Integrating AI-based Smart-Driven Marketing to Promote Sustainable and Green Systems

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***Abstract*— Green marketing is advantageous to both the environment and society, which includes emphasizing product services with claims about an item's health benefits, using organic, renewable materials for packaging, and using renewable business practices. The promotion of sustainable and environmentally friendly solutions is a major issue nowadays. Recently, the public has become well-versed in pure items' manufacturing, consumption, and disposal processes. International shipping is a highly effective mode of transportation that increases energy efficiency and reduces carbon emissions for global trade. Competition, the state of the economy, and data influence the marketing plan. Marketing plans will need to incorporate cutting-edge smart-driven technologies like Artificial Intelligence (AI) to overcome the obstacle of green marketing. In this study, the Artificial Intelligence-based Smart Driven Marketing Planning Strategy (AI-SDMPS) is proposed for eco-friendly and sustainable practices. Dimensional smart marketing is utilized to meet the needs of AI strategies for creating, promoting, and building environmentally friendly and sustainable transportation systems through optimization, smart data exploitation, and powerful decision support. By using AI in marketing tactics, businesses may use data analytics, machine learning, and technology to boost their campaigns and encourage more eco-friendly behaviour. Using students' reported competence, assurance, and professional levels, around a 93.5% confidence interval has been determined for the simulation analysis. Organizations can boost their marketing efforts, attract their ideal customers, decrease unnecessary expenditures, and increase their positive impact on the environment by using the proposed strategy.**

Index Terms: Artificial Intelligence, Smart Marketing, Planning, Eco-friendly, Zero Carbon, Sustainable Transportation System.

I. Overview of Smart Marketing

Eco-friendly and sustainable lifestyles can be widely disseminated through the use of data-driven marketing strategies [1]. It includes many aspects of marketing, such as strategies, plans, advertisements, promotions, designs, designs, better customer experiences, market research, and market segmentation [2]. Marketing plans and advertising are elements of marketing. Marketing is proposed to sell a product or service. When it comes to every corporation or organization's development strategy, advancement is a must-have component [3]. Many of the greatest crucial aspects of business in current years have been advertising. Most people have no idea what word of mouth is and confuse it with selling or advertising when questioned [4]. These responses are part of development, even if they are not always accurate. Supply chain, promotion, design, and creation of resources such as web pages and blogs, customer experience improvement, market research, market segmentation, and more are all part of marketing [5, 6].

Green marketing is the practice of promoting environmentally friendly goods and services [7]. As many people become involved regarding ecological problems and pursue to expand their market in an extra ecologically pleasant manner, it is becoming increasingly famous [8]. Environmentally pleasant goods, organic, renewable wrappers, renewable business practices, and emphasizing item services with declarations about an item's health advantages are all examples of green marketing [9]. Expression marketing like this may be extra expensive due to enhanced trends and can be financially viable [10].

II. Related Works and Features of This Research Article

Akbar M. Bet al. [11] proposed Consumer research, Segmentation, Design of the social program, Implementation, Evaluation, and Sustainability (CSD-IES) defined by administrators and introduced long-lasting socio-economic advertising programmes to influences or changed specific behaviours using accessible resources.

Overgoor et al. [12] developed the well-known and widely used Cross-Industry Standard Process for Data Mining (CRISP-DM) framework to help businesses understand how and when to apply artificial intelligence to solve marketing problems.

Throne et al. [13] invented EXMAR, where the results back up Little's classic "decision calculus" criteria, such as ensuring that executives understand and control the system instead of the business technology goal of recommending an optimum prescription. Instead shows the importance of systems in building cross-functional planning team knowledge and, as a result, commitment to the final plan.

Yadav R. B. et al. [14] stated the research thoroughly to develop an appropriate theoretical structure for CPMS. More than 4,900 people completed a digital survey for this study, which was analyzed using systemic formula modeling. They investigated the relationship between IoT-enabled sustainable development, big data analytics in manufacturing, and deep learning-powered smart process planning.

Rauschnabel et al. [15] created a PCA-RF algorithm to identify the most beneficial marketing activity in a given location. It will aid organizations in future planning, such as allocating more funds to activities that generate greater profit in a specific location.

Roodt J. Het al. [16] introduced (AR-HUP) a structure that explores how customers analyze AR applications' advantages and alteration effectiveness and how this assessment affects brand outlook changes. According to research, customers highly inspired by the efficiency and integration of digital models into their everyday lives positively impact their brand awareness.

Ashfaq et al. [17] investigated the aspects that affect users' CI, and they created an integrated framework combining the Expectation-Confirmation Model (ECM) and the Task-Technology Fit Model (TTFM). The authors used artificial neural network (ANN) and Structural Equation Modeling (SEM) methods to analyze the data. Several sequential relationships between the variables were found in this research.

Yadegaridehkordi et al. [18] proposed an approach combining segmentation and the approach for Order of Preference by Similarity to the Ideal Solution (TOPSIS) for TripAdvisor's current online traveller evaluations about travellers' preference behaviour toward green hotels.

Aloud et al. [19] Emphasized the significance of reinforcement learning (RL) for attaining optimal dynamic algorithmic trading; this article highlighted the relevance of establishing a lucrative trading approach in algorithmic trading. Reinforcement Learning (RL) allows for efficient dynamic algorithmic trading by treating the price time-series as its environment

III. Artificial Intelligence-Based Smart, Driven Marketing Planning Strategy

A three-tiered structure is designed for sophisticated market research, strategy, and ultimate objectives. It is possible to create phases comparable to Deming's, and they do not take into account tactics in any way. Starting with brand administration, here look at the market, the new entrants, and the clients, and afterwards proceed to improve techniques for classifying and aiming consumers and invent precise advertising acts for the approach to be implemented. Marketing initiatives do not bring this cycle to a close.

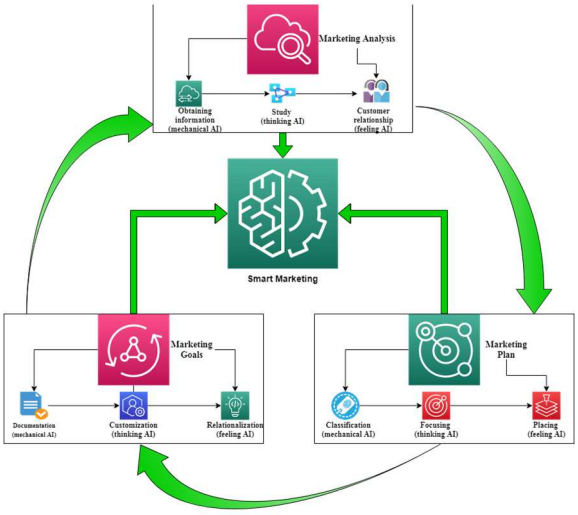

Fig. 1. Strategic marketing decisions and Artificial intelligence

A. *Several AI intelligence*

As seen in Fig. 1, economic data will be reflected in marketing evaluation, planning, and goal attainment due to this cycle. This model represents a three-tiered structure for the data analysis process in business. Deming's plan-do-check-act process is a good example of an equivalent process, and it does not provide the responsibility of approach. It starts with a product advertising task to identify requirements, industries, new entrants, and consumers. Afterwards, it proceeds onto strategy development for classifying the market to narrow in on a particular target audience.

B. *The strategic procedure for AI*

According to our recommendations, AI can be applied to advertisements in a three-step process, as illustrated in Fig. 1, that takes advantage of the specific AI cognitive skills and their benefits. As in the advertising survey phase, physical AI can be used for data gathering, believing AI for business evaluation, and emotional AI for client comprehension. Critical decisions, such as categorization, concentration, and placement, are made using Machine learning and artificial intelligence in the advertising evaluation phase.

C. *Marketing analysis*

For more successful advertising efforts, accurate forecasting is all about making the most of the information available. Investigating, analyzing, and evaluating marketing campaigns helps businesses save money and maintain flexible marketing strategies. It is accomplished using sophisticated analytics centred on studying consumer action patterns, gaining customer insights, and optimizing marketing campaigns.

D. *Plan for CFP based Marketing Strategy*

AI can be used to standardize and consider AI can be customized; At this stage, retailers may use AI to make three sound decisions: Classification, Focusing, and Placing (CFP). Retailers must first define the effective action placement of their items before making specific CFP decisions. They can utilize this data to assist them in making CFP decisions—a technology-based approach to manoeuvring an organization's mission.

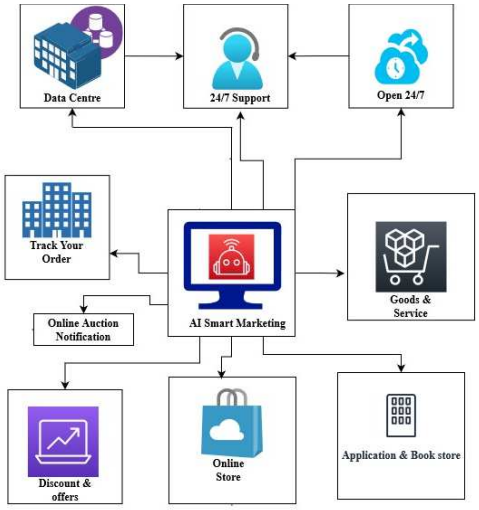

Fig. 2. Artificial Intelligence-based Smart Driven Marketing Planning Strategy (AI-SDMPS)

Resource-constrained quickest trajectory problems for plug-in hybrid battery-powered automobiles have been formulated. They are given in Fig. 2. Cognitive AI emphasizes central decision-making besides its ability to analyze inputs and show up at the latest discoveries or choices. However, it is worth mentioning that some apps are assigned to a particular category solely based on their use. When cognitive AI becomes entirely routine, like in categorization tasks, it takes on most of the features of robotic AI since it simply recognizes data patterns frequently and repeatedly without much consideration about producing better choices.

1) Data Collection and Sampling

The study intends to conduct a quantitative study with numerical modeling to learn about retailers' perceptions of the impact of AI on sales and marketing because our research purpose is to learn about their thoughts on the impact of AI on corporate development. The statistics are collected through a survey of different types of marketers. The Likert scale is used to create the questionnaire, ranging from strongly disagree to agree on a five-point scale Strongly. The information is gathered by distributing questionnaires to advertisers via the internet.

2) Research Methodology

Following a thorough inquiry and observation, the researcher examines the components of the questionnaire that aid in understanding the research's measurements and criteria. In our study, the basic model included 12 marketing components: User, Budget, Ease, Interactions, Familiarity, Trading, Accessibility, and Outreach are all terms used to describe the item, value, placement, and branding. AI and marketing are independent factors, whereas value creation is classified as a regression. As a result, the research shows how AI in marketing is vital for economic growth. The research used a five-point summative scale, with 1 indicating significant disagreement and 5 indicating strong agreement. The respondents responded to questions based on their satisfaction with AI in business development.

E. Promotional efforts

For record-keeping, retailers can use technical Artificial intelligence technology; for customization, think AI; and for rationalization, emotional AI. Depending on the gain sought, a trader can use various AI consciousnesses informally or formally. Various business disciplines can benefit from Artificial intelligence-based skills, which demonstrate with examples and short- and long-term cases. Here continuously update our assertions based on new data as it becomes available. The dispute is framed across the whole branding four Ps (item, value, location, and advertising) and the associated four Cs (client, costing, convenience, and connection) to emphasize that now the four p actions must be able to provide customer benefits.

F. Two-dimensional Sustainable Problem Solutions

The optimization challenges are then introduced to address the steady and transient sustainable and environmental difficulties. The problems of optimization in fixing environmental and sustainable issues are discussed. It addresses these difficulties by introducing a dynamic formulation, which incorporates a model of traffic disruption. Parameters and variables such as Resource Vector (S), Stacks (R), Battery Energy (Sw), Fuel Energy (Se), Time (Ss), and Cost Function are used to illustrate the optimization issue. The cost function, denoted by $(\alpha s^{e}_{kl}(S^{w}_{k}) + \beta e^{w}_{kl}(S^{w}_{k}))a_{kl}$, quantifies the aim or goal of the optimization problem. Energy (e), stacks (w), and vertices and edges (kl) are some of the variables that make up the cost function. The statement offers a mathematical model of the issue, which may be used for further investigation and optimization.

The hesitancy kl that experts experience while discussing their preferences$a$ is an essential consideration in the above Equation (1). To accurately model αsl this, a variance$e$ measure S^{w}_{k}, can be used that captures the range βe of preferences. If the variability is modest, the expert exhibits X an objective perspective toward the candidates being considered.

$$\min_{a_{kl}} \sum_{(kl)\in X}((\alpha s^{e}_{kl}(S^{w}_{k}) + \beta e^{w}_{kl}(S^{w}_{k}))a_{kl} \quad (1)$$

$$\sum_{l|(p,l)\in X} a_{pl} = 1, \sum_{l|(l,d)\in X} a_{kd} = 1 \quad (2)$$

From the above Equation (2), experts' reluctance$l$ to reveal their preferences$p$ is an important factor$a$ to keep in mind. A variance measured can be used to model accurately, a_{kd}, captures the range of preferences $\sum_{l|(p,l)\in X} a_{pl}$. The expert's perspective on the candidates is objective if the variability n be calculated using a small value of $\sum_{l|(l,d)\in X} a_{kd}$.

$$\left.\begin{array}{c} \sum_{l|(k,l)\in X} a_{kl} - \sum_{l|(l,d)\in X} a_{kl} = 0, \\ \underline{S}^{w} \sum_{l|(k,l)\in X} a_{kl} \le S^{w}_{k} \le \bar{S}^{w} \sum_{l|(k,l)\in X} a_{kl}, \} \\ \underline{S}^{e}_{k} \sum_{l|(k,l)\in X} a_{kl} \le S^{e}_{k} \le \bar{S}^{e}_{k} \sum_{l|(k,l)\in X} a_{kl}, \end{array}\right\} \forall k \in M\backslash\{p,l\} \quad (3)$$

$$\left.\begin{array}{c} a_{kl}(S^{w}_{k} + s^{w}_{kl} - S^{w}_{l}) = 0, \\ a_{kl}(S^{e}_{k} + s^{e}_{kl} - S^{e}_{l}) = 0, \\ a_{kl}(S^{s}_{k} + s^{s}_{kl} - S^{s}_{l}) = 0 \\ a_{kl} \in \{0,1\}, \end{array}\right\} \forall (k,l) \in X \quad (4)$$

The Eco route algorithm considers two key factors: based on the above two Equations (1) and (2), road conditions, as indicated by the pavement condition rating$s$and traffic

conditions M, as shown by the pavement condition rating∈. Equations (3) and (4) show how the simple exponential utility function links the two factors to calculate the value of a particular route through $\forall k \in M$.

$$\underline{S}_d^w \le S_d^w \le \bar{S}_d^w,\ \underline{S}_d^e \le S_d^e \le \bar{S}_d^e,\ \ \underline{S}_d^s \le S_d^s \le \bar{S}_d^s) \quad (5)$$

Equation (5) employs a weight to fine-tune the impact of traffic circumstances on the overall utility function. The rationale for employing a simple exponential optimal solution is that a great road would be useless to a driver if it is clogged with traffic caused by an accident or construction.

G. Eco route Algorithm Description

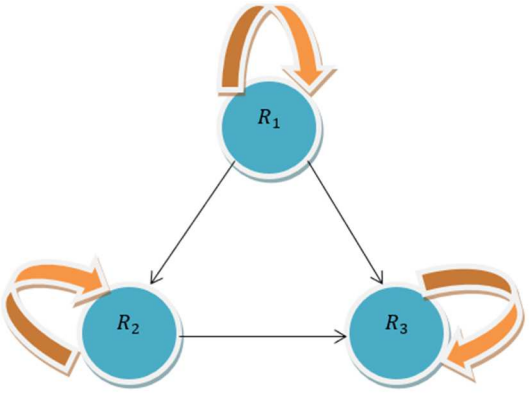

Fig. 3. (a) AI's technological advancement

$$(R_1, R_2, \ldots\ldots R_n) = \sum_{i=1}^{n} pd(R_1/\pi_i) \quad (11)$$

In Fig. 3(a), the market analysis $R_1, R_2, \ldots\ldots R_n$, business model and product promotion (4Ps/4Cs) form a three-stage structure $\sum_{i=1}^{n} pd(R_1/\pi_i)$ for the tactical use of AI in the advertising industry in the above Equation (11). Tactical AI is centred π_i , on a greater knowledge of AI's technological advancementpd, previous AI and advertising analyses, and present or prospective AI technologies. It can develop strategic marketing strategies, organize existing AI marketing research, and pinpoint research gaps.

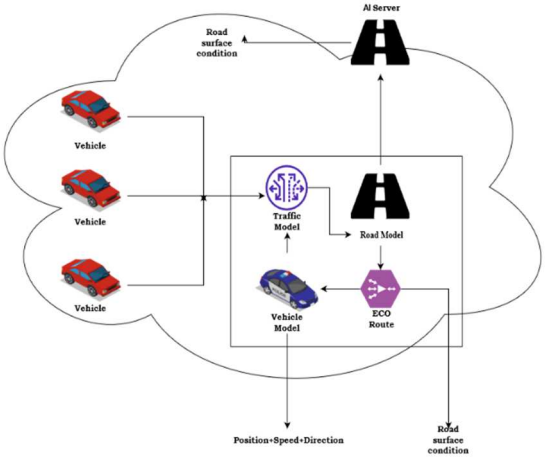

Fig. 3(b). Mass object node

Fig. 3(b) represents the mass object node that categorizes subgroups with environment and time weights based on navigation. Here focus on extracting eco weights from trajectories; period generation is more complex. AI marketing is viewed as separate components, while value generation is a recursive process. Because of this, the research suggests that AI in marketing is essential to economic progress. A five-point summative scale is employed throughout the study, with 1 indicating considerable disagreement and 5 indicating great agreement. Respondents answered questions According to their satisfaction with AI in business development.

$$length\ (e) = \frac{1}{|Set\ (e)|} \cdot \sum_{ri \in Set(e)} \frac{ri+1.f - ri.f}{dist(ri+1, ri)} \quad (12)$$

$$\text{Set(e)} = \{ri | ri\} = e$$

$$\text{Distance} = (r_1, r_2, r_3, r_4)$$

$$\text{Length} = (v_1, v_2, v_3, v_4)$$

$$length((v1, v2)) = \frac{1}{2} \cdot \left(\frac{r2.f - r1.f}{dist(r2, r1)} + \frac{r3.f - r2.f}{dist(r3, r2)}\right) \quad (13)$$

This section focuses on obtaining eco weights from trajectories; period creation is a more involved process. Recursive processes in value development have been separated from artificial intelligence (AI) and marketing using Equation (12) (Fig.4).

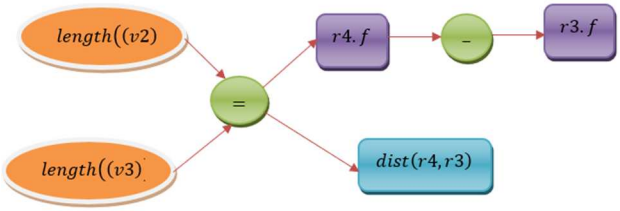

Fig. 4. Section's environmental representation

IV. Results and Discussion

This simulation analysis aims to analyze and address the suggested Artificial Intelligence-based Smart Driven Marketing Planning Strategy (AI-SDMPS) with Kaggle data source [20] to improve data, consumer knowledge, and economic performance. The following graph compares the section's accuracy, confidence, performance, efficiency, and reliability to other existing models like CSD-IES, CRISP-DM, EXMAR, CPMS, PCA-RF, and AR-HUP.

A. Accuracy Analysis

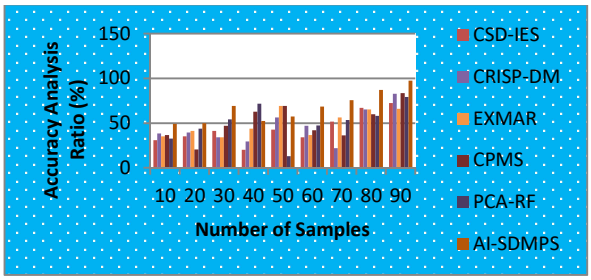

Fig. 5. Accuracy Analysis of AI-SDMPS and Other Methods

The accuracy ratio that samples are compared to the analytical accuracy ratio, as shown in Fig. 5. Using Equation (3), FDL-USAI-SDMPS outperforms all other

methods in accuracy. Data transmission accuracy is better than data transmission accuracy in other existing models.

B. *Confidence Analysis*

The results in Fig. 6 represent the samples analyzed for the confidence analysis ratio. The data must be completely protected and stored in a secured AI server. As a result, AI-SDMPS ensures a high level of security in data transfer compared to all other proposed techniques. The result demonstrates that the data confidence is higher than in other models.

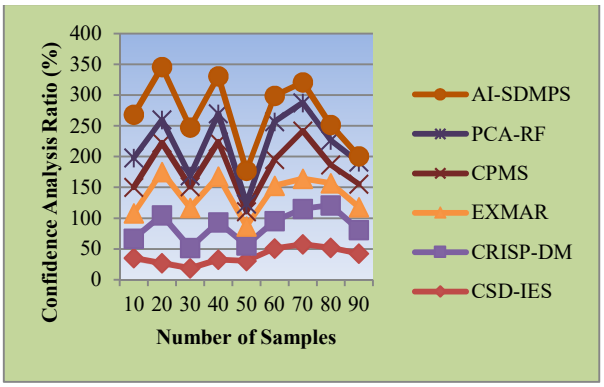

Fig. 6. Confidence Analysis of AI-SDMPS and Other Methods

C. *Performance Analysis*

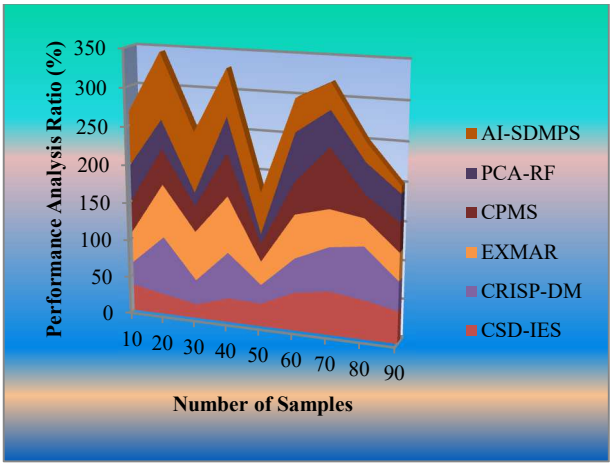

Fig. 7. Performance Analysis of AI-SDMPS and Other Methods

The results of such an investigation are shown in Fig. 7. Samples can be collected and analyzed using the Performance Testing Ratio. The proposed model is far more effective than current methods for reducing carbon dioxide emissions and fuel use. AI-SDMPS stands for high environmental performance with minimal Co2 emission, as obtained by Equation (5).

V. Conclusion

The article emphasizes the role of advertising and marketing in boosting revenue and expanding businesses. The AI-SDMPS approach is used to create this document. For researchers, each user's foundation-building important aspects are highlighted to choose the optimal research instrument for a certain assignment. As a result, users plan to analyze each AI-SDMPS approach presented in this research, which includes complex simulations, to see which approach provides an accurate method for evaluating the performance of various routing protocols. The needs of AI approaches to transportation planning, development, and promotion are satisfied by dimensional smart marketing optimization, intelligent data exploitation, and improved decision support. As a result, the AI-SDMPS (Artificial Intelligence-based Smart Driven Marketing Planning Strategy) has been presented to increase data collecting, consumer comprehension, and financial performance.

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