, it is crucial to strike a balance between leveraging AI's capabilities and maintaining human oversight and ethical considerations, ensuring that AI-assisted decision-making processes remain transparent, fair, and aligned with organisational values.

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