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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(1), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

IMMERSIVE AI-ENABLED TECHNOLOGIES AND CONSUMER BEHAVIOUR: ETHICS AND ENGAGEMENT IN MERCHANDISE MARKETING

[2]Noorien Khannum and [2]Dr. Sivakami R
[1]M.Com International Business PG Department of Commerce School of Commerce Mount Carmel College, Autonomous Bengaluru
[2]Research Director , PG Department of Commerce School of Commerce Mount Carmel College, Autonomous, Bengaluru

ABSTRACT

This conceptual study investigates the impact of AI-powered immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR) on consumer behavior within the merchandise marketing contexts. It examines how these immersive experiences can enhance consumer engagement, their perceptions and the purchasing decisions, while also considering the ethical concerns such as transparency and Data Privacy. The research underscores the importance of perceived ethical use of data in building consumer trust and acceptance of AI-driven immersive platforms. By combining experiential and ethical perspectives, the study highlights gaps in existing literature, where these factors are often analyzed separately or outside the context of merchandise marketing. The findings may provide a theoretical foundation for developing AI-driven merchandising strategies which are both engaging and responsible. They also highlight the importance for the organizations to combine technological innovation with ethical practices in order to build long-term and sustainable relationships with consumers in immersive retail environments.

KEYWORDS: ***Artificial Intelligence, Immersive Technologies (AR/VR), Consumer Engagement, Data Privacy & Ethics, Digital Merchandise Marketing.***

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INTRODUCTION

In the growing era of digitalization, organizations are increasingly leveraging advanced technologies to reshape how the consumers interact with brands and their products. Artificial intelligence (AI), along with immersive technologies like Augmented Reality (AR) & Virtual Reality (VR) are revolutionizing the merchandise marketing practices. These technologies facilitate interactive product simulations that enable better visualization and evaluation, ultimately improving experiential value and perceived product authencity. Empirical evidence suggest that Augmented Reality (AR) product displays intensify the vividness and stimulates mental imagery, thereby positively shaping consumer attitudes **(Javornik, 2016)[i].** Additionally, immersive retail technologies have been found to strengthen consumer engagement and their purchasing decisions **(Hilken et al., 2017)[ii].** In merchandise marketing environments, AI-driven immersive solutions operate as sophisticated display strategies that convert traditional product showcase into interactive & personalized virtual spaces.

The fusion of AI with immersive technologies strengthens personalization and adaptive communication in merchandise marketing. By using behavioral analytics and preference data, AI systems create real-time product experiences that results in perceived value and increased relevance in digital retail ecosystems. **(Huang & Rust, 2018)[iii]**, highlighted in their study that AI has been widely acknowledged for paradigm shift of merchandising through dynamic product recommendations and immersive product interactions. Moreover, research findings further confirms that AI-driven personalization significantly impacts consumer engagement & decision-making within online retail platforms **(Dwivedi et al., 2021)[iv].** Thus, AI-driven immersive technologies function as critical drivers of Consumer perception, evaluation and buying behaviour.

From a behavioral point of view, AI-driven immersive technologies have been found to operate as an influential stimulus, which stimulates rational and emotional components of the consumer's decision-making process. The high level of interactions and immersions helps to increase feelings of perceived control, thereby reducing risks and increasing confidence in product judgments **(Flavián et al., 2019)[v].** Additionally, the high level of presence in immersive technologies has been found to increase cognitive engagement, enabling consumers to scrutinize product features more effectively and develop stronger evaluative clarity **(Yim et al., 2017)[vi].** In merchandise marketing contexts, the combined cognitive and emotional

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responses of consumers in AI-based virtual environments have been found to transform traditional approaches to product comparison and purchase intentions.

Although AI-based immersive technologies facilitate better consumer interaction and decision-making efficiency, it also creates ethical concerns that relate to the privacy of consumer data, the transparency of AI algorithms, and the aspect of surveillance. Immersive technologies require the collection of large amounts of consumer data to deliver personalized experiences in the virtual world, thus raising ethical concerns regarding the control of consumer data and informed consent **(Martin & Murphy, 2016)[vii].** Moreover, the lack of transparency in AI-based immersive technologies can lead to higher levels of consumer skepticism, especially when the mechanisms of personalized experiences are not well communicated to the consumer **(Aguirre et al., 2015)[viii].** In the context of merchandise marketing environments, the ethical handling of consumer data is vital in the integration of AI-based immersive technologies.

At the core, beyond the mere existence of ethical concerns, consumer acceptance depends primarily on how ethically these AI-driven technologies are perceived to function. When organizations demonstrate transparency in data collection, clarify algometric processes and empower users with meaningful control over their personal information, it leads to perceived trustworthiness and institutional integrity **(Bleier & Eisenbeiss, 2015)[ix].** Trust acts as a significant mediator in the adoption of technology, especially in environments where the level of personalization is dependent on complex algorithms and predictive analytics systems**. (Binns et al., 2018)[x].** In the context of merchandise marketing, immersive technologies that communicate the policies of data usage in a transparent manner, as well as adopting effective strategies of personalization, can lead to the development of enduring levels of consumer trust in AI-based merchandising models.

Nevertheless, it has been observed that although there has been a rise in the number of studies on the impact of immersive technologies and AI-driven personalization, but the majority of the studies were limited to the effectiveness and ethical considerations in isolation from each other. There has been a lack of exploration on the amalgamation of the effectiveness of immersive technologies and ethical considerations in AI-driven systems in the context of merchandise marketing. The majority of the studies revealed that there is a need to bridge the gap between innovation and governance in the context of the sustainability of trust in AI-driven systems **(Cowls & Floridi, 2018)[xi]**. Moreover, there has been a need to shift from traditional marketing research and incorporate a framework that reveals the value of experience and ethical

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considerations in AI-driven systems **(Huang & Rust, 2018)[xii].** Therefore, this study aims to conceptually reveal the impact of AI-driven technologies on consumer perception and acceptance, and the impact of ethical considerations in AI-driven systems on the establishment of trust in merchandise marketing.

RESEARCH OBJECTIVES

- To examine the influence of AI- Enabled immersive technologies such as AR, VR & Virtual Environments on consumer behaviour, engagement, and decision- making in Merchandise Marketing.
- To study the relationship between perceived ethical use of data and consumer acceptance of AI-driven Immersive Technologies in the context of Digital Marketing Environments.

LITERATURE REVIEW

❖ AI-ENABLED IMMERSIVE TECHNOLOGY EXPERIENCE

- **(Balekar, 2024)[xiii]** examined the transformative role of immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR) in digital marketing. Their study provided a conceptual analysis of the technological foundations , integration strategies with its associated challenges and practical examples of AR & VR adoption in various marketing campaigns.It was highlighted in the study that these Immersive technologies strengthen the consumer's and brand connection by creating memorable experiences, enabling the marketers to move beyond the limits of traditional marketing and influencing the consumer behaviour through interactive story-telling.
- **(Gokhan Nalbant & Aydin, 2025)[xiv]** explored the revolutionary effects of AI on digital marketing by emphasizing its role in personalization and strategic decision making. Their study discussed how AI-enabled immersive technologies help the marketers in interpreting the consumer behaviors. The study reveals that the implementation of AI-based tools such as chatbots and recommendation systems improved the consumer engagement and operational efficiency. However, the study suggested that AI adoption leads to improved conversion rates and better optimization of resources, while also addressing the need of ethical concerns and data privacy concerns.

❖ CONSUMER ENGAGEMENT AND ACCEPTANCE OF AI & IMMERSIVE TECHNOLOGIES

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- **(Monaco & Sacchi, 2025)[xv],** provided a conceptual analysis of the factors influencing consumer acceptance of AI-powered marketing systems. The research emphasized that focusing on the benefits of personalization, algorithmic transparency, data management, and emotionally intelligent AI interactions act as key drivers in terms of improving consumer trust and brand loyalty. The study also recognizes several impediments in the way of successful AI integration, including several concerns related to data privacy, surveillance, digital inequality and ethical variability. The study also underlines the need for finding an equilibrium between the advancement of AI and ethical considerations, with special emphasis on consumer empowerment. Lastly, it also proposed future research directions on exploring culturally sensitive and equitable AI adoption strategies.
- **(Fazlay Rabby et al., 2023)[xvi]** critically examined the intersection of Artificial Intelligence, Augmented Reality (AR), and Virtual Reality (VR) in redefining the dynamics of customer engagement strategies. The study demonstrated the role of AI in enriching immersive experiences and consumer satisfaction. In their study, the authors used a mixed-method research methodology, which revealed personalization and consumer engagement as key factors in the creation of value in different sectors. The study also presented some barriers in the form of high costs, technical complexities and data privacy concerns in the context of AI and AR/VR technologies. The paper concludes that the establishment of robust ethics and AI governance is critical in the sustainable and responsible use of AI.

❖ PERCEVIED ETHICAL USE OF AI AND DATE PRIVACY

- **(Mohammad Khalaf Daoud et al., 2023)[xvii]** explored the ethical considerations of data privacy and targeted advertising in digital marketing. The study is relevant because it is an empirical study that examined consumer perceptions on digital marketing using a mixed-methods approach, combining qualitative and quantitative techniques. The findings of this study revealed that consumers are increasingly concerned about how their personal information is being used for targeted advertising. This is a concern because it raises questions about the tension between personalization and privacy. The study also highlighted and provided insights and guidelines on how the marketers can

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balance personalization and ethical considerations of data usage while considering consumer perceptions.

- **(El Refae et al., 2024)**[xviii] presented a conceptual analysis of the relationship between artificial intelligence (AI) and digital marketing, with a focus on ethical considerations and data privacy. The authors discussed how AI can enable the marketers to collect and use consumer data for more effective marketing and a better customer experience. However, the study also highlighted the possible risks of handling consumer data, including privacy and ethical issues. Using a conceptual approach, the study mentions there is a need for the marketers to use transparent and ethical practices to protect consumer rights in AI-based marketing practices. Future research is recommended for exploring consumer attitudes towards data privacy and the effectiveness of privacy focused AI-based marketing.

Despite the growing attention on AI-Driven Immersive Technologies influencing the consumer behaviour, there is a lack of cohesive research focused on merchandise marketing. The existing studies tend to analyse immersive technologies, consumer acceptance or ethical-related concerns individually, lacking a unified approach which connects all these dimensions within a framework. Although Immersive Technologies like AR & VR have demonstrated their ability to enhance consumer interaction and decision-making, yet there are limited studies on how ethical considerations regarding data usage shapes the overall consumer acceptance and trust in Immersive Merchandise Environments. Furthermore, existing literature concentrates on general digital marketing contexts, leaving limits insights into the potential of AI-based technologies to optimize merchandise advertising ethically. Therefore, this study aims in addressing these gaps as it is vital for developing a holistic understanding of how AI-Immersive technology, ethics & consumer behaviour intersects in modern merchandise marketing.

RESEARCH METHODOLOGY

This study adopts a quantitative research approach to examine the influence of AI-enabled immersive technologies on consumer behaviour and the relationship between perceived ethical data practices and consumer acceptance. Primary data was collected through a structured questionnaire administered to respondents familiar with digital marketing and immersive technologies such as AR, VR, and AI-driven platforms. A descriptive and analytical research design was used to understand patterns and relationships among variables. The study is based on a sample of 112 respondents selected through convenience sampling. The questionnaire measured key constructs including purchase intention, impulse buying, responsiveness,

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consumer attitude, reliance, buying pressure, unconscious influence, perceived ethical use of data, and consumer acceptance. Data analysis was conducted using SPSS software, where multivariate analysis (MANOVA) was applied to examine the impact of immersive technologies, and Pearson correlation was used to assess the relationship between ethical perception and acceptance. The findings were interpreted to test the hypotheses and draw conclusions relevant to AI-driven merchandise marketing.

DATA ANALYSIS & INTERPRETATION

OBJECTIVE 01

To examine the influence of AI-enabled immersive technologies (AR, VR & Virtual Environments) on consumer behaviour, engagement, and decision-making in merchandise marketing.

Null Hypothesis (H_0):

AI-enabled immersive technologies (AR, VR & Virtual Environments) have no significant influence on consumer behaviour, engagement, or decision-making in merchandise marketing.

Alternative Hypothesis (H_1):

AI-enabled immersive technologies (AR, VR & Virtual Environments) significantly influence consumer behaviour, engagement, and decision-making in merchandise marketing.

Between-Subjects Factors

		N
Immersive technology:	AR Filters & Virtual try ons	33
	3D product previews	19
	VR showrooms	8
	AI-personalized advertisements	52

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Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.924	1.769E2[a]	7.000	102.000	.000	.924
	Wilks' Lambda	.076	1.769E2[a]	7.000	102.000	.000	.924
	Hotelling's Trace	12.142	1.769E2[a]	7.000	102.000	.000	.924
	Roy's Largest Root	12.142	1.769E2[a]	7.000	102.000	.000	.924
Immersive technology	Pillai's Trace	.602	3.729	21.000	312.000	.000	.201
	Wilks' Lambda	.500	3.815	21.000	293.439	.000	.206
	Hotelling's Trace	.806	3.864	21.000	302.000	.000	.212
	Roy's Largest Root	.436	6.481[b]	7.000	104.000	.000	.304

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept + Immersive technology

The multivariate tests clearly show that immersive technologies have a statistically significant effect on consumer behaviour variables. All test statistics (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) report significance at **p = 0.000**, which means the probability of these results occurring by chance is extremely low. The partial eta squared values (ranging from 0.201 to 0.304) indicate a moderate to strong effect size, confirming that immersive technologies meaningfully influence consumer engagement and decision-making.

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Descriptive Statistics

	Immersive technology	Mean	Std. Deviation	N
Purchase Intention	1	3.0606	.96629	33
	2	3.6316	1.30002	19
	3	2.8750	1.24642	8
	4	3.3654	1.06695	52
	Total	3.2857	1.10224	112
Impulse Buying	1	2.9091	1.20840	33
	2	3.2105	1.27275	19
	3	2.7500	1.28174	8
	4	3.2500	1.08239	52
	Total	3.1071	1.16524	112
Responsiveness	1	2.9091	1.12815	33
	2	3.8421	1.16729	19
	3	4.0000	1.30931	8
	4	3.5192	.91802	52
	Total	3.4286	1.10457	112
Consumer Attitude	1	2.8788	1.08275	33
	2	2.7895	.97633	19
	3	2.5000	.92582	8
	4	3.3077	.82933	52
	Total	3.0357	.96729	112
Reliance	1	2.9394	.99810	33
	2	4.2632	.73349	19
	3	3.0000	.92582	8
	4	3.2308	1.05933	52
	Total	3.3036	1.07250	112

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Buying Pressure	1	3.0000	1.36931	33
	2	3.1053	1.52369	19
	3	2.2500	1.38873	8
	4	3.0385	1.13693	52
	Total	2.9821	1.29435	112
Unconscious Influence	1	3.0909	.94748	33
	2	3.2105	.63060	19
	3	3.5000	.53452	8
	4	3.3654	1.13809	52
	Total	3.2679	.97705	112

Among the different immersive technologies, **3D product previews** scored the highest mean for purchase intention (3.63), suggesting that consumers are more likely to plan purchases when they can visualize products in detail. For impulse buying, **AI-personalized advertisements** had the strongest effect (mean = 3.25), showing that tailored marketing strategies can trigger spontaneous purchases more effectively than AR filters or VR showrooms.

Responsiveness was highest in **VR showrooms** (mean = 4.00), indicating that immersive virtual environments encourage consumers to interact more actively with merchandise. Consumer attitude was most positive with **AI-personalized advertisements** (mean = 3.31), suggesting that personalization enhances how consumers perceive products and brands compared to other immersive methods.

Consumers showed the greatest reliance on **3D product previews** (mean = 4.26), meaning they trust these immersive tools the most when making purchase decisions. Buying pressure, however, remained moderate across all technologies, with AR filters and 3D previews showing slightly higher averages (~3.1). This implies that while immersive technologies influence decisions, they do not excessively pressure consumers into purchases.

The strongest unconscious influence was observed in **VR showrooms** (mean = 3.50). This highlights that fully immersive environments can subtly shape consumer perceptions and

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decisions without them being fully aware of the impact. Such influence is important in marketing, as it can drive engagement and brand loyalty at a deeper psychological level.

Based on the statistical evidence, the **null hypothesis (H_0)** stating that immersive technologies have no significant influence is rejected. The **alternative hypothesis (H_1)** is accepted, confirming that AI-enabled immersive technologies (AR, VR, and virtual environments) significantly influence consumer behaviour, engagement, and decision-making in merchandise marketing.

OBJECTIVE 02

To study the relationship between perceived ethical use of data and consumer acceptance of AI-driven immersive technologies in the context of digital marketing environments.

Null Hypothesis (H_0):
There is no significant relationship between perceived ethical use of data and consumer acceptance of AI-driven immersive technologies in digital marketing environments.

Alternative Hypothesis (H_1):
There is a significant positive relationship between perceived ethical use of data and consumer acceptance of AI-driven immersive technologies in digital marketing environments.

Descriptive Statistics

	Mean	Std. Deviation	N
ETHICS SCORE	3.3571	1.00545	112
ACCEPTANCE SCORE	3.3624	.69773	112

The descriptive statistics show that the average score for perceived ethical use of data (ETHICSSCORE) is **3.36** with a standard deviation of about **1.00**, while the average score for consumer acceptance of AI-driven immersive technologies (ACCEPTANCESCORE) is also **3.36** but with a lower standard deviation of **0.69**. This indicates that respondents generally rated both ethics and acceptance at a moderate level, but acceptance scores were more consistent across participants compared to ethics perceptions.

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Correlations

		ETHICSSCORE	ACCEPTANCESCORE
ETHICS SCORE	Pearson Correlation	1	.635**
	Sig. (2-tailed)		.000
	N	112	112
ACCEPTANCE SCORE	Pearson Correlation	.635**	1
	Sig. (2-tailed)	.000	
	N	112	112

Correlation is significant at the 0.01 level (2-tailed).

The correlation table reveals a **Pearson correlation coefficient of 0.635** between ETHICS SCORE and ACCEPTANCE SCORE. This is a strong positive correlation, meaning that as consumers perceive the use of their data to be more ethical, their acceptance of AI-driven immersive technologies increases significantly. The significance value ($p = 0.000$) confirms that this relationship is statistically significant and not due to chance.

This finding highlights the importance of ethical data practices in digital marketing. When consumers trust that their data is being used responsibly and transparently, they are more willing to engage with and accept AI-driven immersive technologies such as AR, VR, and personalized virtual environments. Ethical considerations therefore play a crucial role in building consumer confidence and driving adoption of advanced marketing tools.

Based on the correlation results, the **null hypothesis (H_0)**, which states that there is no significant relationship between perceived ethical use of data and consumer acceptance, is rejected. The **alternative hypothesis (H_1)** is accepted, confirming that there is indeed a significant positive relationship between these two variables in digital marketing environments.

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SCOPE OF THE STUDY

The scope of this study is limited to analyzing the role of AI-enabled immersive technologies in influencing consumer behaviour within digital merchandise marketing environments. It focuses on tools such as augmented reality filters, virtual try-ons, virtual reality showrooms, 3D product previews, and AI-personalized advertisements. The study examines how these technologies affect consumer engagement, decision-making, and purchasing behaviour. Additionally, it explores the impact of ethical considerations, particularly data privacy, transparency, and responsible data usage, on consumer acceptance of these technologies. The research is confined to online retail and virtual merchandising contexts and considers selected behavioural and ethical variables. The findings are intended to provide insights for marketers and businesses on integrating immersive technologies with ethical practices. However, the scope does not extend to all industries or demographic variations, and it remains specific to the context of digital merchandise marketing.

LIMITATIONS

This study is subject to certain limitations that should be considered while interpreting the findings. The sample size of 112 respondents is relatively small, which may limit the generalizability of the results to a larger population. The use of convenience sampling may introduce bias, as the sample may not fully represent diverse consumer groups. The study is also geographically limited, and therefore the findings may not reflect global consumer behaviour patterns. Since the data is based on self-reported responses, it may be influenced by personal bias or limited awareness of immersive technologies. Additionally, the study focuses only on selected behavioural and ethical variables, while other factors such as cultural differences, income levels, and technological familiarity were not included. The cross-sectional nature of the research captures responses at a single point in time and does not account for changes over time. These limitations suggest the need for further research with broader samples and additional variables.

CONCLUSION

The present study highlights the growing significance of AI-enabled immersive technologies in transforming consumer behaviour within merchandise marketing environments. The findings indicate that tools such as augmented reality, virtual reality, and AI-driven

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personalization enhance consumer engagement, improve product evaluation, and positively influence purchase decision-making. The statistical results confirm that these technologies have a significant impact on how consumers interact with and respond to digital marketing strategies.

From an organizational perspective, the study emphasizes the need for businesses to strategically integrate immersive technologies into their marketing practices while maintaining ethical standards. Companies must focus on transparency in data collection, responsible usage of consumer information, and building trust through ethical AI practices. By balancing innovation with accountability, organizations can strengthen customer relationships, enhance brand loyalty, and achieve sustainable growth in competitive digital markets.

From a consumer perspective, AI-enabled immersive technologies provide more interactive, personalized, and convenient shopping experiences, allowing individuals to make more informed decisions. However, consumers must also remain aware of data privacy concerns and understand how their personal information is being utilized. Overall, the study concludes that a balanced approach combining technological advancement with ethical responsibility is essential for fostering trust, increasing acceptance, and ensuring long-term success in digital merchandise marketing.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(1), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

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Volume:15, Issue:5(1), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

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