

## Profiling Digital Commerce: Business and Revenue Models in an Edge-Driven Landscape

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### ABSTRACT

Edge computing brings about a transformation for digital commerce, which makes it faster and more convenient in the present times. Due to this, the businesses and operations can be carried out efficiently. This research studies Digital Commerce through three dimensions, namely protocols, business models, and revenue models. For a secure and trusted digital transaction, various protocols like HTTPS, SSL, TLS, and ONDC can be enforced. The specific market needs of emerging business models are addressed by B2B, B2C, and other emerging forms, such as C2B and G2C. Different revenue models to be evaluated based on scalability and customer alignment are subscription, freemium services, ads, and dropshipping. Edge computing is improving all these layers by measuring latency and improving responsiveness. Through such integrations of edge computing across the dimensions, digital commerce will ensure that customers experience more seamless and efficient experiences. This paper highlights the best practices, identifies challenges, and outlines strategies for leveraging all three dimensions and edge computing to achieve a sustainable competitive advantage. It provides a framework to maximize all those elements for innovation, efficiency, and growth in digital commerce.

**Keywords:** Digital commerce, Protocols, Business Models, Revenue Models.

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## 1 Introduction

The scenario of Digital Commerce has changed the overall look of the world economy. It allowed the interrelations between businesses and consumers using digital platforms [1]. In this fast-growing market, it is necessary to have a good understanding of the basic building blocks of digital commerce. These blocks include protocols, business models, and revenue models. These blocks play a crucial role in remaining competitive and innovative. Secure and uniform digital transactions are necessary for any business, and protocols help to achieve them. Similarly, trust and interoperability are achieved using technologies such as HTTPS, TLS, digital certificates & signatures. Open Network for Digital Commerce (ONDC) emphasizes issues such as payment security and data breaches. Business models help to run the business in a structured manner. It helps to maintain a proper structure of digital commerce operations. Along with business models like B2B, B2C, and C2C, some new models such as C2B, G2C, etc have been developed. These new models provide novelty and give opportunities to engage the customers and meet the market demands. Revenue models, on the other hand, help with the monetary compensation of the platforms. Revenue models include subscriptions, freemium, transaction charges, etc. The choice and combination of models depend on the business requirements, target audience, and market conditions to enhance the scalability and profit for the businesses. This paper presents the profile of digital commerce by analyzing the relationship between protocols, business models, and revenue models. The proper combination of all these helps in achieving good efficiency and business growth, eventually leading to good customer satisfaction.

Arul V. in [2] provides the emergence of e-commerce with its components, trends, and challenges, and discusses the impact of digital marketing on consumer behavior. In [3], Sugnyanam, et al. explore how exponential growth in India's internet access, smartphone usage, and affordable data is catalyzing a shift in global brand marketing, from simple digital adoption to full digital transformation, which encompasses revamped business strategies, organizational culture, and customer engagement channels. The paper details how e-commerce (including mobile, social, and AI-enhanced commerce) serves as a vital integration point, offering brands round-the-clock access, reduced transaction costs, and personalized consumer experiences, while also identifying persistent challenges such as infrastructural gaps in logistics, regulatory complexities, and consumer trust issues. Furthermore, it highlights strategic innovations like omnichannel branding, data-driven personalization, and emerging technologies (AR/VR, voice commerce, blockchain) as tools through which brands strengthen their connection with Indian consumers. Finally, the author recommends strengthening public-private cooperation on payment systems, logistics, and rural internet penetration, along with embedding digital transformation across governance and culture, to empower global brands to navigate India's rapidly evolving digital marketplace. Dikson Silitonga, et al. in [4], examine how integrating edge computing within e-commerce platforms – evaluated through quantitative analysis and interviews across five companies – delivers significant economic benefits and scalability advantages. By shifting computation closer to users, edge computing enhances system responsiveness and operational efficiency, reduces latency, improves data security, and

bandwidth costs. These improvements facilitate better customer retention and support flexible scaling of information systems as businesses grow. Of course, the authors interpret the advent of sophisticated technologies, including edge computing and scalable architecture, as favorable conditions to improve performance and competitiveness in e-business today.

## 2 Methodology

### 2.1 Computational Efficiency in Digital Commerce

Some ways to increase computational efficiency in digital commerce through the use of edge computing are:

Computation offloading is the primary method for enhancing IoT sensor computing capabilities. It uses less energy for IoT sensors, while possibly increasing transmission energy costs [5]. Edge AI merges edge computing and AI technology. It has been optimized for power-efficient operation while maintaining low latencies and addressing data privacy concerns [6]. IoT enhances edge computing through fast data sharing and improves scalability [7, 8]. Cloudlet is a type of Mobile Edge Computing (MEC). It narrows the computing resources nearest to the user to communicate effectively and enhance Quality of Service (QoS) and Quality of Experience (QoE) for mobile devices [9]. CloudSim is an emulation of a variety of cloud computing environments in a realistic environment. Thus, the researcher can analyze certain considerations like resource allocation, scheduling methods, and energy management without making use of a physical infrastructure. iFogSim enables fog computing architecture and applications assessment simulation performance [10]. PureEdgeSim provides evaluation in simulation of cloud, fog, and some particular edge computing environments [11].

### 2.2 Three-layer architecture for profiling digital commerce

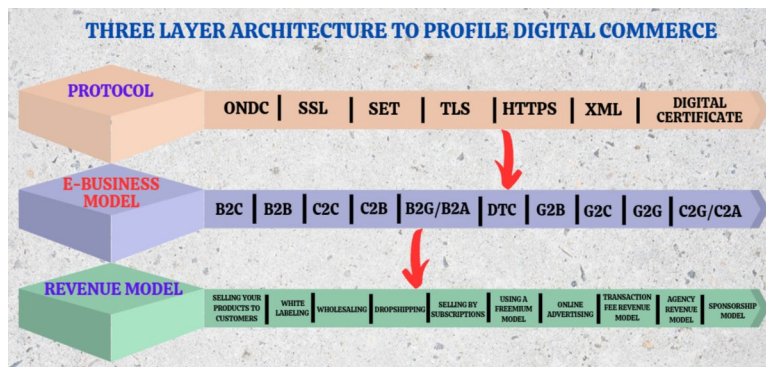


Fig. 1: Three-layer architecture for profiling digital commerce

Fig. 1 shows a three-level architecture for digital commerce profiling, taking into account various business models, protocols, and revenue strategies. This architecture groups digital commerce into different interrelated components according to ease of operations, security, and scalability. It portrays the interrelatedness of digital commerce business models, security protocols, and revenue strategies. It provides a holistic view of operating digital commerce platforms securely while depending on various business models for maximizing revenue streams.

### 2.3 Digital Commerce Protocols

The Open Network for Digital Commerce (ONDC) [12] is an initiative of the Government of India for open e-commerce by joining consumers with platforms and retailers. It consists of a set of protocols and specifications that will enable interoperability between e-commerce platforms. The concept of ONDC is making digital commerce democratized, as it is unlike other platform-oriented e-commerce concepts. Secure Sockets Layer (SSL) serves the purpose of having an encrypted connection between two systems, which is initiated by one of them. SSL has Advantages as Transparency, Ease of use for customers, and Low complexity [13]. A set of standardized, industry-wide protocol specifications that have been formulated to secure payment transactions and verify the identities of the parties involved across various networks, including the internet, is called Secure Electronic Transaction (SET) [13, 14]. It was intended to create a level of trust that the consumer would need. Transport Layer Security (TLS) provides better security than SSL and is a successor to the SSL entities. Hypertext Transfer Protocol Secure (HTTPS) is a protocol that uses SSL or TLS to encrypt all communications between the two systems. This provides secure communication between a web server and a web browser. Extensible Markup Language (XML) is a method for transmitting data between two different systems and may be used in building web-based applications. Digital certificates enable authentication and secure encryption for websites, individuals, organizations, devices, users, or servers [15].

### 2.4 E-commerce/Digital Commerce Business Models

[16, 17] The model in Fig. 2 depicts various types of transactions between parties, which include businesses, consumers, as well as Government.

1. B2G/B2A (Business-to-Government or Business-to-Administration) Business-to-Government (B2G) is a type of transaction in which businesses offer a range of services and solutions to the government. These engagements will give the Government the utmost priority to secure regulatory approval and to gain knowledge of the procurement procedure. Most common examples are software firms providing legal documentation and IT companies providing e-governance solutions.
2. C2G/C2A (Consumer-to-Government or Consumer-to-Administration) Consumer-to-Government or Consumer-to-Administration includes the transactions that involve an individual directly interacting with the Government. These interactions are basically done for services and payments. Convenience can be achieved through digital platforms, which allow citizens to pay bills, utility bills, etc. This promotes accessible communication very efficiently between the consumer and the public administration.

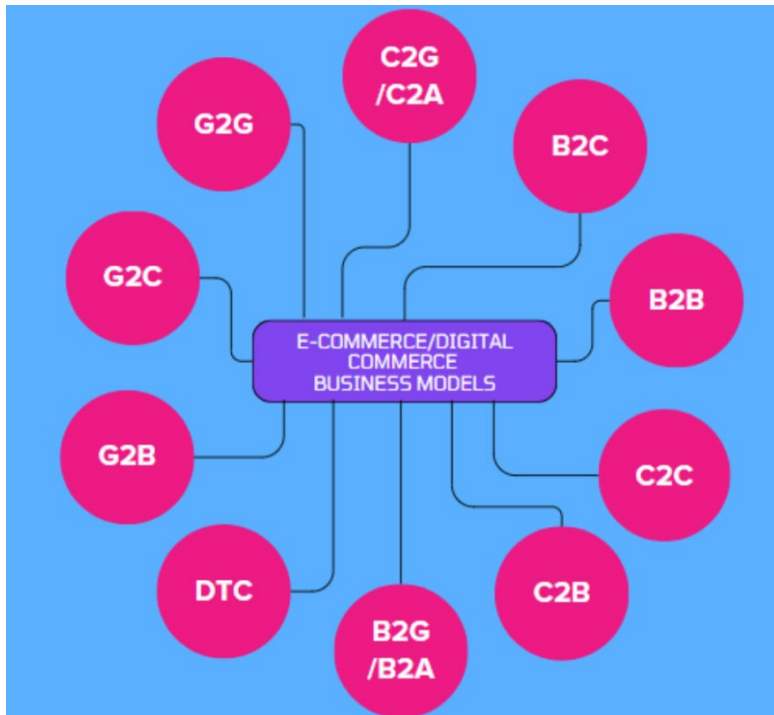


Fig. 2: E-commerce/Digital Commerce Business Models

3. B2C (Business-to-Consumer)  
Business-to-Consumer (B2C) is used when businesses offer products or services directly to individual consumers. It aims at customer experience, utilizing digital marketing, easy platforms, and effective delivery systems. Typical examples would be shopping on online portals such as Amazon or signing up for services such as Netflix or Spotify.
4. B2B (Business-to-Business)  
Business-to-Business (B2B) involves one company selling its products to other companies. They involve sales in larger quantities, foster long-term agreements, as well as relationship management and supply chains. Some examples of B2B include wholesalers selling inventory to retailers, raw materials sold by manufacturers, and selling business software, etc.
5. DTC (Direct-to-Consumer)  
Direct-to-Consumer (DTC) means that manufacturers or producers sell directly to consumers. It does not involve any middleman, such as wholesalers or retailers. This gives the companies more control over their branding and customer experience. Digital entertainment platforms are used for engagement and sales. Some examples include subscription services like Netflix and brands like Dollar Shave Club.

6. C2C (Consumer-to-Consumer)  
Consumer-to-Consumer (C2C): A C2C model refers to a model in which individuals directly barter or trade with each other using online platforms that act as neutral intermediaries. Trust is ensured by community-governed mechanisms like the peer reviews and user ratings. Good examples are the resale of second-hand goods on eBay, Facebook Marketplace, or short-term property rentals on Airbnb.
7. C2B (Consumer-to-Business)  
Consumer-to-Business (C2B) turns the conventional commercial relationship on its head because individual consumers offer products, skills, or content that businesses buy or license. This model has gathered momentum in parallel with the gig economy, as freelancers provide services on sites like Upwork or Fiverr and indie creators license images through stock platforms such as iStock.
8. G2B (Government-to-Business)  
Government-to-Business (G2B) includes formal interactions between public authorities and private companies in areas like procurement, compliance, and licensing. Governments publish tenders for public contracts through official digital channels. Businesses use government portals to obtain the permits and certifications needed to operate legally.
9. G2C (Government-to-Consumer)  
Government-to-Consumer (G2C) involves the direct delivery of public services from government bodies to individual citizens. Digitization has greatly improved access and efficiency. Common examples include online tax filing, electronic issuance of passports and driving licenses, and digital applications for welfare benefits or government subsidies.
10. G2G (Government-to-Government)  
Government-to-Government (G2G) relates to formal transactions and institutional engagements between sovereign governments at bilateral or multilateral levels. This includes international trade agreements, intergovernmental procurement, and collaborative efforts in defense, education, and public infrastructure. These activities require strong diplomatic frameworks and reliable institutional systems.

These models show how digital platforms and e-commerce are changing transactions across various industries, focusing on convenience, efficiency, and transparency.

### 2.5 E-commerce/Digital Commerce Revenue Models

[17]

The diagram illustrates 10 e-commerce/digital commerce revenue models that are grouped by their method of generating income. The following is an elaborate explanation of each model:

#### 1. Sales Revenue Model

The Sales Revenue Model generates income through the direct exchange of goods or services for money. In the direct-to-consumer (D2C) approach, companies sell products directly to end users, avoiding middlemen such as distributors or retailers. This strategy helps businesses lower costs, have better control over their branding



Fig. 3: E-commerce/Digital Commerce Revenue Models

and pricing, and build stronger customer relationships through direct engagement. Companies like Warby Parker, Glossier, and Casper exemplify this model.

### 2. White Labeling

White labeling allows companies to buy generic products from third-party manufacturers, add their own logo, and then sell them under their brand. This method cuts product development costs, speeds up time to market, and enables businesses to concentrate on marketing and sales instead of manufacturing. It is especially common in industries such as health, beauty, and fashion.

### 3. Wholesaling

Wholesale is the practice of selling products in bulk at discounted prices to businesses or retailers who then resell them to end users. This approach reduces customer acquisition costs through bulk orders, provides steady revenue from bulk contracts or frequent B2B buyers, and is common in B2B agreements, especially for manufacturers shipping to online retailers.

### 4. Dropshipping / Affiliate Marketing

Dropshipping and affiliate marketing are low-cost business models. In dropshipping, retailers sell products without holding inventory; suppliers send the items directly to customers. In affiliate marketing, retailers earn a commission by promoting third-party products via referrals. These models require little initial investment and remove the need for warehousing. The focus is on marketing, generating traffic, and acquiring customers to earn revenue.

### 5. Selling by Subscriptions

The subscription model requires customers to pay a regular fee, either monthly or annually, to use a product or service for a set period. This approach provides businesses with steady income, helps build customer loyalty, and increases customer lifetime value. Popular examples include Netflix for streaming, Blue Apron for meal kits, and Amazon Prime for fast shipping and additional benefits.

### 6. Freemium Model

The Freemium Model offers users free access to a basic version of a product or service, while advanced features or premium content are available for paying subscribers. This strategy efficiently attracts a large user base through free access, which converts a segment of those users into paying customers. Spotify illustrates this model by providing free, ad-supported music streaming and a paid tier that offers an uninterrupted listening experience. Wynk Music also gives premium subscribers ad-free access and offline features.

### 7. Online Advertising

The Online Advertising Model involves companies making money from their digital platforms by selling advertising space to other businesses. Advertisers typically pay per click, per impression, or a flat fee. This model generates passive income without needing to sell physical products, and it offers significant revenue potential for high-traffic platforms, including niche blogs and high-volume e-commerce sites like Amazon.

### 8. Transaction Fee Revenue Model

The Transaction Fee Revenue Model charges a small fee for each transaction processed through a platform. This model is widely used by marketplaces and payment processors, scaling with transaction volume to provide a steady and reliable revenue stream. Notable examples include eBay's auction fees, PayPal's payment processing fees, and eTrade's stock trading commissions.

### 9. Agency Revenue Model

The Agency Revenue Model focuses on offering specialized professional services, such as digital marketing, web development, or search engine optimization. Clients are charged based on expertise and project scope. Pricing is usually customized for each project, allowing for high profit margins on skilled services. Marketing agencies, design firms, and SEO consultancies are common practitioners of this model.

### 10. Sponsorship Model

The Sponsorship Model involves partnerships between brands and digital platforms, where businesses pay for visibility through sponsored content, product placements, or collaborative campaigns. This model generates revenue independently of product sales and can be very profitable when associated with platforms that have significant reach or influence. Common examples include sponsored articles, influencer partnerships, and event sponsorships.

### 2.6 Modeling Digital Commerce

It is the process of collecting and studying information about customers’ online interactions with a brand or product [18]. The goal is to build a profile of a customer’s habits and interests [19] to help businesses tailor their products, services, and marketing efforts. Profiling digital commerce can work with other data types, such as consumer and social data, to help marketers turn broad consumer trends into action. Digital commerce profiling helps businesses improve marketing strategies, enhance customer experience, increase engagement and loyalty, refine campaigns, identify and convert unhappy customers, reduce marketing costs, and create more opportunities for cross-selling and up-selling. The diagram in Figure 4 shows a 12-step process for understanding and using customer data to improve digital commerce strategies.

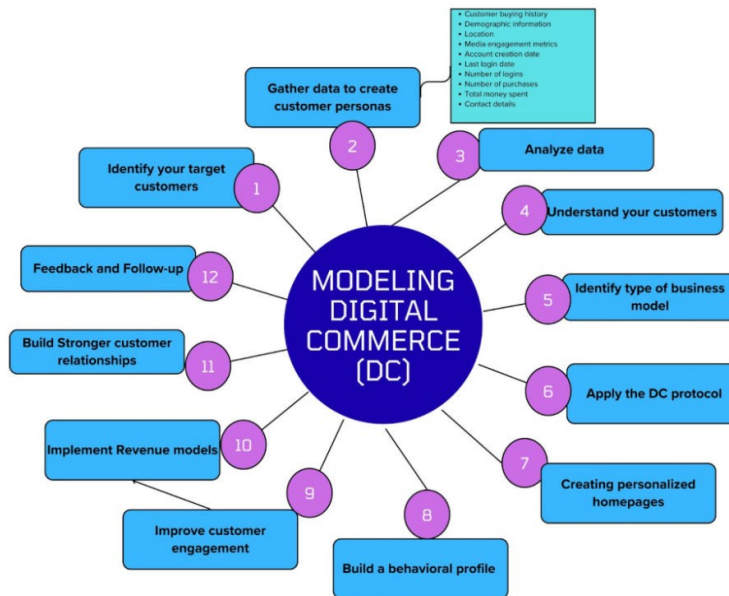


Fig. 4: Modeling Digital Commerce

The process involves gathering, examining, and using customer data to create focused strategies that improve engagement, relationships, and revenue. It combines data-driven decision-making with customer-focused approaches to increase the success of digital commerce efforts. Including edge computing [20] in this framework is becoming essential. It allows data to be processed closer to the user, which reduces delays and supports real-time personalization. This helps businesses respond quickly to customer behavior and provide dynamic content, significantly boosting user engagement and satisfaction. Research shows that adding edge computing to digital profiling workflows can raise conversion rates by up to 15% and lower customer churn by as much as 10%. By adopting this framework, businesses can streamline operations, improve customer experiences, and encourage sustainable growth.

Procedure involved in digital commerce practices:

### 1. Identify Your Target Customers

Begin by defining the ideal customer based on your business goals. Factors like demographics, preferences, and purchase behavior play a critical role.

### 2. Gather Data to Create Customer Personas

Collect customer information, such as:

- Buying history, Demographics, Location, Media engagement metrics, and Account details (e.g., creation date, logins, purchases, total money spent).

Use this data to create customer personas that represent different segments of your audience. Edge computing allows for quicker, localized data collection, particularly from IoT devices or applications that support edge computing. This ensures real-time updates for personas.

### 3. Analyze Data

Use tools like analytics software to understand the gathered data. Identify patterns, trends, and insights to guide decision-making. With edge computing, analysis can start immediately at the point of data generation. This reduces lag and helps make faster adjustments to campaigns.

### 4. Understand Your Customers

Gain deeper insights into customer motivations, preferences, and pain points. This understanding forms the basis for personalized strategies.

### 5. Identify the Type of Business Model

Choose the best business model (e.g., B2C, B2B, subscription-based) based on customer needs and behavior.

### 6. Apply the Digital Commerce Protocol

Implement appropriate digital commerce protocols for secure and efficient operations. Examples: HTTPS, SSL, XML digital certificates.

### 7. Create Personalized Homepages

Use the analyzed data to customize homepages and user experiences according to customer profiles. Personalized content boosts engagement and conversions. Edge computing enables this in real time, dynamically adjusting homepages as users navigate. This improves responsiveness and decreases server load.

### 8. Build a Behavioral Profile

Map customer behavior patterns, including preferences, buying cycles, and online interactions. Helps predict future actions and needs.

### 9. Improve Customer Engagement

Implement strategies to interact with customers effectively, such as personalized marketing campaigns or chatbots. Focus on enhancing user satisfaction and loyalty. Edge-powered chatbots and recommendation engines offer faster response times and context-aware interactions.

### 10. Implement Revenue Models

Introduce suitable revenue strategies, like freemium, subscription, or transaction fee models, based on customer preferences and business goals. Edge computing helps support smooth microtransactions and fast content delivery, enhancing monetization.

11. **Build Stronger Customer Relationships**  
Establish trust and loyalty through consistent engagement and value-driven interactions. Examples: loyalty programs, exclusive offers.
12. **Feedback and Follow-Up**  
Gather customer feedback to refine strategies and address concerns. Regular follow-up ensures long-term customer retention and satisfaction. Edge computing enables real-time feedback collection, helping businesses immediately act on customer sentiment and behavior.

### 3 RESULTS AND DISCUSSION

#### 3.1 Case Study-based Customer Profiling and Segmentation

Some of the key categories in the profiling process:

- **Type of Customer:** Returning (old)
- **Customer Objective:** Visit the app to buy a product before the festival
- **Device Used:** Mobile phone
- **Visit Frequency:** Almost daily
- **Time of Use:** 6 PM to 8 PM
- **Discount Sensitivity:** High (most purchases made on discounted items)
- **Payment Method:** Google Pay
- **Product Category:** Clothes

By leveraging this micro-segment, the platform can:

- Send personalized push notifications around 6 PM, promoting discounted clothing offers.
- Use secure protocols such as HTTPS, SSL/TLS, and XML digital certificates to protect user data and ensure secure communication.
- Implement a B2C business model, showcasing a variety of clothing products from multiple sellers with offers.
- Use a revenue strategy focused on discounts, freemium content (e.g., early access to deals), and subscription perks to increase purchase frequency.
- Track real-time user activity to improve personalization and predict future buying behavior.
- Collect feedback post-purchase and follow up with targeted suggestions or loyalty rewards.

#### 3.2 Impact of Edge Computing in Digital Commerce Practices

The proposed system here deals with the latency issue by using a product buying application for testing the result. The steps for the experimental execution are:

1. Execute the code on the local machine and store the result on the local device only.
2. Execute the code on the local machine, but store the result in the cloud.
3. Compare the results of the above two methods.

Table 1: Product Buying Application - Result Comparison

Product Count	Local Execution and Storage (Edge Device) (s)	Local Execution and Storing the Result on the Cloud (s)
1	3.202756	3.845447
2	3.783754	4.019016
3	4.657013	5.633435

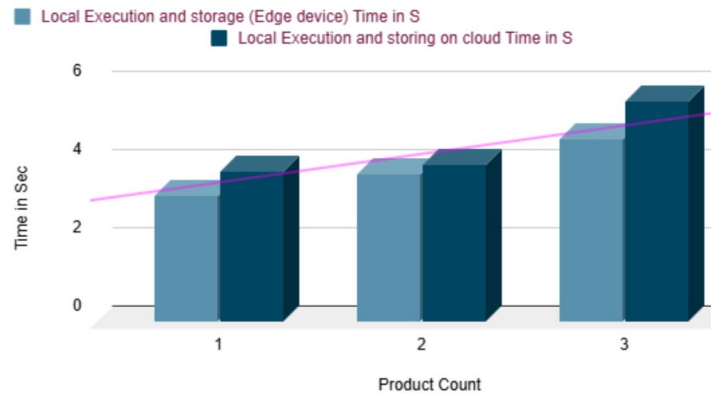


Fig. 5: Impact of Edge Computing on Reducing Latency

Table 1 shows the time taken for buying the product using edge and cloud computing. Fig 5 shows the graphical representation of execution time based on the number of products. The result clearly shows that Edge computing takes less time to generate the result.

Edge computing processes data closer to the user (at or near the mobile device), enabling:

- Real-time behavioral tracking and instant personalization
- Faster notifications and page loads, especially at high-traffic times (e.g., 6-8 PM)
- Enhanced security through distributed architecture and protocol layering
- Increased trust and convenience, especially with seamless mobile payment experiences like Google Pay

#### 4 Conclusion and Future Work

The paper provides a comprehensive overview of different types of businesses and revenue models of E-commerce. E-commerce and Digital commerce businesses need to follow some protocols for a successful and secure business. The Open Network for Digital Commerce (ONDC) is a digital project initiated by the Indian government to revolutionize e-commerce. The paper provides clear steps to profile digital commerce. An elaborated case study is given to understand the way to profile digital commerce.

Digital commerce is rapidly evolving, with businesses seeking to deliver real-time, personalized services. Integrating edge computing with new technologies like artificial intelligence (AI) and blockchain can greatly improve digital commerce. This integration allows for faster transaction times, personalized user experiences, and strong data privacy. Edge computing processes information closer to the customer. This reduces delays and supports real-time decision-making using AI-driven insights. At the same time, blockchain provides transparency and security in transactions, which builds trust in digital ecosystems. The goal of this study is to explore how edge computing, AI, and blockchain together can transform digital commerce operations for better security, intelligence, and efficiency.

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