The Impact of Digital Capabilities in Biopharmaceutical Enterprises on Patients' Purchase Intention in the Context of Digital Transformation: The Mediating Role of Perceived Value

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ผลกระทบของขีดความสามารถทางดิจิทัลขององค์กรชีวเภสัชกรรมต่อความตั้งใจซื้อของผู้ป่วยในบริบทของการเปลี่ยนแปลงทางดิจิทัล: บทบาทการเป็นตัวกลางของคุณค่าที่ผู้บริโภครับรู้

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บทคัดย่อ

ในยุคที่การเปลี่ยนแปลงทางดิจิทัลเป็นไปอย่างรวดเร็ว บริษัทชีวเภสัชกรรมต้องพัฒนาขีดความสามารถทางดิจิทัลเพื่อยกระดับประสบการณ์ของผู้ป่วยและเสริมสร้างความสามารถในการแข่งขัน การศึกษานี้สำรวจผลกระทบของขีดความสามารถทางดิจิทัลต่อความตั้งใจซื้อของผู้ป่วย โดยมีคุณค่าที่รับรู้เป็นตัวแปรคั่นกลาง โดยอยู่บนฐานของทฤษฎีพฤติกรรมตามแผนและทฤษฎีขีดความสามารถแบบพลวัตร การวิจัยนี้มุ่งเน้นไปที่ขีดความสามารถหลักสี่ประการ ได้แก่ การวิเคราะห์ข้อมูลลูกค้า การมีส่วนร่วมของผู้ใช้ ความปลอดภัยของข้อมูล และการบูรณาการข้ามช่องทาง โดยใช้ข้อมูลจากการสำรวจและการวิเคราะห์เชิงประจักษ์ ผลการศึกษาชี้ให้เห็นว่าขีดความสามารถทางดิจิทัลเหล่านี้ส่งผลเชิงบวกต่อความตั้งใจซื้อ นอกจากนี้ คุณค่าที่รับรู้ยังเป็นตัวกลางที่มีนัยสำคัญในความสัมพันธ์นี้ แสดงให้เห็นว่าขีดความสามารถทางดิจิทัลไม่เพียงส่งผลโดยตรง แต่ยังเพิ่มความตั้งใจซื้อทางอ้อมผ่านการยกระดับคุณค่าที่รับรู้ด้วย ผลการศึกษาเน้นย้ำถึงความสำคัญเชิงกลยุทธ์ของการเปลี่ยนแปลงทางดิจิทัลในการปรับปรุงประสบการณ์ผู้ป่วยและขับเคลื่อนผลงานในอุตสาหกรรมชีวเภสัชกรรม

คำสำคัญ : การเปลี่ยนแปลงทางดิจิทัล บริษัทชีวเภสัชกรรม ขีดความสามารถทางดิจิทัล คุณค่าที่รับรู้ ความตั้งใจซื้อ

Abstract

As digital transformation accelerates, biopharmaceutical companies are enhancing their digital capabilities to improve the patient experience and strengthen competitive advantage. Grounded in the Theory of Planned Behavior and Dynamic Capabilities Theory, this study investigates how four core capabilities—customer data analysis, user engagement, data security protection, and cross-channel integration—affect patients' purchase intention, with perceived value as a mediating variable. Survey data were collected from 489 patients with hematological, oncological, or immune-related diseases and their families in China. The data were analyzed using SPSS 26.0, employing descriptive statistics, reliability and validity tests, correlation analysis, regression analysis, and mediation effect testing. Research findings demonstrate that digital capabilities not only directly increase patient purchase intention, but also indirectly enhance it through perceived value. These findings highlight the strategic importance of digital transformation in enhancing patient value and driving performance in the biopharmaceutical industry.

Keywords: Digital transformation, biopharmaceutical companies, digital capabilities, perceived value, purchase intention

1. Introduction

In the current wave of digital transformation, technologies such as the internet, big data, and artificial intelligence are profoundly reshaping the global economic structure and corporate strategies, thereby accelerating the shift toward digitally driven innovation models (Sánchez, 2017). The digital economy has emerged as a key engine of global growth, with its contribution to GDP particularly pronounced in China (Luo, 2024). The biopharmaceutical industry is undergoing profound changes, as digital technologies are not only enhancing operational efficiency but also reshaping how companies interact with patients and deliver value. According to the China Academy of Information and Communications Technology (CAICT, 2021), digital tools have significantly optimized R&D efficiency, reduced production costs, and streamlined supply chain management. A McKinsey & Company report (2024) further indicates that leading global pharmaceutical companies have achieved substantial improvements in quality control, cost-effectiveness, and patient treatment outcomes through digital transformation.

However, existing research has rarely addressed how digital capabilities influence patients' decisions to purchase medications. Beyond product quality, a company's level of digital maturity and the perceived value it delivers are becoming critical factors in patient decision-making (Venkatesh et al., 2012; Deng & Liu, 2017). Perceived value—patients' comprehensive assessment of treatment effectiveness, safety, convenience, and service quality—serves as a core determinant of purchase intention (Sweeney & Soutar, 2001; Zeithaml, 1988). Particularly in high-involvement disease contexts, such as cancer or autoimmune disorders, the mechanism by which digital capabilities influence purchase intention through perceived value remains insufficiently explored.

To address this, the study constructs a conceptual framework: Digital Capabilities ⟶ Perceived Value ⟶ Purchase Intention, focusing on four core capability dimensions: customer data analysis, cross-channel integration, data security and privacy protection, and interactive user engagement. Theoretically, it expands the application of Dynamic Capabilities Theory (DCT) and the Theory of Planned Behavior (TPB) within the biopharmaceutical sector. Practically, it offers strategic insights for companies to enhance digital competitiveness, meet regulatory demands, and address the evolving expectations of digitally literate patients. This study, based on patient survey data, reveals the direct impact of digital capabilities on purchasing behavior and the mediating role of perceived value, offering academic and practical insights for the industry's sustainable development.

2. Research questions

1. How do different dimensions of digital capabilities in biopharmaceutical companies influence patients' purchase intention?

2. How do various types of perceived value affect patients' purchase intention?

3. Does perceived value mediate the relationship between the digital capabilities of biopharmaceutical companies and patients' purchase intention?

To address the research questions, this study aims to develop a framework of "Digital Capabilities—Perceived Value—Purchase Intention" to explore how digital capabilities influence patient purchase decisions through perceived value. It seeks to reveal both direct and indirect effects while offering strategic insights for improving patient experience and market performance in biopharmaceutical firms.

3. Literature review

This literature review focuses on several key areas: digital transformation, biopharmaceutical enterprises, digital capabilities, perceived value, and patients' purchase intention. It also draws on the Theory of Planned Behavior and the Dynamic Capabilities Theory as theoretical foundations.

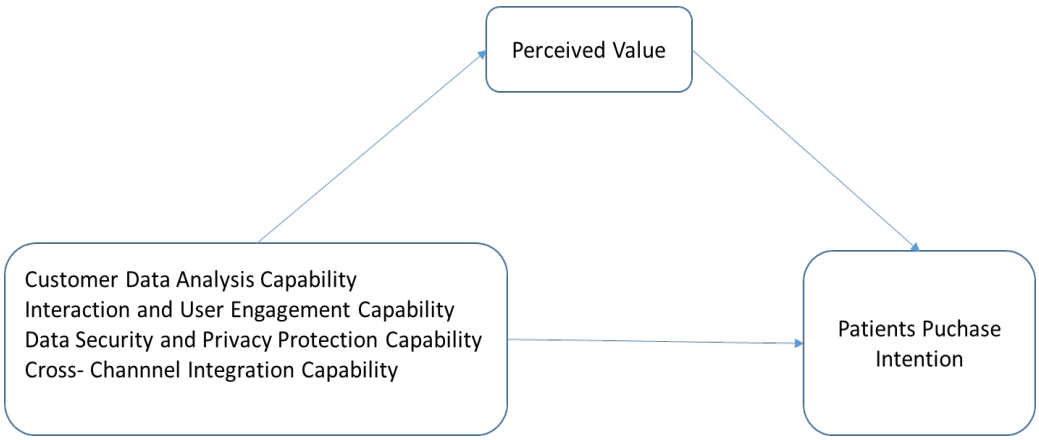

Figure 1 Theoretical Framework of Digital Capabilities in Biopharmaceutical Enterprises

3.1 Digital transformation

Digital transformation has emerged as a critical driver of competitiveness and patient care in the biopharmaceutical sector. It entails the deep restructuring of organizational models through digital technologies, exemplified by data-driven decision-making, precision R&D, intelligent manufacturing, and personalized services. Scholars such as Sousa-Zomer et al. (2020) define it as a technology-led organizational change, while Zhang et al. (2022) emphasize

its strategic nature in creating digital business models that enhance enterprise value. From an ecosystem perspective, Qian and He (2021) regard digital transformation as a reconfiguration of strategy, processes, and stakeholder networks. At a macro level, Jafari-Sadeghi et al. (2021) highlight its role in national innovation systems, and Liu et al. (2022) underline its foundational role in integrated management.

The transformation is dual-faceted, requiring alignment with the "technology-process-people" framework (Verina & Titko, 2019), and embedding ethical and regulatory compliance, as seen in Mergel et al.'s (2019) insights from the public sector. Applications such as AI-assisted target identification and blockchain-enabled drug traceability illustrate the synergy between biotechnology precision and digital agility (CAICT, 2021). This requires capabilities in data mining and process reengineering, alongside robust mechanisms for privacy and clinical transparency.

Despite progress in customer experience frameworks (Lemon & Verhoef, 2016), the interdependence between treatment effectiveness and data compliance remains underexplored. This study defines digital transformation as a co-evolution of digital capabilities, with a unique focus on leveraging patient-specific data to optimize therapeutic decisions within regulatory constraints. Biopharmaceutical firms are thus positioned not merely as drug manufacturers but as integrated providers of disease prevention, treatment, and rehabilitation. This shift enhances both competitiveness and patient experience.

3.2 Biopharmaceutical companies

Biopharmaceutical companies differ significantly from traditional pharmaceutical companies in terms of technology and industry characteristics. Traditional companies rely on chemical synthesis for small-molecule drugs, while biopharmaceutical companies focus on advanced technologies, such as genetic and cell engineering, for large-molecule drugs aimed at complex diseases, including cancer and rare diseases. These companies face high technological barriers, lengthy development cycles, and substantial capital investment, with growth largely dependent on breakthroughs in biotechnology (Pisano, 2006). The industry also benefits from collaborative innovation networks that span academia and industry, driving new drug development (Powell et al., 2005).

Digital transformation reshapes biopharmaceutical companies' value creation models by integrating AI, genomics, and big data. This has led to shifts from linear to data-driven iterative innovation and improved precision medicine systems. The convergence of IoT and CRM systems enables more dynamic and responsive patient services, thereby enhancing treatment adherence and the overall patient experience (Lemon & Verhoef, 2016). This transformation is a systemic change involving "technology, data, and services," and its success relies on organizational readiness in structure, processes, and culture (Sánchez, 2017).

This study focuses on biopharmaceutical companies with technological advantages and market influence in specific disease areas. These companies exemplify digital transformation practices that enhance competitiveness and contribute to optimizing the industry's innovation ecosystem. By integrating R&D resources and enhancing operational processes, they can transition from being drug suppliers to full-cycle health solution providers, addressing challenges such as high failure rates and lengthy development cycles.

3.3 Digital capabilities

In the digital economy era, digital capabilities have become a key driver of competitive advantage, particularly in the biopharmaceutical industry, which exhibits unique complexity. These capabilities impact drug quality control, precision in R&D, personalized patient services, and data privacy, largely because of the industry's high technical barriers, lengthy development cycles, stringent regulations, and complex patient needs.

Scholars have defined digital capability from various perspectives. Ritter and Pedersen (2020) emphasized the importance of data management and security. Liu et al. (2023) viewed it as a core competency for innovation in the digital era. Lenka et al. (2016) identified intelligence, connectivity, and analytical capabilities as its foundations. Trainor et al. (2014) emphasized social CRM, while Kannan & Li (2017) described it as an adaptive value-creation process.

Based on existing literature, this study focuses on four dimensions of digital capability tailored to the biopharmaceutical context: customer data analytics, user interaction and engagement, data security and privacy, and cross-channel integration. These dimensions reflect both the core elements of digital capability and the specific needs of the biopharmaceutical sector.

Accordingly, this paper defines digital capability in biopharmaceutical firms as the ability to leverage digital technologies for data insights, customer engagement, privacy protection, and resource integration, ultimately enhancing patients' purchase intentions. This multidimensional definition aligns with the industry's digital development needs and supports improved customer relationships, experiences, and market competitiveness.

3.4 Perceived value

Perceived value, a core concept in consumer behavior research, represents patients' subjective assessment of a product or service's overall utility, balancing "gains" and "costs" (Zeithaml, 1988). Early studies conceptualized perceived value as a transactional trade-off between perceived quality and cost (Dodds et al., 1991). Later, scholars expanded its meaning, with Woodruff (1997) proposing a "value hierarchy model" that includes functional attributes and how well patients' goals are met. Yang & Peterson (2004) emphasized emotional and social factors in value perception.

Recent studies highlight the dynamic and context-dependent nature of perceived value. For example, Wang & Hazen (2016) found that digital services enhance perceived value by increasing convenience and personalization. Blut, Chaney & Lunardo (2023) noted that data security and transparency in privacy-sensitive industries, such as biopharmaceuticals, reduce psychological costs, thereby improving value assessments. This aligns with Pura (2005) "experience–value" framework, where past interactions shape future decisions.

In the context of biopharmaceutical digital transformation, perceived value encompasses not just efficacy and price but also digital interaction elements such as privacy protection and cross-channel consistency. This study defines perceived value as the overall judgment formed by patients through the evaluation of functional, emotional, and social benefits, while weighing monetary and non-monetary costs. This concept serves as a mediator in the "digital capabilities ⟶ purchase intention" link, providing a foundation for further development of the theoretical model.

3.5 Patients' purchase intention

In the era of digital transformation, a patient's purchase intention refers to their willingness to buy biopharmaceutical products or services based on their perceived value, quality, and price. According to the Theory of Planned Behavior (Ajzen, 1991), purchase intention is influenced by three key factors: attitude, subjective norms, and perceived control. Prior studies (Pura, 2005; Mukherjee & Nath, 2007; Grewal et al., 2017) have shown that it is shaped by traditional factors, such as price and brand, as well as digital features, including personalization, interactivity, and service customization. Dodds et al. (1991) and Parasuraman et al. (1988) emphasize the role of perceived value in shaping purchase behavior, whereas Howard & Sheth (1969) view it as the result of a decision-making process.

This study defines purchase intention as patients' proactive tendency to purchase biopharmaceutical products or services within the context of digital transformation, particularly influenced by experiences of personalized services, data-driven interaction, and perceived data security.

3.6 Theory of Planned Behavior

The Theory of Planned Behavior (TPB) provides a comprehensive framework for understanding patient purchasing behavior. Extending the Theory of Reasoned Action (TRA), TPB incorporates perceived behavioral control, highlighting the influence of external factors on behavior. TRA emphasizes behavioral intention but neglects external constraints, whereas TPB includes attitude, subjective norms, and perceived control as factors that shape behavioral intention.

This study applies TPB to explore the impact of digital capabilities in biopharmaceutical companies on patients' purchase intention. Digital capabilities influence purchase intention through:

Attitude: Personalized recommendations and data analytics (Li et al., 2016) enhance patients' perceptions of quality and improve their attitudes toward purchasing. Privacy protection reduces risk perception, boosting trust and satisfaction.

Subjective Norms: Cross-channel integration ensures consistent brand experiences (Mukherjee & Nath, 2007; Verhoef et al., 2015), reinforcing social identity and influencing purchase intention.

Perceived Behavioral Control: Data security and privacy measures (Bansal et al., 2010) alleviate concerns, enhancing trust and control over the purchase decision.

In conclusion, TPB demonstrates that digital capabilities enhance patient purchase intentions by improving attitudes, social influence, and perceived control, clearly illustrating how digital transformation can drive consumer engagement in the biopharmaceutical sector.

3.7 Dynamic Capabilities Theory

Dynamic Capabilities Theory (DCT) highlights how firms sustain competitive advantage by dynamically managing resources and responding to environmental changes. Digital capabilities, as a dynamic capability, enable firms to adapt quickly to technological shifts and market demands, maintaining a competitive edge (Teece et al., 1997; Eisenhardt & Martin, 2000).

In the digital transformation of biopharmaceutical companies, DCT is applied to enhance digital capabilities. Customer data analytics provide insights into patient behavior, boosting purchase intentions (Wamba et al., 2015). Interaction and engagement capabilities foster emotional connections and loyalty, increasing purchase intention (Sashi, 2012). Data security and privacy measures enhance trust, which in turn fosters purchase intention (Bansal et al., 2015). Cross-channel integration ensures a consistent experience across platforms, a factor critical to improving patient satisfaction and informed decision-making (Verhoef et al., 2015).

Perceived value serves as a mediator in the relationship between digital capabilities and purchase intention. Zeithaml (1988) emphasizes its role in shaping attitudes and decisions. Ajzen's (1991) Theory of Planned Behavior further substantiates the influence of attitude, subjective norms, and perceived behavioral control on intention.

In conclusion, DCT elucidates how enhancing digital capabilities and perceived value within biopharmaceutical companies positively impacts patient purchase intention, thereby illustrating the transformative effect of digitalization on patient behavior.

4. Research Methodology

This study, based on the Dynamic Capabilities Theory and the Theory of Planned Behavior, investigates the influence of digital capabilities on patient purchase intention in

biopharmaceutical companies, incorporating perceived value as a mediating variable. The following hypotheses are proposed:

H1: The digital capabilities of biopharmaceutical companies have a significant positive impact on patients' purchase intention. H1a: Customer data analytics capability positively influences patients' purchase intention. H1b: Interaction and user engagement capability positively influences patients' purchase intention. H1c: Data security and privacy protection capability positively influences patients' purchase intention. H1d: Cross-channel integration capability positively influences patients' purchase intention. H2: Perceived value has a positive impact on patients' purchase intention. H3: Perceived value mediates the relationship between digital capabilities and patients' purchase intention. The questionnaire design includes dimensions of digital capabilities, perceived value, and purchase intention. After a pilot test and subsequent refinement, a 46-item questionnaire was finalized. The survey was conducted online from February 12 to 17, 2024, resulting in 489 valid responses. Data analysis was performed using SPSS 26.0, which included descriptive statistics, reliability and validity assessments, correlation analysis, regression analysis, and mediation effect tests to verify the hypotheses.

5. Research Results

5.1 Descriptive statistical analysis

The descriptive statistical analysis yielded the following results:

Table 1. Demographic Characteristics of the Sample (N = 489)

Category	Option	Frequency	Percentage
Gender	Male	218	44.58%
	Female	271	55.42%
Age	18-30 years	161	32.92%
	31-40 years	156	31.90%
	41-50 years	87	17.79%
	51 years and above	85	17.38%
Have you ever been or are you currently receiving treatment for blood diseases, cancer, or immune-related diseases?	Patient has used	238	48.67%
	Family member has used	251	51.33%
	Total	**489**	**100.00%**

The results indicate that among the respondents, 55.42% were female and 44.58% were male. In terms of age distribution, 32.92% were between 18 and 30 years old, 31.90%

were aged 31 to 40, 17.79% were in the 41 to 50 age group, and 17.38% were aged 51 and above. This reflects a higher proportion of young and middle-aged participants. Regarding treatment experience, 48.67% of respondents reported personal use of treatment for blood diseases, cancer, or immune-related conditions, while 51.33% indicated that a family member had used such treatments. These findings indicate that the sample consists mainly of women and younger to middle-aged individuals, with balanced representation of both patients and their family members, thereby providing a representative foundation for the study.

5.2 Reliability Analysis

In this study, we conducted a rigorous assessment of the internal consistency of the questionnaire using Cronbach's alpha coefficients, as detailed below.

Table 2. Analysis Results of Cronbach's Alpha Coefficients for Research Variables

Dimension	Cronbach's Alpha	Number of Items
Customer Data Analysis Capability	0.888	5
Interaction and User Engagement Capability	0.874	5
Data Security and Privacy Protection Capability	0.864	5
Cross-Channel Integration Capability	0.88	5
Functional Value	0.878	5
Emotional Value	0.867	5
Social Value	0.87	5
Security Value	0.883	5
Purchase Intention	0.83	3

As shown in the table above, the Cronbach's alpha coefficients for all dimensions in this study exceeded the threshold of 0.70, indicating a high level of internal consistency within the constructs. These results confirm the high reliability of the questionnaire, supporting its use for further statistical analysis.

5.3 Validity Analysis

Validity testing was conducted on the collected sample data using SPSS 26.0, and the results are as follows:

Table 3. KMO and Bartlett's Test of Sphericity

KMO Value		0.849
Bartlett's Test of Sphericity	Approx. Chi-Square	11815.755
	Degrees of Freedom	903
	Significance Level	0.000

The results in the table indicate that the KMO value is 0.849, which is well above the critical threshold of 0.60 and indicates sampling adequacy. This suggests that the questionnaire demonstrates strong construct validity and is suitable for further factor analysis.

5.4 Correlation Analysis

The correlation analysis identified significant relationships among the study variables. A detailed analysis is as follows:

Table 4. Pearson Correlation Matrix Table

	Customer Data Analysis Capability	Interaction and User Engagement Capability	Data Security and Privacy Protection Capability	Cross-Channel Integration Capability	Perceived Value	Purchase Intention
Customer Data Analysis Capability	1	.266**	.260**	.158**	.353**	.229**
Interaction and User Engagement Capability	.266**	1	.161**	.212**	.291**	.306**
Data Security and Privacy Protection Capability	.260**	.161**	1	.114*	.219**	.259**
Cross-Channel Integration Capability	.158**	.212**	.114*	1	.223**	.249**
Perceived Value	.353**	.291**	.219**	.223**	1	.350**
Purchase Intention	.229**	.306**	.259**	.249**	.350**	1

Note: *p<0.05 **p<0.01

The correlation analysis results indicate that there are significant positive correlations among the variables in this study, with results being statistically significant ($p < 0.01$). Specifically, customer data analysis capability shows a significant positive correlation with all other variables, particularly with perceived value ($r = 0.353$, $p < 0.01$), suggesting that this capability plays a key role in enhancing patient perceived value. The relationships between the variables were validated through the correlation tests, allowing for subsequent analysis.

5.5 Regression analysis

This study used regression analysis to explore the relationships between the hypothesized variables. The detailed analysis is as follows:

Table 5. Regression analysis of the dimensions of digital capabilities on purchase intention.

	Unstandardized Coefficients		Standardized Coefficients	t	Significance	Collinearity Statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	1.054	0.224		4.712	0.000		
Customer Data Analysis Capability	0.102	0.046	0.098	2.226	0.026	0.874	1.145
Interaction and User Engagement Capability	0.233	0.047	0.215	4.928	0.000	0.893	1.120
Data Security and Privacy Protection Capability	0.208	0.050	0.180	4.189	0.000	0.920	1.087
Cross-Channel Integration Capability	0.181	0.046	0.168	3.943	0.000	0.941	1.063
R^2	0.177						
Adjusted R^2	0.170						
F	25.975 (P=0.000)						
Dependent Variable: Purchase Intention							

The results of the regression analysis indicate that the model's R^2 value is 0.177, and the adjusted R^2 value is 0.170, meaning the independent variables explain 17.7% of the variance in purchase intention. This demonstrates some explanatory power of the model. The F-value is 25.975 ($p < 0.001$), indicating that the model is statistically significant overall. Specifically, the interaction and user engagement capability has a significant positive impact on purchase intention (B = 0.233, Beta = 0.215, $p < 0.001$). Data security and privacy protection capability (B = 0.208, Beta = 0.180, $p < 0.001$) and cross-channel integration capability (B = 0.181, Beta = 0.168, $p < 0.001$) also have significant positive effects on purchase intention. The influence of customer data analysis capability is relatively smaller (B = 0.102, Beta = 0.098, $p = 0.026$), but it is still significant. Collinearity diagnostics show that the VIF values for all independent variables are below 10, indicating no multicollinearity issues. In summary,

Hypothesis H1 is supported, meaning that the digital capabilities of biopharmaceutical companies have a significant positive impact on purchase intention.

Table 6. Regression Analysis of Digital Capabilities and Perceived Value on Purchase Intention.

	Unstandardized Coefficients		Standardized Coefficients	t	Significance	Collinearity Statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	0.396	0.262		1.511	0.131		
Digital Capabilities	0.556	0.077	0.322	7.181	0.000	0.812	1.231
Perceived Value	0.384	0.082	0.210	4.683	0.000	0.812	1.231
R^2	0.206						
Adjusted R^2	0.203						
F	63.217 (P=0.000)						
Dependent Variable: Purchase Intention							

The regression results show that digital capabilities (B = 0.556, Beta = 0.322, $p < 0.001$) and perceived value (B = 0.384, Beta = 0.210, $p < 0.001$) both have significant positive effects on purchase intention, supporting Hypothesis H2. The model explains 20.6% of the variance in purchase intention ($R^2 = 0.206$; Adjusted $R^2 = 0.203$) and is statistically significant ($F = 63.217$, $p < 0.001$). VIF values are all below 10, indicating no multicollinearity.

5.6 Mediation effect test of perceived value

In the mediation analysis section, this study aims to examine whether perceived value, as a mediating variable, mediates in the relationship between the digital capabilities of biopharmaceutical companies and patients' purchase intention.

Table 7. Mediation Analysis

	Effect Value	Boot SE	Boot LLCI	Boot ULCI	Proportion of Total Effect (%)
Indirect Effect	0.1572	0.0357	0.089	0.2299	22.04%
Direct Effect	0.5559	0.0774	0.4038	0.7081	77.96%
Total Effect	0.7131	0.0712	0.5732	0.8531	

The analysis of the mediating effect indicates that the total effect of digital capabilities on purchase intention is statistically significant (effect size = 0.7131, Boot LLCI = 0.5732, Boot ULCI = 0.8531). Specifically, digital capabilities exert a significant indirect effect on purchase intention through perceived value (effect size = 0.1572, Boot LLCI = 0.089, Boot ULCI = 0.2299),

accounting for 22.04% of the total effect. This suggests that perceived value plays a partial mediating role in the relationship between digital capabilities and purchase intention. In addition, the direct effect of digital capabilities on purchase intention remains significant (direct effect = 0.5559, Boot LLCI = 0.4038, Boot ULCI = 0.7081), representing 77.96% of the total effect. These results indicate that digital capabilities not only influence purchase intention indirectly via perceived value but also have a substantial direct impact. In summary, these findings support Hypothesis H3.

6. Discussion

This study confirms that four core digital capabilities—customer data analysis, user engagement, data security, and cross-channel integration—significantly enhance patients' purchase intention (H1). Perceived value partially mediates this relationship (H2) and is positively associated with purchase intention (H3), highlighting the importance of patients' perceptions of professionalism, convenience, and security in digital healthcare settings.

These findings align with previous research. For instance, the positive influence of digital capabilities is consistent with Kannan and Li (2017) and Verhoef et al. (2015), who emphasized the role of data-driven decision-making and digital engagement in improving customer experience. Similarly, the mediating role of perceived value echoes the work of Zeithaml (1988) and Sweeney and Soutar (2001), who identified functional, emotional, and social value as key drivers of purchase intention.

However, some deviations were observed. Unlike Kannan and Li (2017), who highlighted customer data analysis as a dominant factor, this study found its influence weaker compared to user engagement, possibly due to the biopharmaceutical industry's reliance on trust and direct communication. Moreover, while Bansal et al. (2010) focused on privacy's direct effect on trust, our findings suggest data security also indirectly boosts purchase intention via perceived value—especially vital in sensitive sectors like healthcare.

Theoretically, this study extends the Theory of Planned Behavior (Ajzen, 1991) and supports the Dynamic Capabilities Theory (Teece et al., 1997), offering a dual framework for understanding how digital transformation drives patient engagement.

Practically, biopharmaceutical firms should: 1) leverage data analytics for personalized health services; 2) build interactive digital platforms to engage patients; 3) enhance data privacy to foster trust; 4) integrate online-offline channels for seamless experiences; and 5) increase perceived value across functional, emotional, and social dimensions.

In summary, this study highlights the strategic role of digital capabilities and perceived value in shaping patient behavior, offering theoretical insight and practical direction for digital transformation in the biopharmaceutical sector.

7. Conclusion

Through empirical analysis, this study provides an in-depth examination of the impact of digital capabilities on patient purchase intention in biopharmaceutical companies, as well as the underlying mechanisms through which this influence operates. The findings reveal that digital capabilities—including customer data analysis capability, interaction and user engagement capability, data security and privacy protection capability, and cross-channel integration capability—exert a significant positive direct effect on patients' purchase intention ($B = 0.556$, $p < 0.001$).

Among these, the effect of interaction and user engagement capability is the most pronounced ($B = 0.233$, $Beta = 0.215$, $p < 0.001$), suggesting that strengthening user interaction and engagement significantly promotes patients' purchasing behavior. Data security and privacy protection capability ($B = 0.208$, $Beta = 0.180$, $p < 0.001$) and cross-channel integration capability ($B = 0.181$, $Beta = 0.168$, $p < 0.001$) also show strong positive effects, underscoring patients' sensitivity to the protection of personal health information and the importance of optimizing multi-channel user experiences. While customer data analysis capability shows a comparatively smaller effect ($B = 0.102$, $Beta = 0.098$, $p = 0.026$), it remains statistically significant, indicating that leveraging big data for personalized recommendations can effectively enhance purchase intention.

Further analysis reveals that perceived value plays a significant mediating role in the relationship between digital capabilities and purchase intention, with an indirect effect of 0.1572, accounting for 22.04% of the total effect. This indicates that in addition to developing digital capabilities, biopharmaceutical companies should focus on increasing patients' perceived value of drugs or services to further stimulate purchasing behavior. Moreover, perceived value itself is a strong predictor of purchase intention ($B = 0.384$, $Beta = 0.210$, $p < 0.001$), establishing it as a key driving factor. This highlights the importance of enhancing the overall perceived value—across functional, emotional, social, and safety-related dimensions—in biopharmaceutical marketing strategies.

In conclusion, this study confirms the significant, positive impact of digital capabilities on patient purchase intention and affirms the important mediating role of perceived value. The findings offer both theoretical insights and practical guidance for biopharmaceutical firms seeking to optimize resource allocation, enhance patient experience, and strengthen market competitiveness amid ongoing digital transformation. By advancing digital capabilities and increasing perceived value, companies can effectively bolster their competitive advantage and support sustainable, long-term development.

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