



Conference Article

# Advancing E-Commerce Analytics: The Development of Intelligent Analytics Software for Enhanced Customer Experience

Amirkia Rafiei Oskooei\*, Tahir Enes Adak<sup>2\*</sup>

<sup>1</sup> Yildiz Technical University, Istanbul, Turkey, <https://orcid.org/0009-0004-3490-550X>,  
amirkia.oskooei@std.yildiz.edu.tr,

<sup>2</sup> Casper Research and Development Center, Istanbul, Turkey, TahirEnes.Adak@casper.com.tr

\* Correspondence: amirkia.oskooei@std.yildiz.edu.tr

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## Abstract

*In the current era of rapid growth in electronic commerce, it is crucial for organizations to possess an in-depth understanding of client habits in order to effectively optimize their plans. This position paper presents a proposal that centers on the creation of Intelligent Analytics Software designed specifically for Casper, a well-known e-commerce platform that specializes in the selling of electronic devices. The main purpose of the software is to facilitate the real-time monitoring and analysis of users' browsing patterns, utilizing historical navigation data as a basis. The effort arises from the growing necessity to utilize data-driven insights in order to improve client experiences and achieve commercial advantages. The statement above highlights the need for secure and accurate information collecting, rapidly adapting to user behaviors in real-time, and delivering personalized benefits, as well as effectively addressing platform-related challenges. Our research and development efforts involve conducting comprehensive analyses of user navigation, ensuring secure processing of data, and effectively managing behavioral data. The project is notable for its implementation of innovative analytical software that enables real-time tracking of consumer activity, generation of analytical reports, identification of consecutive actions using*



*Sankey diagrams, segmentation analysis, and production of heatmaps. Moreover, the program enhances cross-selling capabilities by monitoring often co-purchased items, so providing a useful asset to the e-commerce platform's repertoire. In addition to expanding the company's understanding of client habits and broadening its range of products, the project also serves to advance national expertise and pursue international academic contributions via research papers. The success criteria include strong benchmarks for clustering and association analysis techniques, emphasizing the dedication to providing fast analytical solutions. The paper offers a comprehensive overview of the project's significance, objectives, methodology, and the urgent need it answers within the field of e-commerce analytics.*

**Keywords:** E-commerce, Intelligent Analytics Software, Customer Behavior, Data-driven Insights, Commercial Advantages

## 1. Introduction

The rapid growth of electronic commerce (e-commerce) in modern business contexts has fundamentally transformed the way companies interact with and respond to their clients. The current paradigm change has not only increased the value of digital platforms but also emphasized the crucial importance for organizations to fully understand and utilize client habits. This position paper presents a substantial project that aims to develop Intelligent Analytics Software specifically designed for the prominent e-commerce platform, Casper, considering the changing paradigm.

Casper, a well-known hub that specializes in the retail of electrical equipment, has experienced significant expansion in its user base and consumer engagements. With the ongoing growth of electronic commerce, businesses are increasingly prioritizing the optimization of customer interactions and the enhancement of consumer experiences in order to remain competitive.

The main aim of this project is to create Intelligent Analytics Software that has the ability to track and interpret user activities in real-time. The software will utilize historical navigation data in order to provide users with crucial analytical insights. The rise of data-driven insights has become a crucial response to the growing need for enhanced customer experiences and competitive advantages in the commercial sector.

The project fundamentally tackles a variety of essential requirements. The primary goals of this system are ensuring the secure and complete collection of data, rapidly adjusting to user behaviors in real-time, and providing individualized advantages while efficiently addressing platform-related difficulties. This project demonstrates a shared acknowledgement across the industry that these features are essential factors in attaining sustainable growth and ongoing competitiveness.



Our research and development efforts involve an in-depth study of user navigation, guaranteeing the secure processing of data, and the effective management of behavioral data. The project includes a novel analytical program that offers potential for real-time behavior tracking, generation of analytical reports, identification of consecutive actions using Sankey diagrams, segmentation analysis, and production of heatmaps. In addition, the software will improve the platform's cross-selling capabilities through the tracking of products that are regularly co-purchased by customers.

As we launch this effort, we expect to not only improve understanding of customer behaviors and broaden our product offerings, but also to make significant contributions to the wider domains of national expertise and international academic conversation. The distribution of the research outcomes derived from this project will be facilitated through academic conferences and journals, thereby emphasizing our dedication to the progression of e-commerce analytics and its diverse consequences.

This study presents a full examination of the project's aims, approaches, and expected impacts, emphasizing its crucial significance in the continuous development of e-commerce analytics.

## 2. Literature Survey

The understanding of customer behavior within the domain of electronic commerce (e-commerce) serves as an essential foundation for organizations aiming to optimize their strategies and improve customer experiences. This literature review examines the existing body of research and current understanding about the crucial elements of e-commerce analytics and analysis of customer behavior.

In the area of electronic commerce, the behavior of customers experiences changes as they get better in making online purchases. A study carried out by Hernández, Jiménez, and Martín sheds light on the transformation of consumer perspectives during the progression from potential to experienced electronic clients. This study highlights the significance of understanding the influence of evolving client behavior on the achievement of e-commerce, a critical factor to be taken into account for the Intelligent Analytics Software project designed for the Casper platform. The primary objective of this program is to utilize up-to-date information and improve client interactions, in accordance with the requirement for meeting evolving customer behaviors in the field of electronic commerce. In this study, we aim to investigate the impact of social media on mental health [1].

In the context of e-commerce, analysis algorithms are of great significance, especially in the domain of recommender systems. These systems provide a set of personalized and precise recommendations, which are essential for improving user engagement and promoting sales. This study highlights the importance of recommender systems in the field of e-commerce, with a particular focus on its central role in accurately reflecting users' characteristics and actions.



Recommender systems effectively utilize learning algorithms to predict and recommend products by proficiently gathering and analyzing user information, covering both explicit and implicit feedback. This transformative capability of recommender systems has been demonstrated by popular industry leaders such as Amazon and Netflix, as they have successfully personalized the vast e-commerce landscape to provide tailored shopping experiences [2].

To optimize e-commerce systems, the incorporation of clustering algorithms has emerged as a crucial aspect. These algorithms facilitate the discovery of hidden user connections, hence enabling the provision of efficient product suggestions and targeted marketing, as observed in platforms such as Amazon and Twitter. Additionally, the utilization of clustering algorithms effectively handles the issues related to data sparsity and cold start problems seen in conventional recommendation techniques, hence facilitating the provision of more sophisticated and individualized recommendations for learning resources [3][4].

In the field of e-commerce, cross-selling methods have seen significant advancements due to the integration of modern technology and the utilization of data-driven methodologies. This practice includes proposing supplementary or associated products to customers, efficiently increasing the sales per consumer. Excessive implementation of cross-selling strategies has the potential to estrange clients. However, research indicates that appropriately designed and necessity-driven cross-selling efforts have the capacity to enhance customer satisfaction and boost sales, establishing it as a significant instrument for e-commerce enterprises [5].

Within the realm of data visualization and customer analysis, the utilization of a Sankey diagram for illustrating user behaviors is a highly valuable instrument. This diagram represents users' movement across diverse interactions and paths within a website or platform, allowing organizations to gain insights into users' navigation patterns. The provision of a visually consistent representation of user activity facilitates the identification of patterns, constraints, and opportunities for enhancement, enabling data analysts to make more informed decisions and improve the overall user experience [6].

Furthermore, within e-commerce, heatmap analysis is a crucial technique as it allows for the visual representation of user interactions and behaviors on websites and online platforms. Color-coded maps are utilized to offer significant insights regarding the areas where consumers display the highest levels of clicking, hovering, or engagement. The utilization of a data-driven methodology enables firms to strategically boost user experience and improve conversion rates through the optimization of web design and content placement [7].

The incorporation of Big Data analytics (BDA) into electronic commerce has attracted considerable scholarly and industry interest, leading to notable enhancements in productivity when compared to rival entities. BDA's growth is evident, having made a significant contribution to the expansion of organizations in the United States. This has led to firms deciding to boost their investments in BDA. The integration of this technology revolutionizes the field of electronic



commerce through its ability to improve customer service, optimize pricing tactics, and enhance overall corporate performance. BDA enhances the efficiency of market transaction costs, management transaction costs, and time costs, enabling organizations to find and retain loyal consumers while streamlining their processes. The symbiotic association among management, technology, and talent, within the theoretical framework of sociomaterialism, contributes to the improvement of business performance, stimulating scholarly investigations in both academic and industrial settings. At the same time, the study examines the advantages and disadvantages of implementing Big Data Analytics (BDA) in the context of electronic commerce, with a particular focus on the reactions of customers. Positive factors, such as information retrieval, recommendation algorithms, flexible pricing strategies, and customer support services, contribute to the improvement of client reactions. On the other hand, it is important to consider negative variables that can have detrimental effects, including problems related to privacy, addiction to shopping, and the influence of peer groups. The evaluation of customer feedback occurs during the intention and behavior phases, with positive and negative elements having discernible effects. This study highlights the importance of understanding client reactions within the context of the Big Data era, which has implications for the development and maintenance of sustainable consumer markets. E-commerce sellers can derive advantages from the utilization of Big Data Analytics (BDA); however, it is important to note that an excessive reliance on BDA can potentially lead to unfavorable outcomes [8][9].

There are many systems that use web service-oriented architectural approaches to solve problems in a number of different areas [10, 11, 12, 18]. The sorting of web usage mining data into groups has been studied [13]. But our project is different because it aims to create a custom analytics system for figuring out trends in how people behave. There is already study on how to represent data and how to embed techniques to shape datasets [19, 21, 22]. However, our project is only interested in e-commerce analytics and won't look at how to represent data until later studies. In the same way, there is writing about how to judge the quality of software made during project implementations [15, 20]. However, software quality is not part of our current project; we will look into it later. Some study also keeps track of how users interact [14, 16, 17], but our work doesn't look at the historical order of user events; that's something we'll look into later.

### 3. Methodology

This section delineates the systematic approach employed in developing the Intelligent Analytics Software for e-commerce tailored to the Casper platform. The methodology encompasses data acquisition, algorithm selection, software design, testing, and deployment. The primary aim of this research is to create a software solution that provides real-time insights into customer behavior in the e-commerce domain.

Data collection forms the foundation of this project, encompassing the gathering of user interaction data within the Casper platform, covering actions such as page views, product



searches, and purchases, along with historical navigation data that identifies long-term trends. Additionally, external data sources, including social media interactions and demographic information, are integrated to enrich customer profiles.

Furthermore, selecting the appropriate algorithms for customer behavior analysis is a critical step. It involves identifying and implementing association analysis algorithms for identifying patterns in user behavior, as well as utilizing clustering algorithms to segment users based on their behaviors and preferences. The software development process is executed methodically, including designing an efficient database structure to store collected data and selecting the appropriate server infrastructure. It also entails implementing the selected association analysis and clustering algorithms within the software, creating an intuitive user interface for data visualization, and incorporating components that enable real-time tracking and analysis of user behavior.

Prior to deployment, rigorous testing and validation procedures are conducted, ensuring data accuracy and completeness within the database, testing the efficiency and accuracy of association analysis and clustering algorithms, and involving users to assess the software's usability and functionality.

Moreover, the Intelligent Analytics Software is deployed into the Casper e-commerce platform by seamlessly integrating the software into the existing platform with minimal disruption. This is accompanied by providing training sessions to platform administrators and data analysts for effective use, and establishing continuous monitoring and maintenance to keep the software up-to-date and error-free.

In addition, ethical considerations are paramount throughout the project, with a strict focus on safeguarding user privacy, data security, and compliance with relevant regulations. User consent and data protection are integral to the project's ethical standards.

#### **4. Expected Outputs and Benefits**

This endeavor to develop and implement the Intelligent Analytics Software for e-commerce on the Casper platform promises a multitude of anticipated outcomes and benefits that hold significant value for both the organization and the broader e-commerce ecosystem.

Foremost among these anticipated results is the real-time delivery of valuable insights into client behavior. By meticulously monitoring and analyzing user actions as they unfold, the program is primed to provide Casper with a current and comprehensive understanding of how clients engage with the platform. This timely flow of information equips the organization to base its decisions on solid data and adapt seamlessly to evolving client behaviors.

The immediate and transformative advantage of this project is the potential for substantial enhancements in the overall client experience. Armed with a profound understanding of user



navigation and interactions, Casper stands ready to customize its services, product recommendations, and offerings to precisely align with client needs. This transformative capability can potentially result in heightened levels of customer satisfaction and unwavering loyalty.

Notably, the software's advanced analytics capabilities stand to redefine personalization. Casper is on the cusp of providing users with highly accurate and relevant customized recommendations. Through astute analysis of past user actions, preferences, and interactions, the platform is poised to suggest products and services in perfect harmony with the unique interests of each customer. This tailored approach is not only a boon for increasing sales but also for elevating the overall user experience.

Capitalizing on the software's analytical insights, Casper can extend its reach into various dimensions of its e-commerce operations, encompassing product arrangement, pricing strategies, and marketing campaigns. A profound shift toward data-driven decision-making promises to enhance operational efficiency and bestow a formidable competitive edge.

The software's cross-selling capabilities are expected to be a notable revenue booster, as Casper can astutely identify frequently co-purchased items and strategically promote these bundled offerings, effectively boosting sales while diversifying its product range.

Amid mounting concerns surrounding data breaches and privacy violations, the project's secure data collection and processing approach is poised to fortify platform security, ensuring the protection of customer data and privacy — an invaluable asset.

Beyond its immediate organizational merits, this project carries the aspiration of contributing to academic discourse. Its outcomes, including research findings, innovative methodologies, and novel insights, will be shared generously within the academic community through scholarly journals and conference presentations, actively contributing to the evolving field of e-commerce analytics.

Notably, the successful deployment of the Intelligent Analytics Software for e-commerce promises to elevate Casper's standing not only within the domestic market but on a global scale. Its unwavering commitment to data-driven methodologies and fostering innovation solidifies its reputation as a forward-thinking e-commerce platform.

Furthermore, the insights derived from this software hold the key to ensuring Casper's sustainable growth, providing it with the agility to remain relevant and responsive to ever-evolving market trends and shifting customer preferences.

In conclusion, the anticipated outputs and benefits of this project form a comprehensive spectrum, ranging from elevated customer experiences and personalization to significant academic contributions and the cultivation of formidable competitive advantages. By anchoring



its strategies in data-driven solutions, Casper is poised not only to achieve its immediate objectives but also to set a pioneering standard of excellence in the e-commerce industry.

## 5. Results and Future Works

The initial implementation of the Intelligent Analytics Software on the Casper e-commerce platform resulted in favorable outcomes. The utilization of real-time data on consumer activity allows for the implementation of data-driven decision-making processes, resulting in the enhancement of customer experiences, the provision of personalized suggestions, and the refinement of cross-selling strategies. Early findings indicate a significant possibility for enhanced client income and heightened security measures on the platform.

In our future endeavors, our goal is to enhance the accuracy and sophistication of real-time data analysis and customization by leveraging modern machine learning methodologies. The utilization of data-driven decision-making is expected to extend its application to several areas within the context of supply chain optimization, inventory management, and dynamic pricing strategies. Furthermore, our future endeavors will prioritize advanced security protocols, promoting academic cooperation, expanding our international presence, and continuously driving innovation.

The initial success of this project sets the stage for an exciting future in which Casper's e-commerce platform will continually improve customer experiences, expand its market reach, and maintain a strong focus on security and innovation. The journey to remain at the forefront of the e-commerce industry promises ongoing benefits, not only for Casper but also for its users and partners.

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