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REVIEW ARTICLE

Multidisciplinary vs. Interdisciplinary vs. Transdisciplinary Approaches: Key Differences and In-Depth Analysis

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ABSTRACT

Research is considered as the most authentic way of knowledge derivation which might be applied either in science (scientific research) or industry (industrial research) or both to solve the global issues. To achieve the optimum version of reproducible and authentic knowledge, several approaches are being applied such as interdisciplinary, multidisciplinary and transdisciplinary research approaches. Multidisciplinary and interdisciplinary research approaches are widely used techniques where the experts of different disciplines work together whereas in the Transdisciplinary research approach, an individual or team is expert of almost all disciplines and apply a holistic approach enforcing you to think outside the box. Current article is an In-Depth Analysis of all these approaches, understanding the key differences and how to apply a transdisciplinary approach for a more authentic conclusion.

Keywords: Research Approaches, Multidisciplinary, Cross-disciplinary, Interdisciplinary, Transdisciplinary

Doing research is a passionate career in which researchers are dedicating their lives to knowledge creation and problem-solving. Doing research requires a systematic approach to draw meaningful, reliable and reproducible conclusions with valid methodologies and authentic references. Doing research is a repetitive cascade of research activities which is generally composed of nine general steps, including research idea → literature review → methods → results → publications (research outputs) (Zhu, 2025). Past few decades have seen enormous research outputs following several research approaches with the involvement of collaboration across different fields of expertise. Among all these, three approaches are widely used such as multidisciplinary, interdisciplinary and transdisciplinary research approaches. Although these terms are generally discussed as working together, all these approaches have distinct characteristics defining the way of collaboration (Mitchell, 2005). The current analysis is an attempt to describe and discuss these approaches in detail focusing on the practical applications and best outcomes of these approaches in solving global issues.

In-Depth Analysis of Research Approaches

Knowledge is a valuable tool and humanity is relying on innovative and new knowledge to survive,

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evolve and develop. Recent example of applied knowledge to survive is the Covid19 knowledge which helped to design preventative strategies and to develop a vaccine to counter the spread of the disease (Tovstiga and Tovstiga, 2021). Several research approaches are applied to develop knowledge based on the type of knowledge like priori knowledge or posteriori knowledge (Tahko, 2011).

Table 1A: Classification of Qualitative Research Methodologies

No.	Name	Characteristic
1.	*Case Study*	*1. Study of a specific subject* *2. Variety of data collection* *3. A holistic understanding*
2.	*Ethnography*	*1. Study of culture of communities* *2. Data collected via close observation* *3. Interpreting beliefs, social dynamics, etc*
3.	*Grounded Theory*	*1. Systematically analysis of qualitative data*
4.	*Phenomenology*	*1. Understanding a phenomenon or event by participants' experiences*

Table 1B: Classification of Quantitative Research Methodologies

No.	Name	Characteristic
1.	*Experimental*	*1. Used to test causal relationships* *2. Manipulating the variables* *3. Randomly assignment of subjects* *4. Conducted in a controlled environment (e.g., a lab)*
2.	*Quasi-experimental*	*1. Testing the causal relationships* *2. No-random assignment of subjects* *3. Comparative analysis of the outcomes* *4. Conducted in a natural environment (i.e. ecological)*
3.	*Correlational*	*1. Testing the relationship of variables* *2. Influence-free measurement of variables*
4.	*Descriptive*	*1. Describing characteristics, averages, trends, etc* *2. Influence-free measurement of variables*

Every research approach is applied via various research methodologies to derive the knowledge and these research methodologies are divided into two main categories, qualitative research or quantitative research which are further classified into several sub-categories as explained in table 1A and 1B (Dawadi et al., 2021, Irfan-maqsood, 2024).

In **multidisciplinary research** approach, researchers from different disciplines work together in a compartmentalized model of contributions to provide discipline-specific methods, perspectives, and knowledge on a common research project. This approach lacks a unified framework of collaboration as researchers work side by side, presenting solutions in their own perspectives (Heller et al., 2008). Consider an example of a biomedical engineering project, where a team of scientists and engineers are collaborating for the development of a technological innovation. In this project, the biological scientists are focusing on the biological aspects, whereas engineers are focusing on the technical feasibility lacking a comprehensive understanding of the issue from all angles (Glasgow et al., 2018). Multidisciplinary research is a good approach for issues that require contributions from various disciplines and there is no need of integrated knowledge for reaching a conclusion. Another prominent example of multidisciplinary research is related to environmental sciences where climatologists provide data on weather patterns, environmental scientists explore the ecosystems and economists evaluate the potential economic impacts of climate change (Burroughs, 2001). Although it remains as a most popular way of collaboration among researchers, but recently, i**nterdisciplinary research** approach is gaining more momentum which is in contrast to multidisciplinary research, involves a higher degree of integration among the disciplines. In interdisciplinary research, researchers from various fields collaborate on an issue with the sole purpose of knowledge integration and to develop methods for a more holistic understanding of the issue (Tobi and Kampen, 2018). The key feature of interdisciplinary research which make it distinguished from multidisciplinarity is the blending of knowledge from different fields into a cohesive framework. The example of an

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interdisciplinary project could be the understanding of the impact of urbanization on public health, in which experts from different fields such as urban planning, sociology, medicine, and environmental science would not only contribute their individual insights but also work together to combine their knowledge into a comprehensive analysis and reach a more holistic conclusion acceptable for all disciplines (Krabbendam et al., 2021). Issues related to the environmental sustainability and social inequality etc are often require interdisciplinary approaches (Hariram et al., 2023).

The **transdisciplinary research approach** is an enhanced evolution of the multidisciplinary and interdisciplinary approaches where a team leader or team of experts having knowledge and understanding of almost all disciplines work together on a specific issue to think out of the box (Lawrence et al., 2022). They consider the academic community as a box and focus on real social issues via developing comprehensive knowledge of social science, policy science in addition to medical or pure science and technological development. The transdisciplinary researchers focus to engage the all stakeholders of the society such as policymakers, practitioners, and even the community members i.e. general public (Bracken et al., 2015, John et al., 2023). Transdisciplinary researchers are aimed to generate the knowledge that focus on addressing the real-world problems in a comprehensive and practical manner.

Transdisciplinary research approaches often develop new theories, SOPs, models, or methodologies that are directly beneficial for the society (del Cerro Santamaría, 2015). The examples of the issues where transdisciplinary research approaches are applied include but not limited to climate change, global health crises, or social justice etc. For example, in case of global health crises, transdisciplinary teams composed of researchers with major in medicine, public health, economics, law, and community development etc work together to develop scientifically strong and socially applicable models or solutions. Transdisciplinary research approach is also known as the approach of co-creation of knowledge which is not achievable without strong integration of all related disciplines as this approach deals with the real-world issues and develops technologies and models that are directly applicable in the society instead of just remaining pieces of knowledge in the research papers (Jacobi et al., 2022).

Holistic Approach and Transdisciplinarity

In the modern era, we are facing more complex and interconnected global issues as compared to the past decades such as climate change, social inequality, and health crises etc. The researchers around the world have failed or been less successful to present the solution as they followed old fashioned, traditional and siloed research approaches. These complex global issues are in need of holistic approach signifying the value of an emerging area of research, Transdisciplinarity (Bunders et al., 2015).

In holistic approaches, the society is considered as a whole system in the research project instead of focusing just one sided solution of each social issue. The system here, could be a social, ecological, or technological system and it is divided into components where inter-relations of each component are studied in multiple perspectives before finalizing the project. As holistic approach is the base of transdisciplinarity, a concept of co-creation is followed strictly while focusing on the collaboration across disciplines e.g., natural sciences, social sciences, humanities and involvement of non-academic contributors such as policymakers, local communities and industry experts. For example, when addressing issues like public health, transdisciplinary teams might include medical professionals, social workers, policymakers and community members, each contributing their unique insights to develop comprehensive solutions (Somerville and Rapport, 2002, Leavy, 2016). A pictorial presentation of similarities and key differences of multidisciplinary, interdisciplinary and transdisciplinary research approaches are given in figure 2

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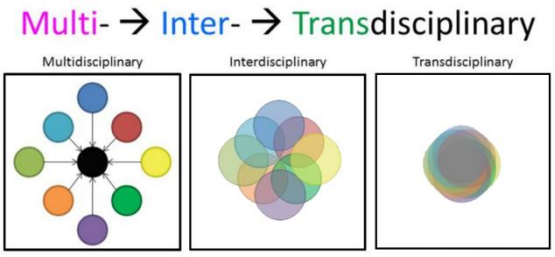

Figure 2: Pictorial presentation of multidisciplinary, interdisciplinary and transdisciplinary research approaches.

Perspective of Transdisciplinary Research

Working together and understanding the need of global collaboration for the social and global issues have gained a momentum in the past few years especially due to the Covid19 pandemics when almost whole world worked together to develop the knowledge about covid19 diseases, prevention strategies and vaccine development. The perspective of transdisciplinary research is intertwined in the idea of co-creation and co-development (Khorram-Manesh et al., 2024). It should be believed that complex, real-world problems cannot be understood or solved by any single discipline alone as academics should work with the societal members and policymakers for more applicable solutions. A key feature of transdisciplinary research is the commitment of working together for a multidimensional and practicable knowledge (Lang et al., 2012). For example, when addressing urban poverty, a team leader or team members following transdisciplinary research approach should have the knowledge of social structures contributing inequality, knowledge of sustainable housing, involvement of local residents sharing their individual experiences and understanding of the financial implications of poverty (Black et al., 2019).

Similarly, in the case of global health crises such as pandemic or epidemic, a transdisciplinary research team, should have medical researchers, government officials, community leaders and the general public, all working together to develop culturally appropriate and practically feasible knowledge to stop spreading the disease and to develop a safe treatment. The transdisciplinary perspective is about recognizing the inter-connectedness of all fields and embracing diverse sources of knowledge and experience to create comprehensive and sustainable solutions to societal challenges (Mitchell and Moore, 2015).

Conclusion

Research approaches define the way of knowledge derivation and reliability of a knowledge depends upon the type of research approach being applied to derive the knowledge. Scientists are applying several approaches based on the applicability of the knowledge from an intra-disciplinary research approach to the transdisciplinary research approach. Several other research approaches such as cross-disciplinary, multidisciplinary and interdisciplinary research approaches are also being applied with limited to a broader holistic approach. Multidisciplinary research approaches have developed technologies to solve the human issues but many technologies remain useless in spite of the investment of billions of dollars which led to the development of more holistic approach and forced scientists to think out of the box. Interdisciplinary research approaches is a more holistic approach which has produced more applicable results whereas a transdisciplinary research approach is considered a research approach with full holistic perspective to solve the social and real-world issues. Scientists are developing models to cope with challenges such as global health crises and by understanding the key differences between these approaches, more effective and innovative collaboration may result to address the global issues humanity is facing today.

Conflict of Interest

Author of this paper declare that there is no conflict of interest with anyone or any organization regarding this review paper.

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REVIEW ARTICLE

Synergies in Global Supply Chains: Implementing Transdisciplinary Approaches in the Evolution of Sustainable Supply Chain Management

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ABSTRACT

Global supply chains have changed drastically over the time and are evolving rapidly due to the convergence of technology and inter-disciplinary knowledge leading to the development of sustainable supply chain management (SSCM). Integration of transdisciplinary approaches are vital in SSCM to understand the synergies in the global supply chains. This review article is aimed to explore and examine the interlinkages between blockchain technology, green supply chain strategies, global logistics systems and cross-sectoral collaboration involved in the sustainability of the global supply chains. This article reveals how integrating knowledge from engineering, environmental science, economics, logistics, and digital innovation can lead to the development of more adaptive and resilient supply chain models emphasising the need for a holistic approach. Several case studies such as blockchain applications and the operational dynamics of air cargo at Hong Kong International Airport (HKIA) are presented to demonstrate real-world implementations of transdisciplinary approaches in the sustainable supply chain management. It has been concluded that a transdisciplinary approach is not only beneficial but essential for designing and managing future-ready, sustainable global supply chains. It offers future scenarios and strategic insights for stakeholders aiming to align operational performance with sustainability goals through collaborative innovation leading to enhanced transparency, efficiency, environmental compliance, and global responsiveness.

Keywords: Global Supply Chains, Transdisciplinary Approaches, Sustainable Supply Chain Management (SSCM), Air Cargo Systems, Hong Kong International Airport (HKIA)

Global supply chains have become the backbone of modern trade as the rapidly interconnected world needs to exchange goods, services, information and capital across international boundaries. With the passage of time, Supply Chain Management (SCM) has evolved to fulfil the global need from a simple warehousing to a strategic, multidisciplinary domain incorporating technological innovation, sustainability imperatives, and cross-sector collaboration. Although global supply chain management has become a vital part of modern commerce connecting several interdependent actors such as suppliers, manufacturers, logistic providers, distributors and end users, still we are not

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having a universally accepted definition of this term, complicating both academic inquiry and practical application (John et al., 2001). Sustainability in the global supply chains has forced to combine the potential of technologies such as blockchain, artificial intelligence (AI), and the Internet of Things (IoT) and has introduced a new era of transdisciplinary innovation in supply chain ecosystems for improved transparency, real-time monitoring, enhanced traceability, and more agile responses to global challenges (Ivanov and Dolgui, 2020, Christopher and Peck, 2004). However, fully leveraging these benefits requires the dissolution of traditional disciplinary boundaries and the adoption of transdisciplinary approaches that integrate knowledge from fields such as logistics, environmental science, engineering, economics, and information systems (Carter and Rogers, 2008).

Transdisciplinary supply chain models or Green Supply Chain Management (GSCM) adopting the concept of co-creation of knowledge through active collaboration of academia, industry, government, and civil society have facilitated secure and efficient information sharing across diverse stakeholders (Reyna et al., 2018, Zhu and Sarkis, 2006). A noteworthy example is the widespread adoption of ISO 14001 by over 40,000 companies worldwide, signalling a commitment to environmental sustainability in their production and logistics operations (Ociepa-Kubicka et al., 2021). The current review paper aims to explore the synergistic potential of transdisciplinary frameworks for global supply chains transiting toward sustainable, resilient, and innovation-driven systems considering the synchronization of supply chain operations at Hong Kong International Airport (HKIA) as a prominent example of air cargo supply chains managements highlighting the convergence and collaboration across several sectors and disciplines to keep the global supply uninterrupted (Liu, 2025). In the following section, we will review the technology-based transformation of manufacturing supply chains and how transdisciplinarity is playing its critical role in the development of green supply chain management. Synergies between technology, sustainability and logistics have also been reviewed to enlighten the future scenarios and strategic directions to maintain the sustainability in this interconnected evolution of global supply chain management.

1. The Role of Blockchain-Enabled Distributed Ledgers

Globally established manufacturing networks are still following traditional supply chain models and as they are becoming more complex, their challenges are also becoming more complicated. Blockchain technology is a game changer in global supply chain management as it offers a secure, decentralized infrastructure to promote trust, reduces fraud, and enhances operational efficiency (Kouhizadeh et al., 2021). Blockchain enables traceable, immutable transactions between stakeholders to integrate cryptography, logistics, systems engineering, and data governance, allowing transdisciplinary teams to develop robust tracking systems and ethical compliance frameworks (Casino et al., 2019, Min, 2019). Despite its advantages, blockchain integration remains constrained by lack of global data standards, its scalability in large supply networks and it is prone to Cybersecurity and data privacy risks.

Transdisciplinary protocols to build a strong cooperative and collaborative relationship between IT architects, compliance officers, and operations managers to implement interoperable, secure, and legally sound blockchain infrastructures are required to solve these technology associated issues (Queiroz et al., 2021). Several firms such as IBM Food trust, TradeLens and De Beers' Tracr platform have implemented blockchains to enhance transparency, improve documentation efficiency and reduce customs delays to reach sustainability in their global supply chain management (Anyibama et al., 2025, Ahmed and Rios, 2022, CHRIS GILBERT, 2024). Automated carbon emissions tracking, digital product passports, and supplier sustainability scoring to enhance their sustainability and transparency are considered the next frontier to be implemented for blockchain technology in supply chain management (Hewett et al., 2019).

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2. Sustaining Ecosystems through Transdisciplinary Innovation

Environmental pressures and climate change are the highly trending topics impacting global supply chains and are choosing the winning players in the global trade routes. Green Supply Chain Management (GSCM) is becoming a strategic necessity of almost every big firm to cope with this issue, to maintain their supply and keep their business models circular and regenerative (Srivastava, 2007, Seuring and Müller, 2008). Only Supply Chain Management (SCM) of a corporation accounts for up to 90% of a company's greenhouse gas emissions risking their Lifecycle assessments and environmental risk auditing (Asif et al., 2022). Closed-loop supply chains emphasize product take-back, recycling, and remanufacturing which are under a specific global standard code introduced by International Standard Organization (ISO). For instance, HP's Planet Partners program recovers and reuses printer components, while IKEA's reverse logistics network enables second-life product circulation (Cavalcanti and Kanzler, 2024). More than 300,000 organizations, mostly from China, Germany, and the Netherlands have already adopted ISO 14001, reflecting the global push for environmental management systems (KUMAR and MUTHU SAMY, 2020).

3. The Strategic Role of Hong Kong International Airport (HKIA) in Global Air Cargo Supply Chains and The Interconnected Evolution

Hong Kong International Airport (HKIA) is consistently ranked among the top global air cargo hubs due to its strategic position at the crossroads of Asia-Pacific and Western trade routes. In 2023, it handled over 4.2 million metric tons of air freight, driven by high-value sectors such as e-commerce, electronics, and pharmaceuticals (Liu, 2025). During the COVID-19 pandemic, HKIA pivoted to support vaccine and PPE distribution via establishing new cold chain capabilities and digital health verification systems (Wojnicka-Sycz et al., 2024). Post-pandemic, the surge in cross-border e-commerce, especially from platforms like Alibaba and Amazon, has led to record growth in small parcel volumes (Fodouop Kouam, 2025).

HKIA is undergoing rapid digitalization to achieve the highest standards in global supply chain management and has implemented IoT-based cargo sensors for real-time environmental monitoring, Digital twin simulations to model cargo flow and predict congestion and AI-powered predictive maintenance for cargo handling equipment (Keppo, 2020) HKIA is also investing in renewable energy systems and adopting green ground handling equipment to reduce carbon emissions. These efforts are linked to regional climate targets set by the Hong Kong government and international aviation sustainability frameworks (Gu et al., 2023).

Technological innovation and sustainability are not competing forces but mutually reinforcing. HKIA, like all other big firms in the global supply chain, is following a Technology-Sustainability Nexus to create and harmonize the synergies between technology, sustainability, and logistics. All technologies are playing their role in sustainability and global supply chain management such as Blockchain secures and authenticates sustainability claims, IoT enables real-time tracking of emissions and AI forecasts environmental risks. All these synergies are maximized through collaboration between engineers, logistics providers, environmental scientists, and regulatory authorities (Chauhan and Sahoo, 2024). Other big firms such FedEx, Salesforce, DHL and Unilever have also implemented the required technologies to move towards the interconnected evolution of sustainability and technology. These firms have developed carbon tracking tools for shipments, verification platforms for sustainability claims and have integrated predictive analytics with sustainable route planning to reduce fuel consumption by 15% (Indriyati et al., 2024).

4. Future Scenarios and Conclusion

The evolution of sustainable global supply chains requires more than isolated innovations as it demands systemic change via transdisciplinary collaboration.

The synergies between blockchain, green supply chain practices, and air cargo operations offer a powerful pathway toward resilience, transparency, and sustainability. Global supply chains will increasingly rely on predictive models and digital twins to simulate scenarios, assess risks, and optimize planning (Klein, 2024). Blockchain enables immutable ESG records to satisfy legal and consumer expectations as new regulations like the EU Corporate Sustainability Due Diligence Directive (CSDDD) will require verifiable data on supplier ethics, emissions and labor practices (Hajiyev, 2024). Innovations in sustainable aviation fuels (SAF), electric aircraft and AI-based logistics routing will transform air cargo into a more sustainable mode of transport. Airports like HKIA, Incheon, and Frankfurt are setting benchmarks for smart and green logistics hubs (Al-Hashmi, 2025). By aligning technological, environmental, and logistical domains through collaborative frameworks, global supply chains can meet the dual imperatives of competitiveness and ecological responsibility.

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ORIGINAL ARTICLE

Exploring the Impact of Virtual Reality Technology on Consumer Buying Behaviour: A Comparative Study of Traditional and Immersive Shopping Experiences

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ABSTRACT

Consumer anthropology has become an emerging discipline is the past decade due to high competition and available variety in the global market. Several technical approaches have been applied to understand factors influence the consumer behaviour and how they make their purchasing decisions. In the past few years, virtual reality (VR) has gained a significant spot among the rising technological megatrends driving the digitization of all aspects of human life such as consumer anthropology etc. The current study has focused on the impact of VR on consumer buying behaviour and its comparison with the traditional shopping experiences as it was aimed to explore how VR technology influences purchase intention, product evaluation, and overall satisfaction of customers. In this work, several qualitative and quantitative approaches have been applied to collect data through surveys and observations during both traditional and VR shopping experiences and to analyse for conclusion. The findings have revealed significant differences in consumer behaviour, indicating that VR technology positively influences purchase intention via enhanced product evaluation. These results have set basics on the understanding of unexplored potential of VR technology to shape consumer buying behaviour, providing valuable insights for businesses and marketers which will be applied to enhance consumer engagement and overall sales.

Keywords: Virtual reality, Consumer anthropology, Consumer buying behaviour, Consumer engagement, Driving sales

Virtual reality (VR) is one of the emerging technologies that has become an important tool in engaging the customers and transforming various industries such as retail sector via offering unique opportunities to influence the buying behaviour of their customers (Chen, Lu and Wang, 2017; Han, Kim and Lee, 2018; Wang *et al.*, 2019). The potential of VR lies in its ability to overcome several traditional limitations like presence of physical stores and product availability at multiple locations etc. VR shopping experiences have been considered as more convenient, personalized with a sense of novelty to influence consumer's behaviour (Yuan *et al.*, 2019). Studies have explored the influence of VR on consumer perceptions of product quality, brand image, and purchase intention (Han, Park and Hyun, 2022). Several other aspects of consumer behaviour including importance of consumer attitudes, role of cognitive process,

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influence of social and personal factors etc have also been well studied for this ongoing transformation (Tajfel *et al.*, 2001).Virtual reality (VR) has introduced a new dimension in consumer anthropology as it has been applied in the context of product presentation (Zhao *et al.*, 2017), in-store advertisement (Ketelaar *et al.*, 2018) and customer service (Zhao, Yan and Keh, 2018). The current research work is also an attempt to understand how VR technology has impacted the consumer buying behaviour and its potential implications for the business operations. The findings have provided valuable insights for businesses and marketers seeking to understand the potential of VR in improving consumer engagement and increasing sales.

MATERIALS AND METHODS

The research approach for this study will be a mixed methods approach, combining both quantitative and qualitative methods. This approach will provide a more comprehensive understanding of the research topic by integrating numerical data and rich qualitative insights.

SAMPLING

A combination of purposive and random sampling technique was applied in this work in which participants were purposively selected based on their recent experiences with traditional shopping and VR shopping. Additionally, random sampling method was also used to ensure a diverse representation of participants. The sample size was determined as a set of 100 and total 750 participants were enrolled and surveyed for this study.

DATA COLLECTION & VARIABLES

Surveys and interviews were conducted to obtain qualitative insights in which participants were allowed to discuss their experiences, motivations, and preferences in both shopping contexts. Purchase behaviour, Consumer perception, Product evaluation, Consumer engagement and customer satisfaction were five variables included in this study.

ETHICAL CONSIDERATIONS

This study was conducted according to the ethical guidelines to ensure the protection and well-being of participants. Informed consents were obtained before survey and interviews, and the participants were given clear information about the study's purpose, procedures, risks, and benefits. Confidentiality was maintained as anonymity and no name were written in the questionnaires although participants were given a chance to withdraw anytime.

DATA PREPROCESSING AND CLEANING

The analysis of the research data began with its preprocessing and cleaning to ensuring the accuracy and reliability of the information. The initial dataset comprised 750 responses, of which, after scrutiny, 50 entries contained inconsistencies, missing values and were removed. Categorical variables were encoded to transform them into a format that could be better understood by the software. The cleaned dataset of 700 responses was then subjected to descriptive statistical analysis.

STATISTICAL ANALYSIS

The statistical tests and techniques used for the data analysis included independent sample t-tests, two-way ANOVA, and multiple linear regression. Independent sample t-tests were conducted to compare the mean scores of enjoyments and ease between the traditional and VR shopping experiences. The t-tests were performed to reveal a significant difference in both enjoyment and ease of shopping between the two shopping methods. A two-way ANOVA was performed to assess the interaction effects of gender and shopping method on the variables of enjoyment and ease. Multiple linear regression was used to model the relationship between the shopping method, enjoyment, and ease, and their impact on consumer buying behaviour.

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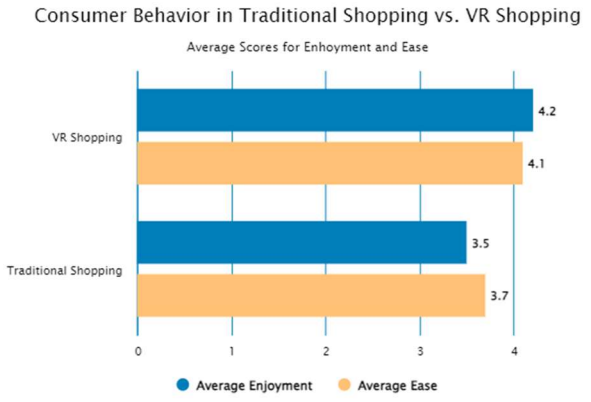
RESULTS

Our dataset originally comprised 750 consumer responses which after meticulous preprocessing and cleaning was left with a usable dataset of 700 consistent responses. The sample constituted an almost equal distribution of males (52%) and females (48%). The age of participants ranged from 18 to 65, with a mean age of 33.5 years and a standard deviation of 7.8 years. Out of these participants, 60% (420) had experienced VR shopping. The remaining 40% (280 respondents) had only been engaged in traditional shopping.

CONSUMER BEHAVIOR IN TRADITIONAL SHOPPING VS. VR SHOPPING

To gauge the consumer behaviour in traditional and VR shopping, we asked the participants to rate their shopping experience in terms of enjoyment and ease. On a scale of 1 to 5, the average score for enjoyment in VR shopping was 4.2, compared to 3.5 for traditional shopping. Similarly, the average score for ease of shopping was 4.1 in VR shopping, as opposed to 3.7 in traditional shopping as shown in figure 1.

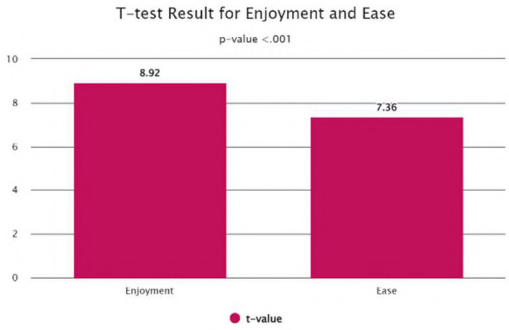
Figure 1: *Average Scores for Enjoyment and Ease*



STATISTICAL SIGNIFICANCE OF THE OBSERVED DIFFERENCES

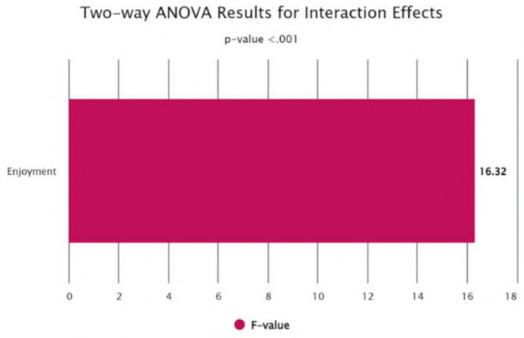
Independent sample t-tests was performed to compare the mean scores of enjoyments and ease between traditional and VR shopping experiences. The t-tests revealed a significant difference in both enjoyment ($t(698) = 8.92$, $p < .001$) and ease of shopping ($t(698) = 7.36$, $p < .001$) between the two shopping methods making our data valuable to conclude the significance of VR based shopping experience as shown in figure 2.

Figure 2: *The t-tests showing a significant difference in both enjoyment and ease of shopping.*



Another statistical analysis, a two-way ANOVA was performed to examine the interaction effects of gender and shopping method on the variables of enjoyment and ease. The results showed a significant interaction effect on enjoyment, $F(1, 696) = 16.32$, $p < .001$, $\eta^2 = .023$, indicating that males and females differed in their enjoyment levels while shopping using VR technology as it has been visualized in figure 3.

Figure 3: *A two-way ANOVA to examine the interaction effects of gender and shopping method on the variables of enjoyment and ease.*



Finally, a multiple linear regression was also conducted to model the relationship between the shopping method, enjoyment, and ease, and their impact on consumer buying behaviour. The regression model was statistically significant, $F(3, 696) = 176.3$, $p < .001$, and accounted for 43% of the variance in consumer buying behaviour ($R^2 = .43$). All predictors were significant, with enjoyment ($\beta = .35$, $p < .001$) having the most substantial impact on buying behaviour as given in table 1.

Table 1: Linear Regression Results for Consumer Buying Behaviour

Predictor	Coefficient	p-value	Impact on Buying Behavior
Enjoyment	0.35	< 0.001	Most significant
Ease	0.20	< 0.001	Significant
Shopping Method	0.15	< 0.001	Significant

In conclusion, our data analysis indicated that VR technology significantly affects consumer buying behaviour by enhancing their shopping experience's enjoyment and ease. Furthermore, the analysis highlighted a gender difference in the level of enjoyment derived from VR shopping, pointing towards the need for further research in this area.

DISCUSSION

Virtual reality or simply VR has attracted the attention of thousands of researchers around the world as this emerging technology is playing a crucial role in almost every industrial sector especially retail and ecommerce. Pantano, 2014 studied the new technology like VR enhancing significantly the consumer shopping experience (Pantano, 2014). Few years later, Huang et al., 2019 also verified the increased ratings for enjoyment and ease of shopping using VR (Huang *et al.*, 2019). It was suggested in 2000 by Venkatesh & Morris to include gender-based analysis, making our research valuable to fill this gap (Venkatesh and Morris, 2000) as we have presented valuable insight in our two-way ANOVA performed as shown in figure 3.

Additionally, the study has contributed to strengthen the Technology Acceptance Model (TAM) by discussing a technology like VR can play a vital role influencing the consumers to enhance their buying behaviour but as it has been entirely based on the self-reported measures of enjoyment and ease, which might be subject to social desirability bias requiring further contributions to the literature on gender differences in technology acceptance (Davis, 1989). While this study provides meaningful insights but due to its limitation to a specific locality, future research could aim to capture a more diverse set of participants.

CONCLUSION

The primary objective of this study was to compare consumer behaviour in traditional shopping and VR shopping. The study was aimed to understand the enjoyment and ease of consumers in both traditional and technology-based shopping environments and to evaluate the statistical significance of the observed differences. The findings of the study substantiated by statistical data, with independent sample t-tests revealed a significant difference in both enjoyment ($t(698) = 8.92$, $p < .001$) and ease of shopping ($t(698) = 7.36$, $p < .001$) between the two shopping methods. Furthermore, a two-way ANOVA test revealed a significant interaction effect on enjoyment based on the gender of the consumer. The current study also has contributed to the literature on gender differences in technology acceptance, indicating that males and females differ in their enjoyment of VR shopping. Furthermore, the gender difference in enjoyment levels studied here has clarified that businesses may need to tailor their VR experiences to cater to the different preferences of male and female consumers effectively (Moss, 2017).

In conclusion, the advent of VR technology has revolutionized the retail industry, providing

consumers with a novel and immersive shopping experience. The current study underscores the potential of VR shopping and its positive implications for consumer enjoyment and ease of shopping. Businesses and marketers should consider these findings when planning their marketing strategies and ensure that they are not left behind in this technological revolution.

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COMMENTARY

Art as a Hope of Life: Role of Art Therapy in Cancer Management

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ABSTRACT

Arts and designs are imprinted impressions creating happiness and charm in personality and are required to create social harmony for a better and developed society. Designs are artistic expressions explaining hundreds of hidden or untold stories creating several questions and quests for their answers leading to solutions of significant humanity issues. Health issues are among the major challenges faced by humanity and cancer accounts among top cause of human mortality of about 10 million deaths per year. Several therapeutic including pharmaceutical and radiological approaches are being implemented but cancer mortality is on rise asking for another view on this issue. Considering the rise of death, the invasion of cost-effective interdisciplinary approaches has been proposed and there are very few evidence of involvement of arts and designs in cancer management which is most cost-effective strategy to stimulate the immunity system leading towards the inner-treatment of cancer patients. Last decade has witnessed the hundreds of psychological approaches applied and emergence of psycho-oncology as most effective therapeutic approach. Integration of arts designs with psychological approaches may help the patients to create the hope for life and call for treatment stimulating the inner-immunity system to fight against cancer cells in body. Challenges to convince the health professionals and authorities to adopt the arts based therapeutic discipline may prolong the positive conclusion but going smooth will all of it may put a full stop on the rising mortality of human beings.

Keywords: Arts and Designs, Medical anthropology, Psycho-oncology, Cancer control, Cancer management

Anthropological studies help us to understand why some people are categorised as stronger than others when it comes to face a disease because a patient is always fighting an internal war so that an external therapy can be effective (Mukhopadhyay and Henze, 2003; Stefansson, 2020). This situation is much worse when it comes to an uncured disease such as Cancer. Cancer, for majority of the patients means a horrible death because it brings a lot of challenges in patient's life ranging from economic, social to family-related issues (Page and Adler, 2008). Although it is the absolute end of life race for almost all cancer victims but very few of them fight back and try harder to live more and steal more time whereas very rare have been succeeded to win their internal war and so external therapies worked well and they survived longer (Puetz, Morley and Herring, 2013).

In this commentary, an entirely different and novel approach is being presented to discuss the necessity of applying pre-therapeutic techniques before regular treatment for cancer is going to be started.

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I did a critical literature review analysis to explore and understand why some people are stronger than others, especially when it comes to face a sickness. Although it is a general fact that every disease is a scary one and the people are afraid of being sick because it is universal truth that 'health is wealth' but when it comes to the Cancer, it becomes scariest one (Penson *et al.*, 2004; Ropeik, 2023). Although Cancer is the second-leading cause of the death that makes it more scarier because it brings lots of socioeconomical damage (Siegel, Giaquinto and Jemal, 2024), but there are many who fought back, overcame the fear and recovered completely.

Few years ago while doing the literature review analysis, I found a wonderful writer, *Ervin D. Yalom* who had published several novels about patients and interestingly, one of his patients-in-novel was a cancer patients who for sure survived and lived a healthy life after the winning (Yalom, 2020). His book described that how the patients were able to fight to their disease and to win. All of them (patients-in-novel) had a common point i.e. hope. Their hope to have a good life again and to have hope that they could be alive was all they fought for. It was obvious that everybody had the hope and not the time of illness as also well discussed by Groopman (Groopman, 2005). It is a fact that naturally, we desire to survive and live longer as the natural law and we know that finally we have to die but as we don't know when we have to do, so we fight for the survival and try to live longer every day. But what happen when a person get sick of a disease, especially Cancer, they lose the hope and will to survive as they realize that death is almost near. So, without hope life might be impossible or too hard resulting the increased chances of death. Whereas the patients-in-novel of Ervin were different and they faced cancer and other diseases differently. It is difficult, almost impossible to survive an illness like cancer (Scheier and Carver, 2001), but Ervin's patients-in-novel when found symptoms of cancer they were referred to the psychologists to find out ways of their wellbeing, that was what made them different.

Paola was one of the patients-in-novel who tried to give her life spiritual meaning and was inspired by one artwork, a painting by her daughter which shows suffering of life in representation of body of a saint (Paola, 2002). Paolla started to communicate with this painting and to create a meaning for her life (Drury, 2002). According to Yalom, the meaning of life is to create an essence of creation or self-actualization as he said that "I believe that art is a tool and that, like all tools, it has functions" (Yalom, 2020). Alain de Botton also described the art as a tool and focused that it is important to know what the tool is for so that we can better know how and when to use it to reach the meaning of life (De Botton, 2013). Mackowiak correlated the meaning of life with the history of the art and called the art as a reason to keeping ourselves alive. The author described numerous artists who faced their diseases just by applying art in their daily lives (Mackowiak, 2019). Frida kahlo, was one of the patients who used art to enhance her hope for life because. She was a medical student but after her accident she was forced to stay on bed for several months (Nixon, 1996). She described it as a bad crash as she was unable to walk or stand for a very long time, so she decided to paint during this crucial time. Her words were 'why I need my feet when I will have wings for flying'. Painting gave her hope and even she tried to be pregnant as she was waiting to have normal life again very soon. Frida had a bad suffering and she was one evidence for Nietzsche`s expression as she said 'if it was not the art, the reality of sickness would perish her' (Dosamantes–Beaudry, 2001).

Another artist, Henri de Toulouse-Lautrec, who was born with congenital problem (de Toulouse-Lautrec and Cooper, 1952; Markatos *et al.*, 2018). His father refused him, and he decided to earn money and live independent by art. After he was left alone by his family, he developed different perspective about the world, and this is well reflected in his all art work. He

started to show colours in his paintings, and they showed people who had low level in the society because he was also at this level, so he started showing the world the colours of the life. He believed that a disease should not let us to wait for our death, but we should create a hope to develop the skills and live longer. His work was mostly lines and colours only as he did not know how to paint and he believed that it is enough as we have started to draw whatever we do know, lines and colours. As he had hope to live, he believed that his hands and his muscle will enjoy the work and will develop the necessary skills. He believed that 'art can change everything especially our view to life as we can freeze our time in painting and it is a kind of immortality' (Peters, 1961).

Art is above the imagination as art is the essence to win over every hard time or suffering we have, that has been applied by several patients-turned-artists and as a transdisciplinary approach, we can apply this to create hope in cancer patients, to give them a purpose of life and a way so they can fight their sickness internally to make the external therapy more effective.

Conflict of Interest:

No conflict of interest is declared.

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