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# Digital Payment Capabilities and Retail Distribution Efficiency in South Korea: Logistics and Customer Retention Implications

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## Abstract

**Purpose:** This study investigates how digital payment capabilities enhance retail logistics and distribution efficiency and how these improvements influence customer retention in South Korea's highly digitalized retail market. **Research Design / Methodology:** Drawing on the Resource-Based View, Dynamic Capabilities Theory and the Technology–Organization–Environment framework, four digital payment capabilities are examined: payment technology sophistication, omnichannel payment integration, payment data analytics capability and payment-based relationship programs. Survey data were collected from 350 retail consumers in South Korea and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). **Results:** The results indicate that all four digital payment capabilities positively and significantly improve retail logistics and distribution efficiency. Among them, payment data analytics capability and omnichannel payment integration exert the strongest effects. Retail distribution efficiency has a substantial positive impact on customer retention and partially mediates the relationships between digital payment capabilities and retention. **Conclusions:** The findings suggest that retailers can improve logistics performance, trade operations and customer loyalty by investing in advanced digital payment systems and analytics-driven distribution processes. This study extends distribution science by demonstrating how digital payment capabilities function as operational enablers that strengthen retail logistics efficiency and customer retention in advanced digital markets.

**Keywords :** Digital Payment Capabilities; Retail Logistics Efficiency; Distribution Performance; Omnichannel Payment Integration; Trade Operations; Customer Retention

**JEL Classification Code:** L81, M30, M31, Q11

## 1. Introduction

The global retail landscape has undergone a profound transformation over the past two decades, driven largely by the rapid diffusion of digital technologies and the evolution of payment systems. Digital payments, ranging from mobile wallets and QR-based applications to contactless NFC cards and platform-integrated payment solutions have become central to modern consumer behavior and retail operations

(Dahlberg et al., 2008; Mallat, 2007; Chen et al., 2020). The convergence of digital commerce, mobile technology and financial innovation has shifted payments from being a simple transactional function to a strategic component of retail competitiveness (Oliveira et al., 2016; Nanda et al., 2021). As retailers across the world digitalize their operations, digital payment capabilities now play a critical role in shaping operational efficiency, customer experience and long-term consumer loyalty (Arora & Banerji, 2024).

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South Korea represents one of the world's most advanced digital payment ecosystems, making it an ideal context for studying the strategic role of payment systems in retail distribution. Korea has consistently ranked among the top countries in digital transformation, smartphone penetration, internet connectivity and fintech adoption (Kim et al., 2022). Mobile wallet platforms such as Kakao Pay, Naver Pay, Toss, Samsung Pay and advanced credit card systems are deeply integrated into the everyday lives of Korean consumers. Korean retail companies, such as Emart, Lotte, GS25, Olive Young and Coupang, operate sophisticated omnichannel ecosystems supported by digital payment infrastructures, real-time data analytics and highly efficient distribution systems. Because of this technological maturity, digital payment capabilities significantly shape not only checkout processes but also transaction flows, order processing and distribution coordination within Korean retail supply chains.

Earlier research on digital payments has focused primarily on consumer adoption, perceived usefulness, ease of use, trust and behavioral intention, often drawing on models such as TAM, UTAUT and innovation diffusion theory (Venkatesh et al., 2012; Davis, 1989; Slade et al., 2015). While these studies provide important insights, they largely emphasize initial adoption rather than the operational consequences of digital payment systems for retailers. More recent studies highlight that digital payments can enhance operational efficiency, reduce transaction time, improve data accuracy and streamline logistics and distribution operations. Recent research indicates that digital payment adoption can enhance operational efficiency, reduce transaction time and support supply chain and retail performance, partly by speeding up settlement processes and reducing transaction costs (Jain & Jain, 2024; Brown et al., 2024; Cornelli et al., 2024). However, empirical research examining specific payment capabilities, such as payment technology sophistication, omnichannel payment integration, payment data analytics capability and payment-linked loyalty programs shape retail distribution efficiency remains limited, particularly in technologically advanced markets.

**Payment technology sophistication** has emerged as an important enabler of operational performance in retail and service settings. Advanced payment infrastructures, including contactless payment technologies, mobile wallets, and secure digital payment platforms, reduce friction at checkout, accelerate transaction processing, and lower the likelihood of human and system errors (Dahlberg et al., 2015; de Kerviler et al., 2016). Prior research shows that mobile and contactless payment systems enhance transaction efficiency by simplifying payment procedures and improving system reliability at the point of sale (Slade et al., 2015; Zhou, 2013). Moreover, digitally integrated payment

systems facilitate real-time data exchange between customer-facing payment interfaces and organizational information systems, supporting faster transaction confirmation and improved coordination of downstream operational activities (Kazan et al., 2018).

**Omnichannel Payment Integration** is another critical factor in today's retail environment. As consumers transition between in-store, online and mobile channels, consistent and seamless payment experiences are essential for maintaining a unified purchase process (Herhausen et al., 2015; Schramm-Klein et al., 2011). Integrated payment systems allow retailers to synchronize transactions across channels, improve inventory visibility, reduce reconciliation delays and achieve smoother distribution flows (Verhoef et al., 2015). Korea's highly developed omnichannel retail sector makes this dimension especially relevant.

**Payment data analytics capability** has gained increasing scholarly attention as digital payment systems generate large volumes of real-time transactional data. Retailers with strong analytics capabilities can convert payment-related data into actionable insights for demand forecasting, inventory management, distribution planning, and customer segmentation, thereby improving operational decision-making (Dubey et al., 2019). Prior studies indicate that analytics-driven firms respond more rapidly to demand fluctuations and operational disruptions, enabling them to achieve higher levels of distribution efficiency and operational agility (Gunasekaran et al., 2017). As a result, payment data analytics capability has emerged as a strategic resource that supports data-driven coordination and efficiency across retail distribution systems.

**Payment-Based Relationship Programs** (e.g., loyalty rewards, membership benefits, personalized offers) are increasingly embedded into digital payment platforms. These programs incentivize customers to use specific payment channels, consolidate their purchase behavior and develop emotional and behavioral attachment to the retailer (Kumar & Reinartz, 2016). In the Korean context, where loyalty platforms are deeply embedded in digital ecosystems (e.g., Lotte Points, Shinsegae Membership, Naver Miles), payment-linked programs significantly influence customer engagement and purchasing patterns. These programs may also stabilize demand, thereby improving distribution planning and operational predictability.

At the core of retail operations lies **Retail Distribution Efficiency**, which includes the speed, accuracy and responsiveness of order handling, checkout processing, inventory movement and fulfillment coordination (Chopra & Meindl, 2019). In digital retail environments, distribution efficiency is a critical determinant of customer satisfaction and retention (Zeithaml et al., 2000). When retail distribution systems operate smoothly, delivering products reliably, minimizing checkout delays and reducing stockouts,

customers perceive greater value and are more likely to remain loyal.

Despite growing interest in digital payments and omnichannel retailing, a clear research gap remains. Most studies emphasize adoption behavior or payment convenience, while very few analyze how multiple digital payment capabilities collectively influence distribution efficiency and customer retention, especially in advanced digital markets like South Korea. Moreover, the mediating role of distribution efficiency in linking digital payment capabilities to customer loyalty outcomes has not been sufficiently explored in existing literature. Addressing this gap is essential to understanding digital payments not merely as transactional technologies but as strategic capabilities shaping retail operational performance and customer retention.

Therefore, this study investigates how four key digital payment capabilities: payment technology sophistication, omnichannel payment integration, payment data analytics capability and payment-based relationship programs affect retail distribution efficiency and how distribution efficiency ultimately influences customer retention among retail consumers in South Korea. By integrating perspectives from digital transformation, retail operations, omnichannel commerce and relationship marketing, this study contributes to the growing literature on digital retailing and offers practical implications for retailers operating in highly digitalized markets.

## 2. Literature Review

### 2.1. Digital Payment Evolution and Retail Transformation

Digital payment technologies have transformed retail systems globally, enabling faster, safer and more flexible transaction environments. Earlier studies emphasized technology adoption, focusing on consumer perceptions of usefulness, ease of use and trust (Davis, 1989; Venkatesh et al., 2003; Kim, Chan & Gupta, 2007). Over time, research expanded toward digital financial ecosystems, mobility and service integration (Dahlberg, Mallat, Ondrus & Zmijewska, 2008; Oliveira, Thomas, Baptista & Campos, 2016). As digital commerce matured, payment systems became integral to operational efficiency, not merely supporting transactions but enabling deeper integration between front-end retail processes and back-end distribution operations (Nanda et al., 2021; Chen et al., 2020).

South Korea is one of the most advanced digital payment environments in the world, with extremely high smartphone penetration and widely used payment platforms such as Kakao Pay, Naver Pay, Samsung Pay, Toss and KB Pay.

Korean retailers have embraced digitalization aggressively, integrating payments into omnichannel retail, logistics coordination and customer-centric digital ecosystems. This makes Korea an ideal research context for studying how digital payment capabilities influence retail distribution efficiency and customer retention.

### 2.2. Digital Payment Capabilities in Retail

#### 2.2.1. Payment Technology Sophistication (PTS)

Payment technology sophistication refers to the advancement and quality of a retailer's digital payment infrastructure. Modern payment systems use contactless NFC, QR codes, tokenization, biometric authentication and mobile wallets to enhance transaction speed and reliability. Studies highlight that sophisticated payment systems reduce queuing time, improve transaction accuracy and enhance customer experience (Dahlberg et al., 2008; Oliveira et al., 2016)

In Korea, technological sophistication is particularly relevant due to the widespread dominance of high-tech payment environments supported by telecoms, platform companies and e-commerce giants. Advanced payment technologies also integrate seamlessly with inventory systems, POS terminals and logistics networks, enabling smoother back-end operations. Therefore, PTS is a critical capability influencing both operational efficiency and customer outcomes.

#### 2.2.2. Omnichannel Payment Integration (OPI)

Omnichannel retailing emphasizes seamless customer movement across physical stores, online platforms and mobile applications (Herhausen et al., 2015; Verhoef, Kannan & Inman, 2015). Payment integration across these channels ensures consistent customer experiences, unified transaction records and coordinated order fulfillment. Research shows that fragmented payment systems can lead to distribution delays, errors and customer dissatisfaction

Korea's retail environment demonstrates high maturity in omnichannel adoption: Emart's SSG Pay, Lotte's LPay, GS25's mobile wallets and Coupang's streamlined checkout all illustrate deeply integrated ecosystems (Verhoef et al., 2015). Integrated payments enhance operational coordination, reduce reconciliation issues and support logistics synchronization, thereby improving distribution efficiency. For these reasons, OPI is essential for understanding retail performance in Korea.

#### 2.2.3. Payment Data Analytics Capability (PDAC)

Digital payments generate extensive transactional data, offering retailers rich opportunities for analytics-based decision-making. Data analytics enables demand

forecasting, inventory optimization, customer segmentation, fraud detection and route planning (Liu et al., 2024). Analytics capability, therefore, becomes a strategic resource that supports distribution responsiveness, accuracy and efficiency.

In digital economies like Korea, where consumers rely heavily on mobile and online payments, analytics play a central role in predicting customer flows, planning inventory restocking and coordinating distribution networks. PDAC strengthens operational agility, reduces stockouts and enhances retailer forecasting accuracy, thereby improving distribution efficiency.

#### **2.2.4. Payment-Based Relationship Programs (PBRP)**

Loyalty programs linked to digital payment behaviors such as rewards, points, membership tiers and personalized promotions have become common in modern retail systems (Kumar & Reinartz, 2016). Payment-linked loyalty systems allow firms to build long-term relationships with customers by using purchase histories, payment preferences and behavioral data to deliver targeted offers.

Korea's digital ecosystem is characterized by the widespread integration of payment-linked loyalty platforms, such as Lotte Members, Shinsegae Points, CJ ONE, and Naver Rewards, which combine payment functions with customer rewards and data collection. Prior research shows that loyalty programs embedded within digital and omnichannel retail environments encourage repeat purchases, enhance customer retention, and stabilize demand patterns over time (Kumar & Reinartz, 2016; Verhoef et al., 2015). More stable and predictable demand enables retailers to improve inventory allocation, distribution planning, and logistics coordination, thereby enhancing overall operational efficiency (Herhausen et al., 2015). Accordingly, payment-based reward programs function not only as marketing instruments but also as important operational enablers within digitally integrated retail systems.

#### **2.3. Retail Distribution Efficiency (RDE)**

Retail distribution efficiency refers to the speed, accuracy and smoothness of retail operations from transaction to fulfillment. Efficient distribution systems depend on real-time data, integrated systems and synchronized workflows (Chopra & Meindl, 2019). Prior studies show that digitalization significantly enhances distribution efficiency by reducing delays, minimizing errors and improving order handling.

In Korea, retailers are recognized for highly efficient last-mile delivery systems and digitally enabled logistics networks, exemplified by services such as Coupang's "Rocket Delivery." Prior research suggests that digitally

integrated payment systems enhance operational reliability by improving transaction accuracy, enabling real-time information updates, and supporting tighter coordination between customer transactions and backend information systems. Such integration facilitates synchronized order processing and distribution management within advanced retail logistics environments (DeLone & McLean, 2003; Gunasekaran et al., 2017).

#### **2.4. Customer Retention (CR) in Digital Retailing**

Customer retention is defined as the extent to which customers continue purchasing from a retailer, resist switching and exhibit loyalty over time (Zeithaml et al., 2000). Research shows that retention is influenced by service quality, transaction experience, convenience and distribution performance (Ladhari et al., 2019; Chang & Chen, 2009). In digital environments, smoothness and reliability of both payment and distribution processes play dominant roles in determining whether customers stay loyal (Mentzer et al., 2001).

Korea's digital-native consumers expect very fast, error-free and frictionless experiences across payment, checkout and delivery stages. When retailers deliver consistent and efficient distribution outcomes, customer retention improves significantly. Thus, CR becomes a key dependent variable connected to both digital payment capabilities and distribution performance.

#### **2.5. Research Gap**

Although digital payment adoption is widely studied, several clear gaps remain. Most research focuses on adoption intention, not operational impact (Slade et al., 2015; Oliveira et al., 2016). Few studies examine how multiple digital payment capabilities influence retail distribution efficiency. The mediating role of distribution efficiency between payment capabilities and customer retention is underexplored. Research in highly digitalized markets like South Korea remains limited despite Korea's leading digital infrastructure. This study addresses these gaps by linking four digital payment capabilities to distribution efficiency and retention within the Korean retail context.

### **3. Theoretical Framework**

This study is grounded in three major theoretical perspectives: the Resource-Based View (RBV), Dynamic Capabilities Theory (DCT), and the Technology–Organization–Environment (TOE) Framework. Together, these theories provide a robust foundation for understanding how digital payment capabilities enhance retail distribution

efficiency and ultimately improve customer retention in the South Korean retail sector. These frameworks have been widely applied in information systems, digital commerce and operations research, making them highly suitable for the context of technology-driven retail environments.

### 3.1. Resource-Based View (RBV)

The Resource-Based View (RBV) argues that firms achieve superior performance by developing and leveraging valuable, rare, inimitable and non-substitutable (VRIN) resources (Barney, 1991). Within modern digital retail environments, technological resources, such as payment systems, data analytics tools and loyalty platforms, constitute strategic assets that enable firms to improve their operational and competitive positioning (Wade & Hulland, 2004; Dubey et al., 2019).

In the context of this study: Payment Technology Sophistication (PTS) represents a technological resource that allows firms to process transactions more efficiently and securely. Omnichannel Payment Integration (OPI) reflects an integration capability that enables seamless cross-channel retail experiences. Payment Data Analytics Capability (PDAC) functions as an informational resource, facilitating data-driven operational decisions. Payment-Based Relationship Programs (PBRP) serve as customer relationship assets that enhance loyalty and stabilize demand patterns. These digital payment capabilities collectively enhance the firm's ability to streamline distribution processes, consistent with RBV's argument that superior operational performance is the outcome of well-developed firm resources (Aker et al., 2016). By creating efficient distribution operations, retailers can generate sustained competitive advantages that positively impact customer retention.

### 3.2. Dynamic Capabilities Theory (DCT)

Dynamic Capabilities Theory (DCT) extends RBV by emphasizing a firm's ability to reconfigure, integrate and adapt resources in response to market changes (Teece, Pisano & Shuen, 1997). As retail environments evolve rapidly, especially in digital-first economies like South Korea, dynamic capabilities become essential for maintaining operational efficiency and customer loyalty.

From a DCT perspective: PTS enables retailers to adopt advanced payment technologies, improving responsiveness and transaction reliability. OPI reflects the ability to integrate multiple payment channels, enhancing operational agility. PDAC aligns with sensing and seizing capabilities by enabling real-time analysis of payment data for forecasting and distribution planning (Srinivasan et al., 2021). PBRP contributes to reconfiguring personalized

interactions and adaptive loyalty strategies. These capabilities collectively strengthen Retail Distribution Efficiency (RDE), which is viewed as an operational dynamic capability that supports fast, accurate and reliable fulfillment processes (Chopra & Meindl, 2019; Mentzer et al., 2001). DCT therefore provides a theoretical explanation for how digital payment capabilities translate into improved operational outcomes and ultimately supporting customer retention.

### 3.3. Technology–Organization–Environment (TOE) Framework

The Technology–Organization–Environment (TOE) Framework (Tornatzky & Fleischer, 1990) explains how firms adopt and implement new technologies based on three contextual factors: technological readiness, organizational conditions and environmental pressures. This framework has been widely used to study digital payment adoption, omnichannel systems and analytics capabilities (Oliveira et al., 2016; Kim et al., 2010). In this study for the technological context, it includes PTS and OPI, representing the retailer's readiness to implement advanced and integrated payment technologies. For organizational context it Captures by PDAC and PBRP, which reflect the firm's internal capability to use data and customer programs to support distribution efficiency. Environmental Context is reflected in South Korea's highly competitive retail market and technologically advanced consumer base create environmental pressures for retailers to adopt innovative payment systems and improve distribution performance.

The TOE framework therefore supports the argument that digital payment capabilities are not isolated technological features but are shaped by broader organizational and environmental factors that influence operational and customer-related outcomes.

### 3.4. Combined Theoretical Rationale

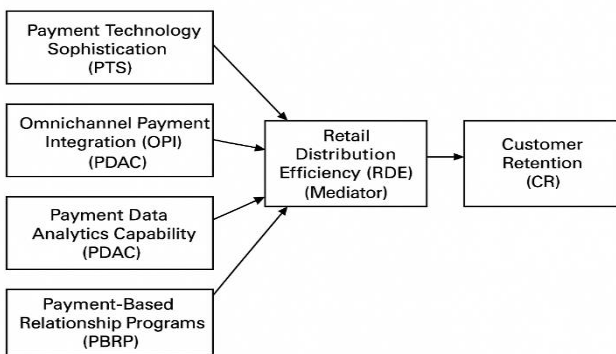
RBV, DCT and TOE collectively justify the study's model and hypotheses: RBV explains *why* digital payment capabilities act as strategic resources that enhance distribution efficiency. DCT explains *how* firms integrate, adapt, and deploy these payment capabilities to improve operational performance. TOE explains *what contextual factors* influence the adoption and utilization of payment-related capabilities. Together, these theories support the conceptual pathway: Digital Payment Capabilities effecting retail distribution and efficiency effecting customer retention. This multi-theoretical foundation strengthens the study's contribution to digital retailing, distribution science and technology-enabled service research.

## 4. Conceptual Framework & Hypothesis

Based on the Resource-Based View (RBV), Dynamic Capabilities Theory (DCT) and the Technology–Organization–Environment (TOE) framework, this study proposes a conceptual model that explains how digital payment capabilities influence retail distribution efficiency and customer retention in South Korea. The model integrates four key digital payment capabilities: Payment Technology Sophistication (PTS), Omnichannel Payment Integration (OPI), Payment Data Analytics Capability (PDAC) and Payment-Based Relationship Programs (PBRP) and examines their collective and individual contributions to distribution efficiency and customer loyalty.

Digital payment systems have evolved into a core strategic asset within modern retail operations. According to RBV, such capabilities represent valuable firm resources that improve operational performance (Barney, 1991; Akter et al., 2016). DCT reinforces this view by highlighting the importance of integration, adaptation and reconfiguration of technological resources to enhance supply chain and distribution processes (Teece et al., 1997). The TOE framework further explains how technological readiness, organizational capabilities and environmental pressures influence the adoption and success of innovative payment systems (Tornatzky & Fleischer, 1990; Oliveira et al., 2016).

In this model, Retail Distribution Efficiency (RDE) serves as a central, mediating mechanism. It reflects how effectively retailers convert payment capabilities into operational outcomes such as delivery speed, order accuracy, responsiveness and channel coordination (Chopra & Meindl, 2019). RDE, in turn, influences Customer Retention (CR) a key performance outcome reflecting consumer’s long-term commitment and repeated purchasing behavior (Zeithaml et al., 2000). Figure 1. Representing the Conceptual Model.



**Figure 1:** Conceptual Framework

The proposed research model examines how four key digital payment capabilities: payment technology sophistication, omnichannel payment integration, payment

data analytics capability and payment-based relationship programs affect retail distribution efficiency and how distribution efficiency subsequently influences customer retention. This section develops the hypotheses by linking each construct to established theories and empirical studies.

### 4.1. Payment Technology Sophistication and Retail Distribution Efficiency

Payment Technology Sophistication (PTS) refers to the extent to which retailers employ advanced digital payment infrastructures such as NFC, QR codes, tokenization, biometric authentication and mobile wallet ecosystems. Prior research highlights that advanced payment technologies reduce transaction friction, accelerate checkout processes and minimize payment errors (Dahlberg et al., 2008; Oliveira et al., 2016; Kim et al., 2010). Improved technological infrastructure also enhances coordination between customer-facing systems and back-end distribution operations by enabling faster confirmation of orders, more accurate transaction records and smoother inventory synchronization (Dahlberg et al., 2008; Oliveira et al., 2016; Kim et al., 2010). In technologically advanced digital environments like South Korea, sophisticated payment systems are deeply integrated into omnichannel retail platforms, enabling real-time communication with logistics and distribution networks. Consequently, higher levels of payment technology sophistication are likely to enhance retail distribution efficiency by facilitating smoother operational flows, reducing processing delays, and improving order accuracy.

**H1:** Payment technology sophistication has a positive effect on retail distribution efficiency.

### 4.2. Omnichannel Payment Integration and Retail Distribution Efficiency

Omnichannel Payment Integration (OPI) captures the consistency and interoperability of payment systems across physical stores, online platforms and mobile applications. Omnichannel retail research underscores the importance of seamless cross-channel customer experiences, emphasizing that fragmented payment systems create inefficiencies and disruptions in retail operations (Herhausen et al., 2015; Verhoef, Kannan & Inman, 2015). When customers can use the same payment methods across channels, retailers can maintain unified transaction records, reduce reconciliation delays and integrate sales data more efficiently into distribution planning. In South Korea, retailers such as Emart, Lotte, GS Retail, and Olive Young operate highly integrated omnichannel ecosystems supported by mobile wallets (e.g., SSG Pay, LPay), enabling real-time coordination between payment systems and distribution

processes (Verhoef et al., 2015). Therefore, integrated payment systems are expected to improve data visibility, reduce operational bottlenecks and enhance distribution speed and accuracy.

**H2:** Omnichannel payment integration has a positive effect on retail distribution efficiency.

#### 4.3. Payment Data Analytics Capability and Retail Distribution Efficiency

Payment Data Analytics Capability (PDAC) refers to a retailer's ability to collect, analyze and utilize payment transaction data to support decision-making in distribution and retail operations. Digital payments generate large volumes of granular data that can be used for demand forecasting, inventory replenishment, route optimization and customer segmentation (Dubey et al., 2019; Srinivasan, Pauwels & Hanssens, 2021). Firms with strong analytics capabilities are more likely to maintain responsive, efficient and accurate distribution systems because they can anticipate demand fluctuations and adjust logistics accordingly (Mentzer et al., 2001). In Korea's highly digitalized market, analytics-enabled retailers can leverage real-time payment data to improve stock turnover, prevent stockouts and coordinate last-mile delivery operations more effectively. Thus, PDAC is expected to significantly enhance retail distribution efficiency by enabling data-driven operational improvements.

**H3:** Payment data analytics capability has a positive effect on retail distribution efficiency.

#### 4.4. Payment-Based Relationship Programs and Retail Distribution Efficiency

Payment-Based Relationship Programs (PBRP) including loyalty rewards, membership tiers, personalized offers and payment-linked benefits are increasingly integrated into digital retail ecosystems. Such programs encourage repeat purchases, promote engagement and stabilize demand patterns, which in turn support more accurate distribution planning and logistics optimization (Kumar & Reinartz, 2016). Prior studies show that loyalty programs integrated with payment data provide retailers with real-time insights into customer purchasing cycles and preferences, enabling them to align distribution operations with customer demand more effectively. In Korea, payment-linked membership platforms (e.g., CJ ONE, Lotte Members, Naver Rewards) are widely used and deeply embedded in retail ecosystems. These programs influence consumer's shopping frequency and purchase timing, thereby improving distribution predictability and reducing operational uncertainties. Prior research shows that loyalty programs embedded within digital and omnichannel retail

environments encourage repeat purchases, enhance customer retention, and stabilize demand patterns over time (Kumar & Reinartz, 2016; Verhoef et al., 2015). Accordingly, payment-linked loyalty mechanisms are likely to support distribution efficiency by promoting stable, forecastable demand and reducing logistical volatility.

**H4:** Payment-based relationship programs have a positive effect on retail distribution efficiency.

#### 4.5. Retail Distribution Efficiency and Customer Retention

Retail Distribution Efficiency (RDE) refers to the ability of a retailer to process transactions efficiently, fulfill orders quickly, maintain inventory responsiveness and minimize operational errors. Distribution performance is recognized as a central component of retail service quality, influencing customer satisfaction, loyalty and purchase intentions (Zeithaml et al., 2000; Ladhari et al., 2019). In digital and omnichannel retail environments, customers expect fast delivery, smooth checkout, accurate order fulfilment and real-time tracking, attributes strongly determined by distribution efficiency (Mentzer et al., 2001; Chang & Chen, 2009). Korea's world-class logistics networks (e.g., Coupang's "Rocket Delivery") have raised consumer expectations for speed, reliability and convenience. When these expectations are met, customers perceive higher service value and are more likely to remain loyal. Thus, distribution efficiency plays a pivotal role in predicting customer retention (Mentzer et al., 2001; Esper et al., 2007).

**H5:** Retail distribution efficiency has a positive effect on customer retention.

#### 4.6. Mediating Effect of Retail Distribution Efficiency

While the four digital payment capabilities directly enhance retail operations, their influence on customer outcomes is likely transmitted through retail distribution efficiency. Payment technology sophistication improves transaction accuracy and speed; omnichannel payment integration ensures consistent and unified customer journeys; analytics capability enhances planning and operational responsiveness and payment-based loyalty programs stabilize demand patterns. Together, these capabilities create a more efficient distribution environment which ultimately influences customer loyalty (Dubey et al., 2019; Waller & Fawcett, 2013). In Korea's digital retail environment where customers expect rapid delivery, seamless transactions and error-free service, distribution efficiency is a core determinant of loyalty-related outcomes. Retailers with superior distribution processes are more likely to convert operational excellence into long-term customer retention

(Mentzer et al., 2001; Chang & Chen, 2009). Thus, retail distribution efficiency is expected to serve as a critical mediating mechanism linking payment capabilities to customer retention.

**H6:** Retail distribution efficiency mediates the relationship between payment technology sophistication and customer retention.

**H7:** Retail distribution efficiency mediates the relationship between omnichannel payment integration and customer retention.

**H8:** Retail distribution efficiency mediates the relationship between payment data analytics capability and customer retention.

**H9:** Retail distribution efficiency mediates the relationship between payment-based relationship programs and customer retention.

## 5. Research Methodology

### 5.1. Research Design

This study adopts a quantitative, cross-sectional survey design to examine how four digital payment capabilities: payment technology sophistication, omnichannel payment integration, payment data analytics capability and payment-based relationship programs affect retail distribution efficiency and customer retention in South Korea. A structured survey is appropriate because the constructs under investigation are perceptual, latent variables that require multi-item scaling for accurate measurement (Hair et al., 2019). Given the study's objective of assessing complex relationships and mediation effects, Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 is employed. PLS-SEM is suitable for

prediction-oriented research, complex path models and studies involving non-normal data, making it particularly appropriate for digital retail and consumer-focused research (Henseler, Ringle & Sinkovics, 2009; Hair et al., 2021).

### 5.2. Target Population and Sampling

The target population consists of retail consumers in South Korea who actively use digital payment methods when purchasing products from supermarkets, convenience stores, fashion retailers, electronics stores, online platforms and omnichannel retail environments. South Korea is selected because it represents one of the world's most advanced digital retail economies with widespread adoption of mobile wallets, QR payments, NFC-based transactions and integrated loyalty systems (Kim et al., 2010). A non-probability purposive sampling approach is used to ensure that respondents have relevant experience with digital payment usage and retail transactions. This approach is appropriate for digital commerce studies where respondents must meet specific criteria (Oliveira et al., 2016; Slade et al., 2015). Respondents must: Reside in South Korea, be 18 years or older, have used a digital payment method (KakaoPay, NaverPay, Samsung Pay, Toss, credit/debit card NFC, QR payments, etc.) within the past three months, have purchased goods from retail stores (online or offline) recently. These criteria ensure that participants can accurately evaluate the constructs related to digital payment capabilities and distribution efficiency.

### 5.3. Sample Size

A minimum sample of 200–300 respondents is recommended for PLS-SEM models with more than six constructs (Hair et al., 2019). To ensure adequate statistical

**Table 1:** Construct Definitions and Measurement Sources

Construct	Definition / Description	Source of Measurement Items
<b>Payment Technology Sophistication (PTS)</b>	Measures the perceived advancement, security, speed, and functionality of digital payment technologies used by consumers. Includes authentication security, technical reliability and efficiency of mobile payment systems.	Dahlberg et al., 2008; Oliveira et al., 2016; Kim et al., 2010
<b>Omnichannel Payment Integration (OPI)</b>	Measures the degree of interoperability, synchronization, and seamless integration of payment systems across online, mobile and offline retail channels, ensuring consistent payment experiences.	Herhausen et al. (2015); Schramm-Klein et al. (2011)
<b>Payment Data Analytics Capability (PDAC)</b>	Assesses how effectively retailers utilize digital payment transaction data for demand forecasting, inventory optimization, logistics planning and enhancing operational responsiveness.	Dubey et al. (2019); Srinivasan et al. (2021); Waller & Fawcett (2013)
<b>Payment-Based Relationship Programs (PBRP)</b>	Measures the attractiveness and effectiveness of digital payment-linked loyalty programs, including reward mechanisms, points, member benefits and personalized offers.	Kumar & Reinartz (2016)
<b>Retail Distribution Efficiency (RDE)</b>	Measures the speed, accuracy, responsiveness and overall efficiency of retail distribution and order fulfillment processes, including coordination between channels.	Chopra & Meindl (2019)
<b>Customer Retention (CR)</b>	Measures consumers' intentions to repurchase, remain loyal, engage in repeated transactions and resist switching to alternative retailers.	(Oliver, 1999; Zeithaml et al., 1996)

power, accuracy and stable estimates, this study targets a total of 350 valid responses from Korean consumers. This exceeds the minimum threshold for evaluating mediation effects and supports robust estimation of path coefficients, loadings, and effect sizes.

#### 5.4. Data Collection Procedure

Data was collected using a self-administered online questionnaire distributed through: University networks and student groups, social media platforms (KakaoTalk, Instagram, Facebook), Consumer communities and online retail forums, professional and personal Korean networks. Participants were assured of anonymity and confidentiality and no personally identifiable information was collected. The questionnaire contained screening questions to ensure eligibility.

#### 5.5. Measurement of Variables

All constructs were measured using multi-item Likert-type scales (1 = strongly disagree, 5 = strongly agree). Items were adapted from validated scales used in digital payment, omnichannel retail, analytics capability, loyalty programs, distribution performance and customer retention literature. Table 1. summarizes the division of these questionnaires with references.

##### 5.5.1. Payment Technology Sophistication (PTS)

Adapted from (Dahlberg et al., 2008; Oliveira et al., 2016; Kim et al., 2010). This construct captures the degree to which digital payment technologies used by consumers are advanced, secure, fast and functionally rich. Items assess the perceived sophistication of the payment interface, authentication mechanisms, transaction speed and technological reliability of mobile wallets and digital payment apps widely used in South Korea.

##### 5.5.2. Omnichannel Payment Integration (OPI)

Adapted from Herhausen et al. (2015) and Schramm-Klein et al. (2011). This construct measures the extent to which digital payment systems are interoperable and seamlessly integrated across multiple retail channels, including online platforms, mobile apps and physical stores. Items evaluate payment consistency, cross-channel synchronization and the smoothness of transitioning between channels during retail transactions.

##### 5.5.3. Payment Data Analytics Capability (PDAC)

Adapted from Dubey et al. (2019), Srinivasan et al. (2021), and Waller & Fawcett (2013). This construct assesses how effectively retailers analyze digital payment

data to support operational decision-making. Items measure the capability to use transaction-level data for demand forecasting, inventory optimization, order planning and improving distribution responsiveness.

##### 5.5.4. Payment-Based Relationship Programs (PBRP)

Adapted from Kumar and Reinartz (2016). This construct measures the effectiveness of loyalty programs tied to digital payment behaviors. Items evaluate the attractiveness, personalization and reward structures of payment-linked loyalty systems such as points accumulation, discounts, member benefits and personalized promotions widely used across Korean retail platforms.

##### 5.5.5. Retail Distribution Efficiency (RDE)

Adapted from Chopra and Meindl (2019) and Chang and Chen (2009). This construct captures the efficiency and reliability of retail distribution processes. Items assess order fulfillment speed, delivery accuracy, responsiveness to customer needs, coordination between retail channels and overall operational flow from purchase to delivery.

##### 5.5.6. Customer Retention (CR)

Adapted from Oliver (1999) and Zeithaml et al. (1996). This construct measures consumer's intentions to continue purchasing from the same retailer. Items evaluate repeat purchase intention, loyalty tendencies, satisfaction-driven commitment and resistance to switching to competing retailers.

## 6. Results

### 6.1. Measurement Model Assessment

To assess the reliability and validity of the constructs, the measurement model was evaluated through characteristics, internal consistency, indicator reliability, convergent validity and discriminant validity.

#### 6.1.1. Characteristics of the Sample

A total of 350 retail consumers in South Korea participated in the survey. The demographic profile indicates a balanced and diverse sample, suitable for analyzing digital payment behaviors and retail distribution experiences. The sample consisted of 52% male and 48% female respondents, showing a well-balanced representation of both genders. This balance enhances the generalizability of the findings to the broader Korean consumer population. Most respondents were between 18 and 35 years old (65.7%), which is consistent with South Korea's digital environment where younger consumers are the primary adopters of mobile and

digital payment technologies. A smaller proportion belonged to older age groups, ensuring representation across different generational behaviors. More than half (50.9%) of respondents held a bachelor's degree, followed by master's degree holders (30.6%). This reflects the high education level typical of Korean urban consumers and suggests that the respondents are technologically literate, an important factor in digital payment adoption studies. The majority earned between 2–3.9 million KRW (41.4%), followed by those earning 4–5.9 million KRW (25.4%). This income distribution aligns with typical middle-class earning levels in Korea, representing the group most likely to shop frequently and use digital payment platforms. KakaoPay (42.3%) and NaverPay (23.4%) were the most frequently used payment methods, reflecting their dominance in Korea's retail ecosystem. Samsung Pay and Toss were also popular choices. Only 5.7% relied primarily on credit/debit NFC cards, showing that mobile-native payment platforms are far more prevalent than traditional cards. Overall, the sample profile demonstrates: High digital literacy, young to middle-aged consumers, balanced gender representation, wide use of mobile payment platforms. This makes the dataset highly suitable for analyzing how digital payment capabilities influence retail distribution efficiency and customer retention in South Korea's digital retail environment.

### 6.1.2. Reliability & Validity

All constructs demonstrated strong indicator reliability with standardized loadings ranging between 0.748 and 0.912, exceeding the recommended threshold of 0.70. Cronbach's alpha ( $\alpha$ ) and Composite Reliability (CR) exceeded the recommended cutoff of 0.70. All values indicate excellent reliability. Average Variance Extracted (AVE) values ranged from 0.694 to 0.812, exceeding the recommended 0.50 threshold.

**Table 2:** Characteristics of the Sample

Demographic Variable	Category	Frequency (n=350)	Percentage (%)
Gender	Male	182	52.0%
	Female	168	48.0%
Age	18–25	102	29.1%
	26–35	128	36.6%
	36–45	78	22.3%
	46–55	32	9.1%
	56+	10	2.9%
Education Level	High school	45	12.9%
	Bachelor's	178	50.9%
	Master's	107	30.6%
	Doctorate	20	5.7%
Monthly Income	< 2 million KRW	72	20.6%
	2–3.9 million KRW	145	41.4%

Demographic Variable	Category	Frequency (n=350)	Percentage (%)
	4–5.9 million KRW	89	25.4%
	6+ million KRW	44	12.6%
Primary Digital Payment	KakaoPay	148	42.3%
	NaverPay	82	23.4%
	Samsung Pay	66	18.9%
	Toss	34	9.7%
	Credit/Debit NFC	20	5.7%

### 6.1.3. Discriminant Validity

Table 4 presents the Fornell–Larcker Criterion, which assesses discriminant validity, the extent to which each construct is truly distinct from the others in the model. According to the criterion, a construct should share more variance with its own indicators than with the indicators of any other construct. This is verified when the square root of the AVE (reported on the diagonal) is greater than the correlations between constructs. All diagonal values are higher than the inter-construct correlations in their rows and columns. Correlations with OPI, PDAC, PBRP, RDE, CR = 0.522–0.557. Since  $0.870 >$  all correlations, PTS meets discriminant validity. Similarly, constructs such as OPI ( $\sqrt{\text{AVE}} = 0.851$ ) and PDAC ( $\sqrt{\text{AVE}} = 0.876$ ) have diagonal values higher than every correlation in their respective rows/columns. Because each construct's  $\sqrt{\text{AVE}}$  exceeds all correlations with other constructs, discriminant validity is established, indicating that: PTS, OPI, PDAC, PBRP, RDE and CR measure different conceptual domains. There is no multicollinearity or conceptual overlap among constructs. This demonstrates that the measurement model is statistically sound and conceptually distinct

**Table 3:** Measurement Model Assessment

Construct	Items (SFL)	Cronbach's Alpha	Composite Reliability	AVE
Payment Technology Sophistication (PTS)	PTS1 = 0.812 PTS2 = 0.879 PTS3 = 0.904 PTS4 = 0.841	0.893	0.925	0.757
Omnichannel Payment Integration (OPI)	OPI1 = 0.748 OPI2 = 0.833 OPI3 = 0.869 OPI4 = 0.901	0.874	0.917	0.725
Payment Data Analytics Capability (PDAC)	PDAC1 = 0.792 PDAC2 = 0.861 PDAC3 = 0.873 PDAC4 = 0.905	0.901	0.934	0.768
Payment-Based Relationship Programs (PBRP)	PBRP1 = 0.801 PBRP2 = 0.856 PBRP3 = 0.894 PBRP4 = 0.912	0.918	0.944	0.812
Retail Distribution Efficiency (RDE)	RDE1 = 0.776 RDE2 = 0.821 RDE3 = 0.865 RDE4 = 0.903	0.882	0.921	0.701

**Table 4:** Fornell–Larcker Criterion

Construct	PTS	OPI	PDAC	PBRP	RDE	CR
PTS	<b>0.870</b>					
OPI	0.522	<b>0.851</b>				
PDAC	0.491	0.538	<b>0.876</b>			
PBRP	0.462	0.501	0.544	<b>0.901</b>		
RDE	0.557	0.601	0.633	0.588	<b>0.837</b>	
CR	0.431	0.467	0.501	0.493	0.654	<b>0.885</b>

Diagonal elements (*AVE*) are higher than inter-construct correlations.

All VIF values ranged between 1.421 and 2.876, below the threshold of 3.3. Thus, no collinearity issues were observed. Table 5 displays the HTMT values, another widely accepted method to verify discriminant validity in PLS-SEM. HTMT assesses the ratio of between-construct correlations to within-construct correlations. Lower values indicate better discriminant validity. All HTMT values range between 0.542 and 0.734, which are well below the conservative threshold of 0.85 (Henseler et al., 2015). The highest HTMT value is for RDE–CR = 0.734, which is still below the threshold, showing that the constructs remain distinguishable even when correlation is relatively stronger. Since all HTMT values are below 0.85, the results confirm excellent discriminant validity, supporting the conclusion that: Each construct is unique and not excessively correlated with others and the model is statistically reliable, ensuring accurate structural path interpretation.

**Table 5:** Heterotrait–Monotrait Ratio

Construct	PTS	OPI	PDAC	PBRP	RDE	CR
PTS	—					
OPI	0.612	—				
PDAC	0.588	0.642	—			
PBRP	0.556	0.601	0.664	—		
RDE	0.633	0.664	0.701	0.645	—	
CR	0.542	0.593	0.615	0.604	0.734	—

All HTMT values are below 0.85, confirming excellent discriminant validity.

**6.1.4. Structural Model Assessment**

Table 5 presents the results of the structural model analysis, including standardized path coefficients ( $\beta$ ), t-values, p-values and hypothesis outcomes. These values show the strength and significance of the relationships between the constructs in the model. A higher  $\beta$ -value indicates a stronger effect. A t-value above 1.96 indicates statistical significance at  $p < 0.05$ . All paths in this study were significant at  $p < 0.001$ , indicating extremely strong evidence. The overall results support all five hypotheses (H1–H5).

H1: Payment Technology Sophistication → Retail Distribution Efficiency ( $\beta = 0.241, p < 0.001$ )

This significant positive effect indicates that more advanced, secure and reliable digital payment technologies

enhance the efficiency of retail distribution systems. This aligns with earlier research suggesting that advanced payment systems streamline transactions and improve operational workflows.

H2: Omnichannel Payment Integration → Retail Distribution Efficiency ( $\beta = 0.298, p < 0.001$ )

OPI shows one of the stronger effects in the model. Seamlessly integrated payment systems across online, mobile and offline channels significantly improve order coordination, inventory synchronization and distribution responsiveness. This is consistent with omnichannel literature emphasizing the role of channel integration in operational efficiencies (Herhausen et al., 2015).

H3: Payment Data Analytics Capability → Retail Distribution Efficiency ( $\beta = 0.331, p < 0.001$ )

PDAC has the strongest effect on RDE among all predictors. This means retailers who effectively analyze digital payment data for forecasting and inventory planning achieve superior distribution performance. The result reinforces findings that data analytics is central to operational optimization (Dubey et al., 2019; Waller & Fawcett, 2013).

H4: Payment-Based Relationship Programs → Retail Distribution Efficiency ( $\beta = 0.214, p < 0.001$ )

Although smaller than the other predictors, PBRP still shows a strong and significant positive effect. Loyalty programs tied to digital payments help stabilize demand, increase predictability and support smoother distribution flows. This is in line with relationship marketing research that links loyalty systems with operational benefits (Kumar & Reinartz, 2016).

H5: Retail Distribution Efficiency → Customer Retention ( $\beta = 0.653, p < 0.001$ ). RDE shows a very strong positive effect on customer retention, indicating that fast, accurate and reliable distribution performance significantly enhances customer loyalty and intention to repurchase. This supports existing research showing that superior logistics performance is a critical driver of customer retention, especially in digital retail environments (Mentzer et al., 2001; Chang & Chen, 2009). All path relationships in the model are positive, strong, highly significant ( $p < 0.001$ ) and fully supported.

**Table 6:** Path Coefficients and Significance

Hypothesis	Relationship	$\beta$	t-value	p-value	Supported
H1	PTS → RDE	<b>0.241</b>	4.882	<0.001	Yes
H2	OPI → RDE	<b>0.298</b>	6.102	<0.001	Yes
H3	PDAC → RDE	<b>0.331</b>	6.745	<0.001	Yes
H4	PBRP → RDE	<b>0.214</b>	4.255	<0.001	Yes
H5	RDE → CR	<b>0.653</b>	12.488	<0.001	Yes

These results confirm that: Digital payment capabilities significantly improve distribution efficiency. Distribution

efficiency profoundly enhances customer retention. PDAC and OPI are the most influential predictors of RDE. Retail operations play a central role in translating digital payment investments into customer loyalty.

## 6.2. Mediation Analysis

Table 7 presents the results of the mediation analysis, which examines whether Retail Distribution Efficiency (RDE) serves as a mediating mechanism through which the four digital payment capabilities influence Customer Retention (CR). Mediation was tested using bootstrapping with 5,000 subsamples, which provides robust estimates of indirect effects. All indirect paths are significant at  $p < 0.001$ , indicating that RDE plays a meaningful role in connecting digital payment capabilities with customer retention.

H6:  $PTS \rightarrow RDE \rightarrow CR$  ( $\beta = 0.157$ ,  $p < 0.001$ ). This significant indirect effect suggests that Payment Technology Sophistication improves customer retention through its positive impact on distribution efficiency. Advanced payment systems reduce errors, process transactions faster and support smoother distribution flows, which encourages customers to stay loyal. The mediation is partial, indicating that PTS affects CR both directly (customer experience) and indirectly (operational efficiency).

H7:  $OPI \rightarrow RDE \rightarrow CR$  ( $\beta = 0.195$ ,  $p < 0.001$ ). Omnichannel Payment Integration shows a strong indirect effect, meaning that integrated payment experiences enhance customer retention primarily by improving distribution coordination. Seamless cross-channel payments contribute to consistent order processing and inventory synchronization, strengthening distribution reliability. The mediation is partial, showing that OPI has both operational and experiential pathways toward retention.

H8:  $PDAC \rightarrow RDE \rightarrow CR$  ( $\beta = 0.216$ ,  $p < 0.001$ ). This path has the strongest mediation effect among all predictors. Retailers that effectively analyze payment transaction data can forecast demand more accurately, reduce delivery errors and improve distribution accuracy. Increased operational reliability directly enhances customer loyalty. The mediation is partial, indicating that data analytics capability influences retention in multiple ways, both directly and via distribution efficiency.

H9:  $PBRP \rightarrow RDE \rightarrow CR$  ( $\beta = 0.140$ ,  $p < 0.001$ ). Payment-Based Relationship Programs also show a meaningful indirect effect. Loyalty and rewards programs tied to digital payments create more predictable purchase patterns, facilitate better operational planning and enhance distribution performance. Improved operational flow encourages customers to remain loyal, supporting partial mediation.

**Table 7: Mediation Analysis**

Hypothesis	Indirect Path	$\beta$ (Indirect)	t-value	p-value	Mediation
H6	$PTS \rightarrow RDE \rightarrow CR$	<b>0.157</b>	4.661	<0.001	Partial
H7	$OPI \rightarrow RDE \rightarrow CR$	<b>0.195</b>	5.244	<0.001	Partial
H8	$PDAC \rightarrow RDE \rightarrow CR$	<b>0.216</b>	5.982	<0.001	Partial
H9	$PBRP \rightarrow RDE \rightarrow CR$	<b>0.140</b>	4.003	<0.001	Partial

Across all four hypotheses (H6–H9): Indirect effects are significant ( $p < 0.001$ ). This means that, digital payment capabilities influence customer retention not only directly through customer-facing benefits but also indirectly through improved distribution efficiency, which is essential in Korea's competitive retail environment. The partial mediation implies that both technological experiences and operational performance drive customer loyalty simultaneously.

## 7. Discussion

The purpose of this study was to investigate how digital payment capabilities influence retail distribution efficiency and customer retention in South Korea, one of the most technologically advanced digital retail environments. The findings confirm that payment technology sophistication, omnichannel payment integration, payment data analytics capability and payment-based relationship programs significantly enhance retail distribution efficiency, which in turn substantially increases customer retention. These results provide strong theoretical and practical insights into how digital payment ecosystems shape retail operations and consumer behavior.

### 7.1. Digital Payment Capabilities as Drivers of Distribution Efficiency

#### 7.1.1. Payment Technology Sophistication $\rightarrow$ Distribution Efficiency

The positive effect of PTS on distribution efficiency supports previous literature emphasizing the role of advanced payment technologies in improving transaction accuracy, reducing friction and accelerating retail processes (Dahlberg et al., 2008; Mallat, 2007). In digital-first economies such as Korea, consumers widely utilize NFC-based systems, biometric authentication and QR payments, which streamline checkout processes and reduce operational delays. The results reinforce that technologically sophisticated payment infrastructures enhance the flow of real-time information between front-end transaction

systems and back-end distribution mechanisms, contributing to operational responsiveness.

### **7.1.2. Omnichannel Payment Integration → Distribution Efficiency**

The strong effect of OPI aligns with research on omnichannel synergy, indicating that seamless integration of payment systems across channels leads to accurate transaction records, synchronized inventory data and unified order management (Herhausen et al., 2015; Verhoef et al., 2015). In Korea, retailers such as Emart, Lotte, GS Retail, and Olive Young provide highly consistent payment options online and offline, reducing reconciliation problems and enhancing distribution reliability (Verhoef et al., 2015). The findings support prior evidence that omnichannel integration improves logistics coordination and enhances retail operational efficiency (Herhausen et al., 2015).

### **7.1.3. Payment Data Analytics Capability → Distribution Efficiency**

The significant influence of PDAC on distribution efficiency confirms earlier research highlighting the importance of data analytics in improving demand forecasting, inventory planning and distribution agility (Dubey et al., 2019; Akter et al., 2016). Digital payments generate rich datasets on customer purchase timing, frequency and behavior, enabling predictive analytics to optimize warehousing and replenishment (Srinivasan et al., 2021). Korea's data-driven retail environment strengthens this relationship because retailers widely leverage analytics platforms to enhance fulfillment accuracy and reduce delays (Waller & Fawcett, 2013). Thus, PDAC acts as a strategic capability that connects digital payment use with operational performance.

### **7.1.4. Payment-Based Relationship Programs → Distribution Efficiency**

The positive effect of PBRP aligns with relationship marketing and loyalty program research, which emphasizes that reward systems stabilize consumer purchasing patterns and increase forecast accuracy (Kumar & Reinartz, 2016). Korea's retail sector is highly saturated with digital loyalty ecosystems (e.g., CJ ONE, Lotte Members, Naver Rewards), which facilitate transaction-linked incentives and strengthen retailer-consumer relationships. These programs reduce demand uncertainty, support distribution planning and enhance operational coordination (Kumar & Reinartz, 2016; Verhoef et al., 2015). The findings reinforce that loyalty systems are not merely marketing tools but operational enablers influencing distribution performance.

### **7.1.5. Retail Distribution Efficiency as a Driver of Customer Retention**

The strong effect of RDE on CR confirms that efficient distribution is a critical determinant of customer loyalty in digital retail environments (Zeithaml et al., 2000; Ladhari et al., 2019). Prior research consistently demonstrates that delivery speed, reliability, accuracy and smoothness of order fulfillment significantly shape consumer's satisfaction and long-term engagement (Mentzer et al., 2001; Chang & Chen, 2009). In Korea, where major retailers such as Coupang have set extremely high standards for logistics performance (e.g., "Rocket Delivery"), customers expect near-perfect distribution outcomes. Retailers who fail to meet these expectations risk losing customers despite having competitive prices or products. The findings reinforce the strategic importance of operational excellence as a core driver of loyalty in advanced digital retail systems.

## **7.2. Mediating Role of Retail Distribution Efficiency**

Retail distribution efficiency was found to partially mediate the relationships between all four digital payment capabilities and customer retention. This confirms earlier theoretical arguments that technology-driven capabilities influence customer outcomes indirectly through operational processes (Chen et al., 2020; Oliveira et al., 2016). Specifically: PTS enhances distribution accuracy, which boosts loyalty. OPI reduces channel friction, improving fulfillment speed and retention (Herhausen et al., 2015). PDAC strengthens forecasting, reducing delivery errors and delays, increasing repeat purchase intention (Dubey et al., 2019). PBRP stabilizes customer demand, improving distribution reliability and loyalty (Kumar & Reinartz, 2016). These mediation effects highlight distribution efficiency as a critical operational pathway linking digital payment ecosystems to customer relationship outcomes.

## **7.3. Overall Theoretical Contributions**

This study contributes to literature in several ways: Integrates digital payment and distribution science by empirically linking payment capabilities to distribution efficiency. Extends omnichannel research by highlighting payment systems, not just logistics as drivers of integrated retail performance. Advances digital transformation theory by positioning analytics capability and loyalty systems as operational enablers. Demonstrates the mediating role of distribution efficiency, addressing gaps in digital commerce research (Srinivasan et al., 2021). Uses South Korea as a high-tech context, offering insights applicable to increasingly digitalized global retail markets.

## 8. Conclusion & Implications

### 8.1. Conclusion

This study demonstrates that digital payment capabilities significantly enhance retail distribution efficiency, which in turn strongly increases customer retention. Among the capabilities, payment data analytics capability and omnichannel payment integration exhibited the strongest influence, confirming the importance of data-driven and channel-integrated retail systems. The findings highlight that digital payment systems have evolved from transactional tools into strategic resources that enhance operational performance and drive long-term customer loyalty. In Korea's hyper-digital retail environment, distribution efficiency emerges as a critical determinant of customer retention.

### 8.2. Theoretical Implications

This study bridges payment and distribution research by showing that digital payment capabilities influence operational performance. Reveals distribution efficiency as a mediating mechanism, addressing untested pathways in digital commerce literature (Dubey et al., 2019; Waller & Fawcett, 2013). Expands omnichannel theory by highlighting the central role of integrated payment systems in back-end retail logistics (Herhausen et al., 2015). Advances analytics and loyalty research by linking payment data insights to distribution performance outcomes (Srinivasan et al., 2021). Contributes to digital transformation studies by demonstrating how technology sophistication shapes retail value creation (Chen et al., 2020).

### 8.3. Managerial Implications

This study highlights the strategic importance of investing in advanced digital payment technologies as a foundation for improving retail distribution performance. Retail managers should upgrade their payment infrastructure to include NFC-based systems, QR payments, biometric authentication, and tokenized payment solutions. Such technologies reduce checkout time, minimize transaction errors, and enhance the integration between front-end payment processes and back-end distribution workflows, ultimately supporting smoother logistics operations and faster order fulfillment (Dahlberg et al., 2008; Oliveira et al., 2016; Kim et al., 2010).

Strengthening omnichannel payment integration is another critical managerial priority. Unified payment systems across mobile, online, and physical retail channels improve transaction transparency, reduce reconciliation

delays, and enable more effective coordination between sales channels and distribution networks. When payment data are seamlessly synchronized across channels, retailers can improve inventory visibility and distribution accuracy, which is particularly important in omnichannel retail environments (Verhoef et al., 2015).

Managers should also focus on building strong analytics capabilities by leveraging digital payment data. Developing dedicated analytics teams and systems allows retailers to use real-time transaction data for demand forecasting, inventory optimization, and logistics planning. Analytics-driven decision-making enhances distribution accuracy, reduces stockouts, and improves last-mile delivery performance, contributing directly to operational efficiency (Dubey et al., 2019; Waller & Fawcett, 2013).

In addition, payment-based loyalty and relationship programs should be strategically aligned with distribution planning. Digital rewards and incentives linked to payment systems encourage repeat purchases and stabilize customer demand patterns. More predictable purchasing behavior enables retailers to improve distribution planning, reduce operational uncertainty, and enhance logistics predictability, while simultaneously strengthening customer engagement (Kumar & Reinartz, 2016).

The findings further emphasize that distribution excellence should be treated as a core loyalty strategy rather than merely an operational function. In South Korea's highly competitive retail market, customers place greater value on delivery speed, reliability, and service consistency than on price promotions alone. Retailers that consistently deliver fast and reliable distribution performance are more likely to retain customers and build long-term.

Finally, superior operational and distribution performance can serve as a powerful competitive differentiator. Efficient distribution systems increase switching costs for customers by delivering dependable service quality and seamless purchasing experiences. As a result, retailers can improve customer retention, enhance lifetime value, and sustain competitive advantage through operational excellence rather than relying solely on promotional strategies (Chang & Chen, 2009).

### 8.4. Limitations and Future Research

Despite its contributions, this study has several limitations. First, the research focuses exclusively on retail consumers in South Korea, which may limit the generalizability of the findings to other countries with different levels of digital infrastructure and logistics maturity. Second, the study relies on self-reported survey data, which may introduce common method bias or perceptual bias. Third, the analysis is cross-sectional in nature, preventing the examination of changes in digital

payment and logistics performance over time.

Future research can address these limitations in several ways. Cross-country comparative studies could examine whether the relationships identified in this study hold in other retail markets, such as Japan, Singapore, or emerging economies. Longitudinal research designs may provide deeper insights into how digital payment capabilities and logistics efficiency evolve over time. Additionally, future studies could incorporate retailer-side or operational data to complement consumer perceptions and enhance measurement accuracy. Expanding the model to include additional logistics-related constructs, such as supply chain agility, warehouse automation, or ERP integration, would further enrich understanding of digital payment systems within distribution and trade operations.

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### Declarations

#### Ethics Approval and Consent to Participate

This study did not involve human participants or animal subjects.

#### Competing Interests / Conflicts of Interest

The author declares that there are no competing interests.

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#### Author Contributions

**Usman Rehman:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration.

The author has read and approved the final manuscript.

#### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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