

**EXAMINING AUGMENTED REALITY AS A PRODUCT  
DISPLAY FORMAT IN ONLINE RETAILING: A  
COMPARATIVE ANALYSIS**

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**DEPARTMENT OF MANAGEMENT STUDIES  
INDIAN INSTITUTE OF TECHNOLOGY DELHI**

**FEBRUARY 2025**

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COMPARATIVE ANALYSIS**

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*by*

**PRAGYA JAYASWAL**

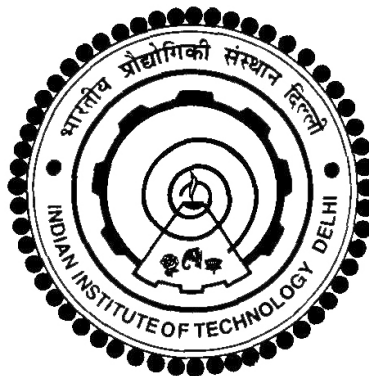
**DEPARTMENT OF MANAGEMENT STUDIES**

**Submitted**

*in fulfillment of the requirements of the degree of*

**DOCTOR OF PHILOSOPHY**

*to the*



**INDIAN INSTITUTE OF TECHNOLOGY DELHI**

**FEBRUARY 2025**

*This thesis is dedicated to my mother,*

*Mrs. Kanchan Jayaswal*

*Thank you, mumma, for always believing in me and being my  
pillar of strength.*

# CERTIFICATE

The thesis titled, “**Examining Augmented Reality as a Product Display Format in Online Retailing: A Comparative Analysis**,” being submitted by Ms. Pragya Jayaswal to the Indian Institute of Technology Delhi for the award of the degree of Doctor of Philosophy is a record of bonafide research work carried out by her. She has worked under my supervision and has fulfilled all the requirements for the submission of this thesis, which has attained the standard required for a PhD degree at this institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

(Prof. Biswajita Parida)

Assistant Professor, Marketing Area,

Department of Management Studies,

Indian Institute of Technology Delhi

# ACKNOWLEDGMENTS

I begin this acknowledgment section by reflecting on the day I started my PhD journey—a day filled with apprehension as I left my job and embraced the complexities of student life once again. Coming to IIT Delhi was a dream seeded during my graduation days when I wanted to pursue a B.Tech. from here, but God had some other plans. Reflecting on this journey, I am reminded of how destiny weaves its course in mysterious ways, as it took a decade to finally realize this dream of coming to IIT Delhi, but this time to pursue a PhD.

Unlike previous educational levels with clear structures and plans, the PhD journey has been longer, much less structured, and full of setbacks. But, throughout this journey, my mother—Mrs. Kanchan Jayaswal has been my unwavering support. From my school days through my PhD, she has been more than just a parent—she has been my study partner. From the early stages of research paper writing to the anxious moments before clicking the “submit” button during submissions, her presence has been a constant source of strength. I recall the countless times I received rejections e-mails from journals, tears flowing, yet her reassuring voice saying, “*arrey mehanat karo tum sab kar logi...shuru mein pareshan hoti ho lekin fir sab karleti ho...*”, never faltered. Today, as I complete this milestone, I dedicate my PhD to my mother, whose sacrifices and belief in me made this possible. Her unconditional love has shaped me into the person I am today.

The same goes for my father Mr. Divy Jayaswal; although he may not fully understand the intricacies of my journey, he made an effort to be with me. His reassuring words—especially during moments of doubt—have been a great support as he said: “*tension mat lo, sab acha he hoga*”—these words reassured me that things would unfold in the best possible way and gave me the strength to persevere.

I am also thankful to my sister, Suyagya, for being there with me during our late-night study sessions, especially throughout the challenging COVID-19 lockdown years. Her presence was motivating and comforting as we sat together for long hours, studying side by side. Her dedication kept me going, and I owe her heartfelt thanks for being my study companion and source of motivation during those times.

I find my solace in the unwavering support of my husband, Ishu. Enduring hour-long phone calls filled with tears and frustrations, he stood by me with unwavering patience and understanding. During the term of this degree, we thankfully got married after waiting for almost eight years, and his presence then became my full-time anchor through the stormy seas of this journey. He consistently ensured that our personal life only served as a constant motivation for my work, never becoming a hindrance. His understanding enabled me to navigate both the personal and professional realms seamlessly.

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Before my tears turn my vision blurry, I would like to raise a cheer to myself for standing through my personal and professional life during these times. I cannot forget the silent, long walks I took outside the central library, encouraging and sometimes crying by myself during all the revise and resubmit phases, saying, "*I can do this; it will be done.*" The challenges and joys of this path are hard to convey to others, which taught me the importance of embracing my journey. In conclusion, this thesis witnesses the profound impact of familial support and love. I extend my heartfelt thanks to all who have been part of this journey, whether in spirit or in person. This achievement would not have been possible without your unwavering belief in me.

Pragya Jayaswal

# ABSTRACT

Augmented reality (AR) is a nascent interactive technology rapidly revolutionizing the marketing field, particularly in the online retailing industry, as it enhances the online shopping experience by offering immersive product-related information. Driven by its increasing popularity in the online retail space, there has been significant growth in academic research on the topic. Considering the growing interest of practitioners and scholars in this emerging field, the thesis starts by offering a holistic overview of the past, present, and future of AR in marketing (ARM) in general. The thesis enriches the ARM scholarship by integrating a quantitative bibliometric analysis with a chronological-thematic review and a qualitative content analysis to develop a more comprehensive understanding of this novel area. The bibliometric analysis reveals the key performance indicators as well as the social and conceptual structure of the ARM research field. The chronological-thematic review exhibits the advancement of ARM research over time and forecasts the emerging trends for the domain. Finally, the content analysis of recent articles reveals the current research hotspots and provides future research directions. After exploring the wide deployment of AR in marketing and acknowledging the increasing use cases of AR in online retailing, the thesis proceeds by consolidating the existing literature on AR in online retailing. For this, the thesis conducts a hybrid systematic review (integration of a structured and a framework-based systematic review), highlighting the development of AR in online retailing in terms of publications, dominant methodologies, theories, and research focus to assist scholars in navigating the topic of AR deployment in online retailing. The thesis also proposes a comprehensive drivers, barriers, and consequences (DBC) framework featuring the tested and proposed variables for future research.

Additionally, gap analysis is done using the TCCM approach on theory (T) development, the context (C) of existing studies, characteristics (C), and methodological (M) approaches. The gap analysis reveals a dearth of knowledge on the brand-related outcomes of AR in online retailing for different product categories (self and surrounding conditions) and two key product display formats: AR and 3D. Moreover, it is analyzed that the literature narrowly explores the perspective of different stakeholders towards AR in online retailing, building a knowledge gap between the managers and the customers.

To bridge this gap, the thesis conducts a first-hand exploration of the different perspectives of stakeholders on AR deployment in online retailing (Study 1) by conducting a multi-method study. The study comprises of document content analysis, customer review analysis, and semi-structured interviews with 33 stakeholders, including AR developers, managers of AR-induced online retailing brands, and customers with three different levels of AR exposure in online retailing. A research framework stemming from the literature gap analysis and the findings of Study 1 is proposed, which is then empirically tested in Studies 2 and 3. The thesis empirically validates the proposed framework for two formats, 3D and the AR product display, and tests the application of these two formats for two distinct product categories, self (Study 1) and surrounding product categories (Study 2). The results reveal that AR-based product displays, compared to 3D, positively trigger media features (such as perceived informativeness and ease of imagination) and consumer psychological factors (e.g., psychological ownership and decision comfort). Moreover, AR-based product displays also trigger much positive brand-related (e.g., customer-brand engagement and brand-usage intent) and purchase-related outcomes (willingness to pay a price premium)

compared to 3D displays in both the self (Study 2) and surrounding augmentation (Study 3) conditions.

The findings and an elaborative implications section of the thesis can benefit AR developers and brand managers in understanding the current AR landscape and in making strategic decisions based on the implementation and usage of AR in online retailing. The implication section also offers guidelines for stakeholders on designing an effective AR-induced online retail platform. Additionally, the thesis lays out potential theoretical implications with research ideas and research questions for future scholars venturing into the novel field of AR in online retailing.

## सार

ऑगमेंटेड रियलिटी (AR) एक नई इंटरैक्टिव तकनीक के रूप में उभरी है, जो तेजी से मार्केटिंग क्षेत्र को बदल रही है, विशेष रूप से ऑनलाइन रिटेलिंग उद्योग में, क्योंकि यह इमर्सिव उत्पाद जानकारी प्रदान करके ऑनलाइन शॉपिंग अनुभव को बढ़ाती है। ऑनलाइन रिटेलिंग प्रथाओं में इसके तेजी से बढ़ते चलन से प्रेरित होकर, AR पर अकादमिक शोध में तेजी आई है। इस उभरते हुए क्षेत्र में अभ्यासकर्ताओं और विद्वानों की बढ़ती रुचि को ध्यान में रखते हुए, यह शोध प्रबंध मार्केटिंग के क्षेत्र में AR (ARM) के अतीत, वर्तमान और भविष्य के समग्र दृष्टिकोण की पेशकश करती है। यह शोध प्रबंध ARM के वर्तमान और विकसित शोध प्रोफ़ाइल के साथ-साथ इसके सामाजिक और वैचारिक संरचनाओं का विश्लेषण करके आगे के शोध को प्रेरित करती है। यह विश्लेषण इस क्षेत्र की अधिक व्यापक समझ विकसित करने और भविष्य के शोध पाठ्यक्रमों का सुझाव दे कर, ARM छात्रवृत्ति को समृद्ध करती है। ग्रंथसूची विश्लेषण ARM शोध क्षेत्र के प्रमुख प्रदर्शन संकेतकों और सामाजिक और वैचारिक संरचना को प्रकट करता है। यह शोध समय के साथ ARM की प्रगति को प्रदर्शित करती है और उभरते रुझानों का पूर्वानुमान लगाती है। अंत में, हाल के लेखों के सामग्री विश्लेषण से वर्तमान शोध हॉटस्पॉट का पता चलता है और भविष्य के शोध दिशाएं प्रदान करता है।

मार्केटिंग के क्षेत्र में AR के व्यापक उपयोग की खोज करने के बाद, यह शोध प्रबंध ऑनलाइन रिटेलिंग में AR पर मौजूदा साहित्य को एक हाइब्रिड व्यवस्थित समीक्षा (एक संरचित और एक रूपरेखा-आधारित व्यवस्थित समीक्षा का एकीकरण) आयोजित करके स्पष्ट रूप से संश्लेषित करती है, जो प्रकाशनों, प्रमुख पद्धतियों, सिद्धांतों के संदर्भ में ऑनलाइन रिटेलिंग में AR के विकास पर प्रकाश डालती है ताकि विद्वानों को ऑनलाइन रिटेलिंग में AR के उपयोग के विषय पर नेविगेट करने में सहायता मिल सके। यह शोध प्रबंध ऑनलाइन रिटेलिंग में AR के उपयोग

को प्रभावित करने वाले विभिन्न चर के बीच संबंधों की पहचान करने के लिए भविष्य के शोध के लिए परीक्षण और प्रस्तावित चर की विशेषता वाले एक व्यापक चालक, बाधा और परिणाम (डीबीसी) ढांचे का प्रस्ताव टीसीसीएम दृष्टिकोण का उपयोग करके करती है।

अंतर विश्लेषण से विभिन्न उत्पाद श्रेणियों (स्वयं और आसपास की स्थितियों) और दो प्रमुख उत्पाद प्रदर्शन प्रारूपों: AR और 3D उत्पाद डिस्ले के लिए ऑनलाइन रिटेलिंग में AR परिनियोजन के ब्रांड-संबंधी परिणामों पर ज्ञान की कमी का पता चलता है। इसके अलावा, साहित्य ऑनलाइन रिटेलिंग में AR के प्रति विभिन्न हितधारकों के दृष्टिकोण का संकीर्ण रूप से पता नहीं लगाता है, जिससे प्रबंधकों और ग्राहकों के बीच एक अंतर पैदा होता है। इस अंतर को पाटने के लिए, यह शोध प्रबंध दस्तावेज़ सामग्री विश्लेषण, ग्राहक समीक्षा विश्लेषण और 33 हितधारकों के साथ अर्ध-संरचित साक्षात्कारों सहित एक बहु-विधि अध्ययन आयोजित करके ऑनलाइन रिटेलिंग (अध्ययन 1) में AR परिनियोजन पर हितधारकों के विभिन्न दृष्टिकोणों की खोज करती है, जिसमें AR डेवलपर्स, AR-प्रेरित ऑनलाइन रिटेलिंग ब्रांडों के प्रबंधक, और ऑनलाइन रिटेलिंग में AR एक्सपोजर के तीन अलग-अलग स्तरों वाले ग्राहक शामिल हैं।

साहित्य अंतराल विश्लेषण और अध्ययन 1 के निष्कर्षों से उत्पन्न एक शोध रूपरेखा प्रस्तावित की गई है, जिसे फिर अध्ययन 2 और 3 में अनुभवजन्य रूप से परखा गया है। यह शोध प्रबंध दो प्रारूपों, 3D और AR उत्पाद प्रदर्शन के लिए प्रस्तावित मॉडल को अनुभवजन्य रूप से मान्य करती है, और दो अलग-अलग उत्पाद श्रेणियों, स्वयं (अध्ययन 1) और आसपास के उत्पाद श्रेणियों (अध्ययन 2) के लिए इन दो प्रारूपों के अनुप्रयोग का परीक्षण करती है। परिणाम बताते हैं कि 3D की तुलना में AR-आधारित उत्पाद प्रदर्शन, मीडिया सुविधाओं (जैसे कथित सूचनात्मकता और कल्पना की आसानी) और उपभोक्ता मनोवैज्ञानिक कारकों (जैसे, मनोवैज्ञानिक स्वामित्व और निर्णय आराम) को सकारात्मक रूप से ट्रिगर करते हैं। इसके अलावा, AR-आधारित

उत्पाद प्रदर्शन भी स्वयं (अध्ययन 2) और आसपास के संवर्धन (अध्ययन 3) दोनों स्थितियों में 3D डिस्प्ले की तुलना में बहुत अधिक सकारात्मक ब्रांड-संबंधी (जैसे, ग्राहक-ब्रांड जुड़ाव और ब्रांड-उपयोग इरादा) और खरीद-संबंधी परिणाम (कीमत प्रीमियम का भुगतान करने की इच्छा) को ट्रिगर करते हैं।

इस शोध प्रबंध के निष्कर्ष और विस्तृत निहितार्थ अनुभाग AR डेवलपर्स और ब्रांड प्रबंधकों को वर्तमान AR परिदृश्य को समझने और ऑनलाइन रिटेलिंग में AR परिनियोजन और उपभोग पैटर्न के आधार पर रणनीतिक निर्णय लेने में लाभ पहुंचा सकते हैं। इसके अतिरिक्त, यह शोध प्रबंध भविष्य के विद्वानों के लिए शोध विचारों और हितधारकों के लिए एक प्रभावी AR-प्रेरित ऑनलाइन रिटेल प्लेटफॉर्म डिज़ाइन करने के लिए दिशा-निर्देशों के साथ संभावित सैद्धांतिक निहितार्थ प्रस्तुत करती है।

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# List of Acronyms/Abbreviations

S. No.	Acronyms/Abbreviations	Explanation
1.	ABDC	Australian Business Deans Council
2.	AJG	Academic Journal Guide
3.	AR	Augmented Reality
4.	ARM	Augmented Reality Marketing
5.	AVE	Average Variance Extracted
6.	BCG	Boston Consulting Group
7.	BUI*	Brand Usage Intent
8.	CAGR	Compound Annual Growth Rate
9.	CBE*	Customer-Brand Engagement
10.	CB-SEM	Covariance-Based Structural Equation Modeling
11.	CE*	Cognitive Engagement
12.	CMB	Common Method Bias
13.	COVID-19	Coronavirus Disease 2019
14.	CR	Composite Reliability
15.	DBC	Drivers, Barriers, and Consequent
16.	DC*	Decision Comfort
17.	EE*	Emotional Engagement
18.	EM*	Ease of Imagination
19.	FDI	Foreign Direct Investment
20.	FICCI	Federation of Indian Chambers of Commerce & Industry
21.	GTRI	Global Trade Research Initiative
22.	HCI	Human-Computer Interaction
23.	HTMT Ratio	Heterotrait-Monotrait Ratio
24.	IAB	Interactive Advertising Bureau
25.	IAMAI	Internet and Mobile Association of India
26.	IBEF	India Brand Equity Foundation
27.	ICC	International Chamber of Commerce
28.	IF	Impact Factor
29.	IRT	Innovation Resistance Theory
30.	IT	Information Technology
31.	LM	Linear Regression Model
32.	MICOM	Measurement Invariance of Composite Models
33.	MR	Mixed Reality
34.	PI*	Perceived Informativeness
35.	PLS-SEM	Partial Least Squares Structural Equation Modeling
36.	PO*	Psychological Ownership
37.	PwC	PricewaterhouseCoopers
38.	RMSE	Root Mean Squared Error
39.	RQ	Research Question
40.	SE*	Social Engagement
41.	SEM	Structural Equation Modeling
42.	SJR	SCImago Journal Rank
43.	SLR	Systematic Literature Review
44.	SOR	Stimulus Organism Response
45.	SRMR	Standardized Root Mean Square Residual

46.	TAM	Technology Acceptance Model
47.	TC	Total Citations
48.	TC/Y	Total Citations per Year
49.	TCCM	Theory, Context, Characteristics, and Methodology
50.	U&G Theory	Uses and Gratifications Theory
51.	USD	United States Dollar
52.	VIF	Variance Inflation Factor
53.	VR	Virtual Reality
54.	WTPP*	Willingness to Pay a Price Premium

**Note:** \* abbreviations used for convenience in *Chapter 6: Empirical validation of AR in online retailing framework*.