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7. ANALYTICAL TOOLS IN MARKETING: CASE OF AUTOMATED TENDER DATA COLLECTION SYSTEM

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Annotation. This article explores modern analytical tools and methods for processing big data in marketing. The study focuses on the role of business intelligence systems, machine learning algorithms, and big data platforms in optimisng marketing decision-making. Additionally, the paper presents the development process of an Automated Tender Data Collection System designed to streamline the retrieval and analysis of procurement data. The main challenges encountered during development, such as handling dynamic web content and data filtering are described along with their solutions. The findings highlight the importance of automation in marketing analytics and its impact on efficiency.

Keywords. Marketing analytics, data analysis, big data, business intelligence systems, machine learning, automated data collection.

Big data analytics has revolutionised modern marketing by enabling data-driven decision-making and enhancing operational efficiency. Companies leverage analytical tools to gain insights, predict customer behavior, and optimise marketing strategies. The rapid growth of digital platforms and e-commerce has increased the necessity for automated systems capable of handling vast amounts of data.

This study examines advanced analytical methods, including business intelligence systems and machine learning algorithms, which facilitate marketing data processing. Additionally, the development of Artificial General Intelligence (AGI) is expected to significantly affect marketing decision-making, as AGI can function as both a marketing assistant and an independent decision-maker, potentially transforming business intelligence applications [1].

Furthermore, market agility plays a crucial role in adapting to dynamic consumer demands, and big data analytics is essential in ensuring the successful development and positioning of new products in the marketplace [2]. Moreover, integrating digital marketing analytics with strategic decision-making is vital to avoid marketing myopia, ensuring that firms focus on consumer needs rather than isolated performance metrics [3]. The primary focus is the development and implementation of an Automated Tender Data Collection System aimed at improving efficiency in procurement data retrieval and analysis.

There are different analytical tools and methods for Big Data in marketing.

1. Business Intelligence Systems.

Business Intelligence (BI) Systems refer to a set of technologies, applications, and processes used for collecting, integrating, analysing, and presenting business data to support better decision-making. BI tools enable organisations to transform raw data into meaningful insights, providing a competitive advantage in data-driven industries. These systems encompass data visualisation, reporting, online analytical processing(OLAP), and predictive analytics, allowing businesses to identify trends, optimise performance, and make informed strategic decisions.

Analytics Power BI and Tableau are two of the most widely used BI platforms in marketing analytics, offering powerful data visualisation and reporting capabilities. Power BI, developed by Microsoft, integrates seamlessly with other Microsoft products and enables marketers to create interactive dashboards that track key performance indicators (KPIs), customer engagement metrics, and return on investment (ROI). For example, a digital marketing team can use Power BI to consolidate data from social media platforms, website traffic, and email campaigns, providing a real-time overview of marketing effectiveness and customer interactions. Tableau, on the other hand, is known for its advanced data visualisation techniques and ability to handle large datasets efficiently. A marketing team can leverage Tableau to perform sentiment analysis on customer reviews, visualise customer journey data, and identify emerging market trends through predictive analytics. By using these tools, businesses gain a clearer understanding of customer behavior, enabling them to optimise advertising cost, improve campaign targeting, and enhance overall marketing efficiency.

Artificial General Intelligence (AGI) refers to a form of artificial intelligence that possesses human-like cognitive abilities, enabling it to learn, adapt, and perform tasks across various domains without specific programming. Unlike narrow AI, which is designed for specialised tasks, AGI can generalise knowledge and apply it to different contexts. In the context of BI systems, AGI has the potential to revolutionise marketing analytics by automating data interpretation, generating strategic recommendations, and identifying patterns that may not be immediately apparent to human analysts. For instance, AGI-powered BI tools could autonomously analyse vast amounts of marketing data, detect shifts in consumer preferences, and adjust marketing strategies in real-time. This advancement would significantly enhance decision-making speed and accuracy, reducing the reliance on human intervention and minimising errors in data interpretation. However, as of now, fully functional AGI-powered BI tools do not yet exist or are still in early stages of development. Current BI systems rely on narrow AI techniques, such as machine learning and natural language processing, rather than true AGI capabilities [1].

Market agility refers to an organisation's ability to quickly adapt to changing market conditions, consumer preferences, and competitive landscapes by leveraging data-driven insights. Companies with high market agility use BI tools to continuously monitor market trends, customer sentiment, and competitor activities, allowing them to make swift and informed decisions. For example, an e-commerce company can use real-time BI dashboards to track customer purchasing behavior and dynamically adjust pricing strategies based on demand fluctuations. Another example is a retail brand that employs BI analytics to monitor social media discussions and promptly respond to emerging consumer trends, ensuring that marketing campaigns remain relevant and engaging. By integrating BI with agile marketing strategies, businesses can enhance their responsiveness, optimise resource allocation, and improve overall competitiveness [2].

Marketing analytics myopia occurs when businesses focus excessively on specific marketing metrics or short-term performance indicators while neglecting broader strategic objectives and customer-centric insights. This issue arises when organisations rely solely on isolated data points, such as click-through rates(CTR) or conversion rates, without considering the customer journey and long-term brand value. For instance, a company may optimise digital ads for high engagement rates but fail to assess whether these interactions lead to sustained customer loyalty and lifetime value. Avoiding marketing analytics myopia

requires a holistic approach that integrates BI systems within a strategic marketing framework, aligning data analysis with overarching business goals. By doing so, companies ensure that data-driven decisions contribute to sustainable growth rather than short-term gains [3].

2. Machine Learning Algorithms.

Machine Learning (ML) refers to a subset of artificial intelligence (AI) that enables systems to learn patterns from data and make predictions or decisions without being explicitly programmed. ML algorithms can be categorised into supervised, unsupervised, and reinforcement learning, each serving different analytical purposes. In marketing, ML techniques, implemented using programming languages like Python and R, play a crucial role in predictive analytics by identifying customer preferences, segmenting audiences, and forecasting demand. These predictive insights contribute to optimising marketing campaigns, personalising customer interactions, and allocating resources more efficiently.

In automated tender data collection systems, ML can analyse historical tender data, help in selecting optimal bids, and forecast the likelihood of success based on various factors, such as the supplier's experience, price, and delivery time. These algorithms can also integrate with big data to predict shifts in the market, enabling firms to adjust their tender strategies in real-time. Furthermore, the use of Natural Language Processing (NLP) within ML helps systems automatically extract key information from tender documents, proposals, and specifications, significantly accelerating the analysis process and enhancing decision-making quality.

These predictive insights contribute to optimising marketing campaigns, personalising customer interactions, and allocating resources more efficiently. AGI, when integrated with ML, can automate complex decision-making processes, reducing the need for human intervention and further enhancing predictive analytics [1].

Moreover, big data analytics allows firms to better anticipate market trends, optimise pricing strategies, and ensure product success through predictive modeling and consumer sentiment analysis [2]. Integrating ML with consumer decision journey models ensures that businesses maintain a customer-centric approach rather than relying solely on isolated performance metrics [3].

The following sections of the article address the development of an automated tender data collection system.

Purpose and Objectives.

The Automated Tender Data Collection System was developed to optimise the procurement data retrieval process, significantly reducing manual effort and improving data accuracy. The system automates the collection, filtering, and storage of tender data, ensuring that only the most relevant tenders are captured and made available for further analysis. By eliminating the need for manual data collection, the system has limited the time required for tender gathering by 50%, while completely mitigating the risk of missing critical tenders. Additionally, it integrates seamlessly with business workflows by automating the generation and distribution of reports, thereby enhancing operational efficiency and ensuring that stakeholders receive timely, relevant information.

Data Sources and Filtering Criteria.

The system aggregates data from multiple procurement platforms, such as government websites (goszakupki.by, icetrade.by), and applies a variety of filtering criteria to ensure the relevance of the collected tenders. These criteria include industry-specific keywords, budget thresholds, geographic location, and regulatory classifications, such as the National Classifier of the Republic of Belarus (OKRB) codes. This approach ensures that the collected data is both comprehensive and precise, aligning with business needs.

Process Overview.

1. Initiating the Process. The process begins when the user logs into the system's web interface and clicks ‘Update Tenders’. Upon receiving this command, the system initiates the data collection process. The request is passed from the user interface to the system via a signal, triggering the subsequent tasks.

2. Data Collection. The system proceeds to gather data from selected sources. The key steps in this phase include:

- querying tender sources (e.g., goszakupki.by, icetrade.by);
- filtering tenders based on criteria such as industry, keywords, and publication date;
- excluding irrelevant tenders, such as those marked as ‘Cancelled’ or ‘Completed’;
- storing data in a structured database for future processing.

3. Processing Lots. Once the tender data is collected, the system analyses each lot within the tenders, ensuring it meets predefined criteria such as relevance to specific keywords or codes. The system then stores the filtered lots for review by the user.

3.1. Displaying Data in the Web Interface. The filtered tenders and lots are displayed in the user-friendly web interface, where the user can review and select which tenders to proceed with. The system uses a timer event to track the time spent waiting for user actions.

3.2. User Review and Selection. After reviewing the filtered tenders and lots, the user can:

– select the tenders to send by marking them with a color code (e.g., green for send, red for do not send);

– once selections are made, the user triggers the next step by clicking 'Send' which sends a signal to the system.

3.3. PDF Generation. The system generates a PDF report with the selected tenders, categorised by departments.

– PDF Distribution. The system sends the generated PDF report to the relevant department emails. After sending, the system archives the data and updates the status, confirming the successful delivery of tenders.

– Completion. The process concludes once the tenders have been sent and the data has been archived. The system then completes the cycle, awaiting the next user-initiated update.

– Role-Based Access Control.

– The system implements role-based access to ensure that users have access to only the features and data relevant to their role. Current roles include:

– Administrators, who have full access to configure settings, manage user roles, and adjust system parameters;

– Standard users, who can interact with the data but have limited access to system configurations and advanced features.

The system also allows configuration of custom filters and interaction modes based on user roles. For example, some users may have read-only access, while others may be able to select and send tenders, streamlining the process and ensuring data security. In the future, the system will offer the ability to generate reports tailored to specific user needs, further personalising the user experience and ensuring each role has access to the most relevant data.

Future Enhancements.

As technology advances, future versions of the system could incorporate AI-driven features, such as machine learning to further improve data filtering and enhance predictive analytics. Integration with big data tools could allow for real-time decision-making, giving businesses a competitive edge in the procurement process. Furthermore, aligning tender data collection with the consumer decision journey model could ensure that the data remains strategically relevant across various departments, driving cohesive decision-making.

The study highlights the transformative impact of analytical tools, business intelligence systems, and machine learning algorithms on marketing decision-making, particularly in the context of procurement data analysis. The development of the Automated Tender Data Collection System demonstrates how automation can streamline data retrieval, enhance accuracy, and reduce manual effort, thereby improving overall efficiency. Key challenges, such as handling dynamic web content and structuring extracted data, were effectively addressed using advanced web scraping techniques and natural language processing.

Furthermore, the integration of business intelligence tools, predictive analytics, and big data platforms allows companies to gain deeper insights into market trends and optimise their marketing strategies. As artificial intelligence continues to evolve, the potential of AGI-powered analytics systems could further enhance decision-making by automating complex analytical tasks and adapting to market changes in real time.

In conclusion, the adoption of automated data collection and analytics solutions is crucial for businesses seeking to maintain a competitive edge in an increasingly data-driven landscape. Future enhancements, such as improved real-time analytics and AI-driven decision support systems, will further refine procurement and marketing strategies, ensuring continued innovation and efficiency in marketing analytics.

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