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# Technology-Enabled Visual Merchandising and Impulse Buying Behaviour: Evidence from Indian Supermarkets

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***Abstract***

*The rapid integration of digital and interactive technologies in brick-and-mortar retail has completely changed visual merchandising from a static display function to a dynamic, experience-based strategy. This research examines the effects of technology-enabled visual merchandising on impulse purchase behaviour in supermarkets, specifically focusing on how visual engagement and emotional arousal act as mediating variables. Using the Stimulus Organism Response (S-O-R) theoretical framework, we conceptualised technology-enabled visual merchandising as the environmental stimulus, visual engagement and emotional arousal as organismic states, and impulse purchase behaviour as the behavioural response. We used quantitative cross-sectional research, collecting data from 400 supermarket consumers in five major cities in Tamil Nadu, India. We employed Structural Equation Modelling (SEM) using SPSS and AMOS to test the hypothesised relationships and mediation effects. The findings indicate that technology-enabled visual merchandising increases visual engagement, which then positively impacts emotional arousal. Emotional arousal is found to be a strong predictor of impulse purchase behaviour. However, technology-enabled visual merchandising does not have a direct effect on either emotional arousal or impulse purchase behaviour; thus, visual engagement and emotional arousal fully mediate the sequential effects between technology-enabled visual merchandising and impulse purchase behaviour.*

***Keywords***

*Technology-Enabled Visual Merchandising; Visual Engagement; Emotional Arousal; Impulse Buying Behaviour; Stimulus–Organism–Response (S–O–R) Model; Supermarkets; Indian Retail Context*

## 1. INTRODUCTION

### 1.1 Evolution of Visual Merchandising and Its Role in Impulse Buying in Physical Retail

Physical retail visual merchandising has evolved from being a simple aesthetic function to a strategic tool that impacts the behaviour of the consumer. The earlier form of visual merchandising was based on hard elements such as the store layout, the arrangement of the shelves, the lighting, and the colour schemes, and the use of signs to make the products more visible and create a sense of aesthetic appeal within the store (Bell Judy, 2017; Bitner, 1992). The earlier form of visual merchandising was essentially aimed at facilitating a purchase by ensuring that the store is easily identifiable and the products are easily identifiable. However, with the rise of competition in the organized retail industry and the changing behaviour of consumers, the role of visual merchandising has evolved from being a display tool to a behaviour-shaping tool (Grewal et al., 2017).

In the last few years, retail technology innovations have been instrumental in the gradual disappearance of visual merchandising as a retail format in favour of technology-based retail formats, especially in supermarkets (Pantano et al., 2020). Digital signage, smart shelves, interactive kiosks, AR features, etc., have completely revamped store decor to create a series of lively and highly interactive customer touchpoints. In comparison to static displays, these technological solutions can provide, among other things, content updates in real time, interactive product information, and personalised visual experiences

that in fact multiply shoppers' visual engagement and emotional involvement (Jessen et al., 2020). In addition to enhancing store decor, technology-based visual merchandising also enhances shoppers' attentional focus as well as their receptiveness to in-store stimuli.

Impulse buying behaviour is today accepted as one of the major factors that affect the profitability of supermarkets since a major portion of their business is comprised of unplanned buying. Supermarkets design their store visuals in such a manner that they can capitalise on the impulse buying behaviour of their customers. Impulse buying is generally the result of the influence of emotions instead of the influence of thoughts (Verplanken & Herabadi, 2001). This is the reason that impulse buying is highly affected by visually stimulating store environments. Hence, the need to understand the change in the concept of visual merchandising and the technological revolution that occurred is important to be able to justify the ability of supermarkets to induce impulse buying behaviour.

### 1.2 Research problem statement

Technology-enabled visual merchandising tools such as technology-enabled visual displays, smart shelves, and other interactive in-store technologies have also started to appear in supermarkets in India (Kalia & Paul, 2021). Although technology-enabled visual merchandising tools are increasingly used in supermarkets, there is still insufficient empirical research investigating their impact on customers' impulse buying behaviour. Existing research focuses on traditional visual merchandising tools or developed market contexts, making it less relevant to emerging markets such as India. Moreover, the psychological aspects of impulse buying behaviour through technology-enabled visual merchandising have not been sufficiently examined from a particular perspective, such as the relationship between visual engagement and emotional arousal responses. Due to the lack of relevant local and theoretical research, academics and practitioners are puzzled about the effectiveness of technology-enabled visual merchandising strategies in the supermarket industry. Thus, it is highly imperative to undertake a comprehensive research study to assess the effect of technology-enabled visual merchandising on impulse buying behaviour in supermarkets in India.

### 1.3 Objectives of the Study

The central objective of this research is to empirically examine the effect of technology-enabled visual merchandising on impulse buying behaviour in supermarkets located across Tamil Nadu, India. Apart from the research objective, this research study has other objectives, which are as follows.

- To identify and understand how technology-enabled visual merchandising in supermarkets can stimulate or trigger impulse buying behaviour among consumers.
- To measure and assess the extent to which visual involvement as a mediator can facilitate and trigger impulse buying behaviour among consumers due to technology-enabled visual merchandising.
- To investigate and understand the mediator effect of emotional excitement between technology-enabled visual merchandising and impulse buying behaviour.
- To develop a detailed and effective demonstration of the proposed conceptual model involving technology-enabled visual merchandising, visual engagement, emotional arousal, and impulse buying behaviour in supermarkets located across Tamil Nadu, India.

## 2. Literature Review

### 2.1 Visual Merchandising in a Retail Environment

Visual merchandising can be termed as the art of displaying the products and associated visual elements in a manner that can attract consumers, help consumers to locate the desired product, and induce the purchase of the displayed products (Bell Judy, 2017). The aspects associated with it are the layout, lighting, colour schemes, signage, and product display, along with the associated elements that create the shopping experience for the consumers (Kerfoot et al., 2003; Turley & Milliman, 2000). Visual elements are the most crucial factors in grabbing the attention of the consumers, as well as helping the consumers to

make quick decisions regarding the product, thus reducing the cognitive load and facilitating the consumers to retrieve the associated information (Pieters & Wedel, 2004).

Researchers have found that retail environments with high visual attraction are capable of grabbing the attention of consumers, which, in turn, results in the generation of emotions, and finally, the emotions influence the buying behaviour of the consumers (Pieters & Wedel, 2004). Traditionally, the concept of visual merchandising was associated with static and standardised displays, but the retail industry is increasingly adopting the use of digital and interactive technologies that can provide a dynamic display, thus providing a better Experience (Pantano et al., 2020).

### 2.2 Technology-Enabled Visual Merchandising

Technology-enabled visual merchandising is a term that covers different facets of technology-based store design and display of products to facilitate consumer interaction and decision-making (Pieters & Wedel, 2004). The new concept of technology-enabled visual merchandising is a departure from the traditional approach to the display of products by using static products such as laminated products (Pantano et al., 2020). On the other hand, technology-enabled visual merchandising is characterised by the display of dynamic, interactive, and technology-based information, which may have the potential to change depending on consumer behaviour and other environmental factors. (Wedel et al., 2016). The technology-enabled aspects include digital signage, touchscreen technology on the walls, technology-enabled shelves, and AI technology for displaying products.

For example, digital signage enables information to change at any time, and the attention of the consumer is caught by the movement and brightness of the information. In addition, touchscreen technology enables the consumer to obtain information about products, compare products, and so on. Smart shelves are used for pricing and providing information to the consumer about products, while AI technology enables the display of products to the consumer based on the previous behaviour of the consumer (Javornik, 2016). In this regard, it may be concluded that technologically advanced visual merchandising is no less than the secret weapon of modern-day retailers.

### 2.3 Impulse Buying Behaviour

Impulse buying behaviour is the buying behaviour where consumers purchase products, in a spontaneous, unplanned manner due to the sudden and strong urge to purchase a product, and in most cases, the consumers have not thought much before purchasing the product (Verplanken & Herabadi, 2001). Such buying behaviour is characterised by immediacy, emotional arousal, and a lack of consideration of the future consequences. Such behaviour is most likely to occur in supermarkets, where a variety of products are available, and consumers are likely to make such purchases in an unplanned manner (Liao et al., 2009). Various factors, such as psychological factors and situational factors, influence the impulse buying behaviour of consumers. Visually stimulating and technology-based store environments create positive emotional arousal, such as feelings of excitement and curiosity, which in turn reduces cognitive control, resulting in immediate purchasing behaviour (Grewal et al., 2017). Therefore, it can be stated that the unplanned buying behaviour is largely a result of the emotions and signs of the consumers, thus making the consumers visually and technologically a key factor in the unplanned purchases.

### 2.4 Visual Engagement and Emotional Arousal

Visual engagement in retail is the degree to which the customers are focused, interested, and mentally engaged with the visual aspects in the retail store during the shopping period. Visual engagement, in a way, is related to the product display, monitors, colours, and the store's layout that not only captures the attention but also influences the way in which the customers are directed towards the products (Hollebeek et al., 2014). If the level of visual engagement is high, then there is a high probability that the customers might get a better view of the products, understand the details in a better way, and get a chance to interact with the displayed products, especially in the case of supermarkets, where the competition is high

(Grewal et al., 2017). Visual engagement also triggers the arousal of different kinds of feelings, such as pleasure, joy, and excitement, which act as a medium between the store and the buying behaviour of the customers. The good feelings, in a way, weaken the rationality of the mind and increase the chances of getting attracted to the lure of impulse buying (Beatty & Ferrell, 1998; Rook, 1987).

After carefully observing the results from a number of experiments, it can be stated with certainty that visually attractive retail environments increase the arousal of emotion, resulting in more purchases happening spontaneously (Beatty & Ferrell, 1998). Visual engagement and emotion, in a way, are considered to be the key factors through which the impulse buying behaviour of the consumers is influenced by the visual merchandising.

**2.5 Theoretical Framework**

The Stimulus-Organism-Response (S-O-R) model, which is originally derived from the domain of environmental psychology, is utilised to describe the influence of the environment on human behaviour. In the context of the S-O-R model, it is proposed that the external stimuli (S) act on the psychological states of the individual (O) and, finally, the psychological states influence the responses (R) of the individual. In the context of the retail industry, the S-O-R model is utilised to describe the influence of various visual merchandising techniques on the thought process and emotions of the consumers, which finally results in the buying decision.

In the present scenario, various technology-enabled visual merchandising techniques are identified as the stimulus element, i.e., the factors that attract the consumers' attention and induce higher involvement. On the other hand, the organism element is visual involvement and emotions, which are the representative factors of the thought process and emotions, respectively, of the consumers towards the various stimuli present in the environment.

The final response is impulse buying, which is the situation in which the consumers take the buying decision spontaneously, i.e., without any prior planning. In the present scenario, the S-O-R model is utilised to explain the phenomenon of impulse buying, which is facilitated by the technology-enhanced visual merchandising techniques in the case of the supermarket environment, as it is able to explain the involvements of the minds and emotions of the consumers. Therefore, the S-O-R model is utilised to explain the phenomenon of impulse buying, which is facilitated by the technology-enhanced visual merchandising techniques in the case of the supermarket environment.

**2.6 Research Gap**

Prior to this, studies have been conducted on the impact of traditional visual merchandising on consumer behaviour, but there is still a scarcity of empirical models that explain the impact of technology-based visual merchandising on impulse buying behaviour. Most studies have been conducted on the impact of technology or visual merchandising individually, and so the combined effect of these factors on consumer behaviour is still unclear. In addition, most studies have been conducted in developed nations, and so these studies are of little use in understanding the situation in emerging economies such as India, which is witnessing rapid growth in the retail industry and the adoption of technology-based visual merchandising techniques. Furthermore, the role of visual engagement and emotional arousal as moderators is still unclear, especially since these are sequential moderators that link the stimulus and the response. It is important to address these gaps and develop a theory-based model targeted at a specific location to gain insights into the impact of technology-based visual cues on impulse buying behaviour in supermarkets in India.

**3. Conceptual Framework and Hypotheses Development**

**3.1 Conceptual Framework and justification for construct Relationship.**

The existing S-O-R (Stimulus-Organism-Response) framework is the basis of the authors' research model. Its purpose is to measure the effect of technology-enhanced visual merchandising on the impulse buying behaviour of customers in

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supermarkets in Tamil Nadu, India. The stimulus in this research model is technology-enabled visual merchandising (TEVM) that is considered as digital displays, interactive screens, smart shelves, and AI-based product presentations, which are able to attract consumers' attention and make the store visually very attractive. The organism part of the model are visual engagement and emotional arousal which are consumers' cognitive and affective responses to TEVM. Visual engagement is about the level of attention shoppers give to in-store visual cues and emotional arousal is about the feelings of excitement, pleasure, and curiosity generated by these stimuli. These two internal states function as a link between TEVM and impulse buying behaviour, which is the response component and characterized by spontaneous, unplanned purchases made in the retail setting. The proposed model claims that the effect of technology-based visual merchandising on impulse buying occurs both directly and indirectly through the sequential mediation of visual attention and emotional arousal. The proposed model represents a theoretically grounded approach to explaining the potential unplanned purchase stimulation effect of advanced visual merchandising technology on the cognitive involvement and affective responses of supermarket shoppers.

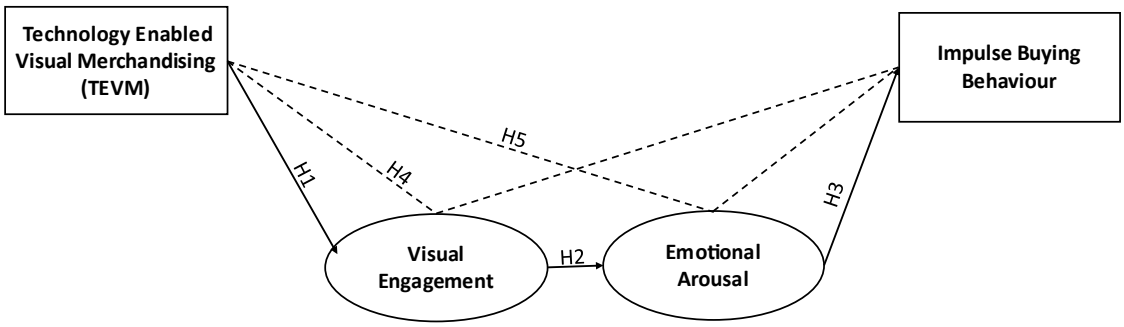


**Figure1: Proposed Conceptual Model**

### 3.2 Hypotheses Development

#### 3.2.1 Impact of Technology-Enabled Visual Merchandising on Consumer Visual Engagement

Technology-enabled visual merchandising (TEVM), including digital displays, interactive screens, smart shelves, and AI-based product displays, increases the sensory richness and interactivity of the retail setting. These technologies draw consumers' attention by providing dynamic visual stimulation, personalised content, and real-time product information, thus increasing the salience of products in the store (Hilken et al., 2017). Based on the stimulus-organism-response (S-O-R) theory, these technologically enhanced visual stimuli serve as environmental factors that amplify consumers' perceptual and cognitive processing (Russell & Mehrabian, 1977). Existing literature on retail atmospherics and visual merchandising indicates that visually dynamic and interactive store features have been found to substantially increase consumers' visual attention, curiosity, and engagement. Technology-based visual merchandising is therefore hypothesized to stimulate more visual attention by encouraging longer gaze times, more extensive visual processing, and interaction with in-store visual displays (Hollebeek et al., 2014).

**H1: Technology-enabled visual merchandising positively influences visual engagement.**

#### 3.2.2 Impact of Visual Engagement on Consumers' Emotional Arousal

Visual engagement refers to the level at which consumers cognitively and perceptually focus on visual stimuli in the retail environment (Vivek et al., 2012). When consumers get visually engaged, they are believed to undergo enhanced sensory stimulation, selective attention, and deep processing of product-related cues (Hollebeek et al., 2014). According to the stimulus-organism-

response (S-O-R) model, a greater amount of visual processing causes changes in internal affective states, thus leading to emotional arousal. The literature on consumer behaviour and retail atmospherics points out that visually attractive and attention-grabbing retail environments trigger consumers' emotional reactions such as excitement, pleasure, and curiosity (Donovan, 1982) Hence, it is anticipated that a higher degree of visual engagement would substantially increase consumers' emotional arousal while shopping.

**H2: Visual engagement positively affects emotional arousal.**

### 3.2.3 Impact of Emotional Arousal on Impulse Buying Behaviour

Emotional arousal is a state of high affective activation, which is marked by feelings of excitement, stimulation, and increased arousal during the buying experience (Rook, 1987). When consumers are in a state of high emotional arousal, their decision-making processes are likely to shift from being cognitive to affective in nature (Verplanken & Sato, 2011). On the basis of the stimulus-organism-response (S-O-R) model and impulse buying theory, it can be hypothesised that consumers in a state of high emotional arousal are likely to engage in spontaneous behaviour, lack self-control, and react impulsively to in-store stimuli (Verplanken & Herabadi, 2001). Empirical studies in retail and consumer behaviour have shown that high emotional arousal has a positive impact on increasing the urge to buy and speeding up impulse buying (Beatty & Ferrell, 1998). Accordingly, emotional arousal is expected to exert a significant positive influence on impulse buying behaviour.

**H3: Emotional arousal positively influences impulse buying behaviour.**

### 3.2.4 Visual Engagement as a Mediator between Technology-Enabled Visual Merchandising and Impulse Buying Behaviour

Technology-enabled visual merchandising (TEVM) enhances the retail environment through dynamic, interactive, and visually stimulating elements that capture consumers' attention and direct perceptual focus toward merchandise. While such technologies may not directly trigger unplanned purchases, they first operate by intensifying consumers' visual engagement with in-store displays (Hilken et al., 2017). According to the stimulus–organism–response (S–O–R) framework, TEVM functions as an environmental stimulus that influences internal organismic states—specifically visual engagement—which in turn shape behavioural responses such as impulse buying (Grewal et al., 2017). Prior research in visual merchandising and consumer behaviour suggests that increased visual attention and involvement heighten purchase urges by amplifying product salience and reducing cognitive resistance (Vivek et al., 2012). Therefore, visual engagement is expected to serve as a mediating mechanism through which technology-enabled visual merchandising indirectly influences impulse buying behaviour.

**H4: Visual engagement mediates the relationship between technology-enabled visual merchandising and impulse buying behaviour.**

### 3.2.5 Mediating Role of Emotional Arousal in the Relationship between Visual Engagement and Impulse Buying Behaviour

By visually engaging a store environment, one's perceptual focus and immersive interaction with the environment become more intense, there is a higher chance of one's emotions getting stirred up during the shopping trip (Hollebeek et al., 2014). Nevertheless, just looking at something without any emotional involvement could be of little effect in leading to a spontaneous purchase unless it causes an internal emotional reaction. Using the stimulus–organism–response (S–O–R) model as an analogue, visual engagement serves as a cognitive–perceptual organismic state that leads to emotional arousal, which further results in behavioural outcomes (Vivek et al., 2012). Researches on consumer psychology and retail atmospherics have shown that emotionally triggered buyers have stronger desires to purchase, lower self-control, and are more inclined to make unplanned purchases (Vivek et al., 2012). Therefore, it is anticipated that emotional arousal will be the mediating factor through which visual engagement has an indirect effect on impulse buying behaviour

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**H5: Emotional arousal mediates the relationship between visual engagement and impulse buying behaviour.**

## 4 Research Methodology

### 4.1 Research Design

The study utilizes a quantitative method alongside a cross-sectional research design for the investigation of the relationships of technology-enabled visual merchandising, visual engagement, emotional arousal, and impulse buying behaviour. Based on the advantages of survey methods in providing standardized data used for statistical modelling and hypothesis testing, the researchers chose a survey-based method. Snowball sampling was considered by the researchers as the appropriate technique to locate respondents knowledgeable about technology-enabled retail environments since there is no definitive list of supermarkets shoppers.

### 4.2 Sample and Sampling Procedure

The study focused on supermarket customers in India and concentrated on Chennai, Coimbatore, Madurai, Trichy, and Salem as the five cities. A sample size of 400 respondents was obtained, with 80 respondents from each city to maintain equal regional representation. The selection of respondents was carried out by snowball sampling method, where the first participants gave names of other eligible shoppers from their acquaintances. The criteria for inclusion were that the respondents should be at least 18 years of age, have done their shopping in supermarkets located in the cities selected within the last six months, and be aware of the use of visual merchandising technologies in the store.

### 4.3 Measurement Instrument

Data were collected through a structured questionnaire which included two major parts, one demographic profile of the respondents and another the characteristics of the study: technology-enabled visual merchandising, visual engagement, emotional arousal, and impulse buying behaviour. Measurement items, among others, were borrowed from the most referred and validated scales in the fields of retailing and consumer behaviour. To rate agreement with statements, all constructs were assessed through a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A pilot study was conducted before the actual survey to test item clarity and reliability, which resulted in minor changes in wording and structure.

### 4.4 Data Collection and Ethical Considerations

Data was collected from the general population visiting supermarkets in the targeted cities. To this effect, the focus of the research was on the general population shopping at various retail stores. The study was underpinned by general ethical principles which were equally followed. It was emphasized to the participants that they could withdraw from the research process at any time they wished. Besides, personal information was not sought by the researcher.

### 4.5 Data Analysis Tools

The data was analysed with the help of SPSS and AMOS software. SPSS software was used to analyse the data for its suitability, to find out the descriptive statistics, and to conduct reliability tests. For conducting Structural Equation Modelling, the data was analysed with the help of 'Analysis of Moment Structure,' and SPSS's own software named AMOS was used for it. The constructed models in data are validated with the help of Confirmatory Factor Analysis and by Structural Models. The validation of the models is done by checking the adequacy of the data with the help of standard Goodness of Fit

## 5. Data Analysis and Results

### 5.1 Respondent Profile of the Study Sample

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**Table1: Sample Characteristics of the Study Respondents**

| Variable | Category | N | % | Variable | Category | N | % |
|---|---|---|---|---|---|---|---|
| **Gender** | Male | 204 | 51.0 | **Employment Status** | Student | 26 | 6.5 |
| | Female | 196 | 49.0 | | Employed | 100 | 25.0 |
| **Age Group (Years)** | 18–25 | 96 | 24.0 | | Self-employed | 160 | 40.0 |
| | 26–35 | 80 | 20.0 | | Homemaker | 75 | 18.8 |
| | 36–45 | 70 | 17.5 | | Retired | 39 | 9.8 |
| | 46–55 | 81 | 20.3 | **Monthly Income (INR)** | < 20,000 | 73 | 18.3 |
| | Above 55 | 73 | 18.3 | | 20,001–40,000 | 100 | 25.0 |
| **Location** | Chennai | 80 | 20.0 | | 40,001–70,000 | 74 | 18.5 |
| | Coimbatore | 80 | 20.0 | | 70,001–1,20,000 | 86 | 21.5 |
| | Madurai | 80 | 20.0 | | > 1,20,000 | 67 | 16.8 |
| | Trichy | 80 | 20.0 | **Marital Status** | Single | 201 | 50.2 |
| | Salem | 80 | 20.0 | | Married | 199 | 49.8 |
| **Educational Qualification** | School Level | 53 | 13.3 | **Shopping Frequency** | Occasionally | 75 | 18.8 |
| | Diploma | 84 | 21.0 | | Weekly | 163 | 40.8 |
| | Undergraduate | 101 | 25.3 | | Monthly | 67 | 16.8 |
| | Postgraduate | 108 | 27.0 | | Fortnightly | 78 | 19.5 |
| | PhD | 54 | 13.5 | | Daily | 17 | 4.3 |

The socio-demographic characteristics of 400 respondents from Tamil Nadu supermarkets are shown in Table 1. There were an almost equal number of female and male respondents, as 51% were male and 49% were female. There was also a variety of ages of respondents (e.g., 24% of 18-25 years old; 20.3% of 46-55; 20% of 26-35). In addition, the respondents were distributed across the five largest cities in Tamil Nadu (i.e., 5 cities; Chennai, Coimbatore, Madurai, Trichy and Salem). The level of education of respondents is also high. Most respondents are graduate (25.3%) and post-graduates (27.0%). Similarly, the proportion of self-employed respondents (40.0%) is high, followed by employees (25.0%). The level of income of respondents shows equal distribution, which indicates diverse income levels of respondents. Most respondents are either unmarried (51.0%) or married (49.0%). Similarly, a significant proportion of respondents are weekly buyers from supermarkets, which indicates that they are exposed to visual merchandise of stores and can be considered suitable for studying impulsive buying behaviour in this context.

### 5.2 Measurement Model Assessment

**Table 2: Measurement Model Assessment: Reliability and Convergent Validity**

| Construct | Item Code | Standardized Loading | Cronbach's α | Composite Reliability (CR) | Average Variance Extracted (AVE) |
|---|---|---|---|---|---|
| **Technology-Enabled Visual Merchandising (TEVM)** | TEVM1 | 0.790 | 0.943 | 0.943 | **0.767** |
| | TEVM2 | 0.789 | | | |
| | TEVM3 | 0.728 | | | |
| | TEVM4 | 0.785 | | | |
| | TEVM5 | 0.745 | | | |
| **Visual Engagement (VE)** | VE1 | 0.702 | 0.926 | 0.925 | **0.716** |
| | VE2 | 0.760 | | | |
| | VE3 | 0.719 | | | |
| | VE4 | 0.731 | | | |
| | VE5 | 0.669 | | | |
| **Emotional Arousal (EA)** | EA1 | 0.767 | 0.937 | 0.947 | **0.748** |
| | EA2 | 0.753 | | | |
| | EA3 | 0.787 | | | |
| | EA4 | 0.759 | | | |

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| | | | | | |
|---|---|---|---|---|---|
| | EA5 | 0.743 | | | |
| **Impulse Buying Behaviour (IBB)** | IBB1 | 0.778 | 0.940 | 0.941 | **0.762** |
| | IBB2 | 0.787 | | | |
| | IBB3 | 0.694 | | | |
| | IBB4 | 0.728 | | | |
| | IBB4 | 0.757 | | | |

Results indicate that the measurement model has strong reliability and convergent validity for all constructs. The standardized factor loadings for each construct exceed the recommended minimum of 0.60 and indicate that the observed variables are sufficiently representative of their corresponding underlying latent variables. Technology-Enabled Visual Merchandising (TEVM) has excellent internal consistency, as demonstrated by a Cronbach alpha coefficient and Composite Reliability (CR) of 0.943, and an Average Variance Extracted (AVE) of 0.767; thus, it exhibits a high degree of convergent validity. Likewise, Visual Engagement (VE) has high reliability (α = 0.926; CR = 0.925), and an acceptable level of convergent validity (AVE = 0.716). Emotional Arousal (EA) also holds strong measurement characteristics, with a Cronbach alpha of 0.937, CR of 0.947, and AVE of 0.748, reflecting that a large proportion of variance is represented by the construct. Impulse Buying Behaviour (IBB) demonstrates good reliability (α = 0.940; CR = 0.941) and a strong convergent validity (AVE = 0.762). In summary, the results provide evidence that the measurement model satisfies the acceptable psychometric standards and supports the appropriateness of the constructs.

**Table 3: Discriminant Validity Assessment (Fornell–Larcker Criterion)**

| **Construct** | **AVE** | **TEVM** | **VE** | **PA** | **IBB** |
|---|---|---|---|---|---|
| **Technology-Enabled Visual Merchandising (TEVM)** | **0.767** | 1 | | | |
| **Visual Engagement (VE)** | **0.716** | 0.381 | 1 | | |
| **Emotional Arousal (EA)** | **0.748** | 0.337 | 0.353 | 1 | |
| **Impulse Buying Behaviour (IBB)** | **0.762** | 0.225 | 0.155 | 0.382 | 1 |

According to the Fornell–Larcker test, the discriminant validity of the constructs has been established. According to Table X (found at the end of this document), the average variance extracted square root (AVE) of each construct is larger on the diagonal than any of those constructs' inter-construct correlations. For example, the Technology-Enabled Visual Merchandising construct (AVE = 0.767) was found to have lower correlation values with Visual Engagement (0.381), Emotional Arousal (0.337), and Impulse Buying Behaviour (0.225). As a result, the Technology-Enabled Visual Merchandising construct is discriminated from Visual Engagement, Emotional Arousal, and Impulse Buying Behaviour. Furthermore, the Visual Engagement construct (AVE = 0.716) has a stronger amount of variance in comparison to its correlation values with Emotional Arousal (0.353) and Impulse Buying Behaviour (0.155). Along these lines, the Emotional Arousal (AVE = 0.748) has adequate discriminant validity when compared to Impulse Buying Behaviour (0.382). Overall, these results imply that all of the constructs are different from one another on an empirical level, thus indicating that all of the constructs have met the criteria for discriminant validity. In conclusion, these findings support the validity of the measurement model.

### 5.3 Explanatory Factor Analysis

**Table 4: Evaluation of Data Suitability for Factor Analysis**

| **KMO and Bartlett's Adequacy Test** | | |
|---|---|---|
| Sampling Adequacy | | 0.947 |
| Bartlett's Test of Sphericity | Chi Square value | 7137.634 |
| | df | 190 |
| | Sig. | .000 |

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Kaiser- Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity indicated that the data are appropriate for factor analysis. The KMO statistic was 0.947, which greatly exceeds the minimum acceptable threshold of 0.60 and suggests excellent sampling adequacy for the sample. Further, the KMO statistic indicates that there are enough compact correlations among the variables to result in the emergence of reliable factors. Results of the Bartlett's Test of Sphericity were statistically significant ($\chi^2 = 7137.634$, df = 190, $p < 0.001$) and provided strong evidence against the null hypothesis that the correlation matrix is an identity matrix. Results from KMO and Bartlett's demonstrate that data are suitable for factor analysis.

**Table 5 Rotated Factor Loading Pattern**

| **Pattern Matrix** | | | | |
|---|---|---|---|---|
| | Component | | | |
| | 1 | 2 | 3 | 4 |
| TEVM1 | | .896 | | |
| TEVM2 | | .875 | | |
| TEVM3 | | .880 | | |
| TEVM4 | | .918 | | |
| TEVM5 | | .921 | | |
| VE1 | | | | -.868 |
| VE2 | | | | -.889 |
| VE3 | | | | -.878 |
| VE4 | | | | -.906 |
| VE5 | | | | -.823 |
| EA1 | .907 | | | |
| EA2 | .911 | | | |
| EA3 | .859 | | | |
| EA4 | .879 | | | |
| EA5 | .879 | | | |
| IBB1 | | | .910 | |
| IBB2 | | | .909 | |
| IBB3 | | | .895 | |
| IBB4 | | | .856 | |
| IBB5 | | | .908 | |

Results from the pattern matrix confirm that the factor structure is clear and coherent. Each measured item was found to load heavily (or significantly) on its respective component and is above the generally accepted threshold of 0.60 for standardised loadings. The values show that observed variables have a close relationship with their corresponding latent variables. Items measuring Technology-Enabled Visual Merchandising (TEVM) are single dimensionally loaded on one component with all loadings ranging between 0.875 - 0.921, representing evidence of construct coherence. The emotional arousal (EA) items were also found to be heavily loaded against one factor (0.859 - 0.911), ensuring that these items provide a reliable measurement of consumers' affective states. Similarly, the impulse buying behaviour (IBB) items had similar loading characteristics (0.856 - 0.910) against one distinct behaviour outcome factor. The visual engagement (VE) items were also loading consistently from one factor (−0.823 - −0.906) with the negative signs of loading indicating the factor's orientation and not a conceptual difference across factors. Cross-loadings were low indicating strong discriminant validity of the constructs, providing a strong basis for concluding that the measurement items appropriately represent their respective constructs and therefore, can be used in future confirmatory and structural modelling analyses.

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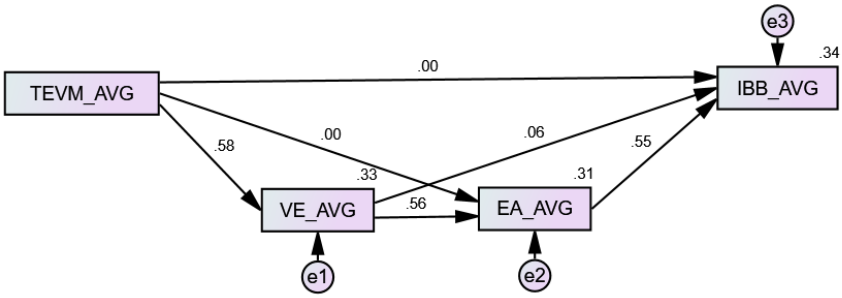
### 5.4 Structural Model Assessment




The findings of this structural modelling analysis show an unambiguous process by which technology-enabled visual merchandising (TEVM), through visual engagement, specifically affects an individual's impulse buying behaviour. When looking at the results, TEVM significantly influenced visual engagement ($\beta = 0.58$, $p < 0.001$), confirming that the use of advanced visual technologies can successfully draw an individual's attention in a supermarket setting. Also, the results show that visual engagement significantly influenced emotional arousal ($\beta = 0.56$, $p < 0.001$), indicating that as visual engagement increases, it has an even greater level of affective response. Emotional arousal then significantly influenced impulse buying behaviour ($\beta = 0.55$, $p < 0.001$), which demonstrates that emotional arousal plays a major role in unplanned purchases. Additionally, the direct relationship between TEVM and emotional arousal is weak ($\beta = 0.06$), while the direct relationship between TEVM and impulse buy behaviour is negligible; this suggests that the overall impact of TEVM on impulse buy behaviour is an indirect effect of visual engagement and emotional arousal using a sequential mediation process, which is entirely consistent with the S–O–R framework (stimulus-organism-response).

**Table 6: Major Indicators for Structural Equation Model Fit**

| Fit Index | Obtained Value | Recommended Threshold |
|---|---|---|
| $\chi^2$/df (CMIN/DF) | 0.968 | < 3.00 |
| GFI | 0.962 | ≥ 0.90 |
| CFI | 1.000 | ≥ 0.95 |
| TLI | 1.001 | ≥ 0.90 |
| RMSEA | 0.000 | ≤ 0.08 |

Analysis of the constructs and relationships shows that there is a very good overall fit between the proposed structural model and data observed in the sample. The chi-square statistic/df (CMIN/DF) of .968 is much less than 3.00, indicating little deviation from the observed covariance matrix of the sample. The Goodness of Fit Index (GFI) is .962, which far exceeds the minimum standard set for GFI of .90, indicating strong absolute fit of the proposed model to the sample covariance matrix. Additional evidence of relative adequacy of the model comes from the Incremental Fit Indices, where the Comparative Fit Index (CFI) was 1.000 and the Tucker-Lewis Index (TLI) was 1.001, which both exceed the accepted standards for determining relative model fit over the null model. The Root Mean Square Error of Approximation (RMSEA) indicates no error in the model fit being used to approximate the sample data as RMSEA was .000, much less than the maximum standard for an acceptable RMSEA of .08. Taken together, these indices indicate that the overall goodness-of-fit of the structural model is excellent and confirm that it is appropriate for testing hypotheses and analysing the structural relationships among the variables.

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**Table 7: Hypothesis testing results.**

| Hypothesis | Structural Path | Standardized Estimate (β) | C.R. | p-value | Result |
|---|---|---|---|---|---|
| **H1** | Technology-Enabled Visual Merchandising → Visual Engagement | 0.579 | 14.168 | *** | **Supported** |
| **H2** | Visual Engagement → Emotional Arousal | 0.559 | 10.954 | *** | **Supported** |
| **H3** | Emotional Arousal → Impulse Buying Behaviour | 0.547 | 11.194 | *** | **Supported** |
| **H4** | Technology-Enabled Visual Merchandising → Emotional Arousal | −0.005 | −0.098 | 0.922 | **Not Supported** |
| **H5** | Technology-Enabled Visual Merchandising → Impulse Buying Behaviour | 0.000 | −0.005 | 0.996 | **Not Supported** |

The results of the hypothesis tests indicate that the proposed sequential relationships of the model are supported. Technology-Enabled Visual Merchandising results in a substantial and positive impact on Visual Engagement, ($\beta = 0.579$; C.R. = 14.168; $p < .001$) which supports H1, and shows that advanced visual technology can enhance customers' engagement while inside supermarket environments. Furthermore, Visual Engagement has a significant positive effect on Emotional Arousal ($\beta = 0.559$, C.R. = 10.954; $p < .001$), confirming H2, and indicating that increased visual interaction increases the level of Emotional Arousal. Emotional Arousal also has a significant positive effect on Impulse Buying Behaviour ($\beta = 0.547$; C.R. = 11.194; $p < .001$), supporting H3, and demonstrating the importance of affective states as antecedents of consumers' Impulse Buying Behaviour. However, the direct effects of Technology-Enabled Visual Merchandising on Emotional Arousal ($\beta = -0.005$; $p = 0.922$) and Impulse Buying Behaviour ($\beta = 0.000$; $p = 0.996$) are not significant leading to the rejection of H4 and H5. Therefore, it can be concluded that Technology-Enabled Visual Merchandising influences consumers' Impulse Buying Behaviour mainly via Visual Engagement and Emotional Arousal and provides empirical evidence of a full mediation model that is in line with the Stimulus–Organism–Response (S-O-R) model.

## 6. Discussion

### 6.1 Interpretation of Key Findings

The findings of this study provide clear empirical evidence that technology-enabled visual merchandising influences impulse buying behaviour primarily through indirect psychological mechanisms rather than direct effects. The strong positive effect of technology-enabled visual merchandising on visual engagement confirms that advanced in-store visual technologies—such as digital displays, interactive signage, and dynamic lighting—successfully attract consumers' attention and enhance their level of interaction with the retail environment. Visual engagement, in turn, significantly increases emotional arousal, indicating that cognitively engaging visual stimuli evoke affective responses that are critical in shaping unplanned purchase decisions. Emotional arousal emerges as a key proximal determinant of impulse buying behaviour, underscoring the role of affective states in driving spontaneous purchasing decisions in supermarket settings. The non-significant direct paths from technology-enabled visual merchandising to emotional arousal and impulse buying behaviour further suggest that technological stimuli alone are insufficient to trigger impulsive purchases unless they first engage consumers visually and emotionally.

### 6.2 Comparison with Previous Studies

The results are consistent with prior studies that emphasize the mediating role of consumer engagement and emotions in retail environments. Earlier research on visual merchandising and store atmospherics has shown that visually appealing retail cues enhance attention and involvement, which subsequently influence affective responses and buying behaviour (Hollebeek et al., 2014). This study extends such findings by demonstrating that technology-enabled visual merchandising operates

through a sequential mediation process involving visual engagement and emotional arousal (Grewal et al., 2017). While some previous studies report direct effects of advanced retail technologies on impulse buying, the present findings suggest that in supermarket contexts—where purchases are often routine and utilitarian—the impact of technology is more nuanced and psychologically mediated (Hilken et al., 2017). This aligns with recent omnichannel and retail technology research that highlights the importance of experiential and emotional pathways rather than purely technological novelty effects.

### 6.3. Theoretical Implications

This study makes several significant theoretical contributions by integrating technology, cognition, and emotion into a single empirical framework, specifically within the unique context of the Indian retail market. By empirically validating the Stimulus–Organism–Response (S–O–R) framework in a technology-enabled physical environment, the research clearly delineates a sequential organismic process where visual engagement (cognitive response) must precede emotional arousal (affective response) to influence behaviour. This layered interpretation provides greater explanatory depth than models treating internal states as singular constructs and extends impulse buying theory by demonstrating a full mediation mechanism; technological stimuli do not directly trigger purchases but instead operate by disrupting habitual patterns through internal consumer states. Furthermore, by operationalizing technology-enabled visual merchandising as a multidimensional and dynamic stimulus, the study bridges the gap between traditional static display literature and emerging smart retail research. In the specific context of Indian supermarkets—characterized by high density and predominantly planned shopping—these findings reveal that interactive technologies align with the digital familiarity of consumers to convert utilitarian trips into experiential encounters. Ultimately, this theoretical integration reinforces the relevance of the S–O–R model in emerging markets and highlights the necessity of designing retail technologies for emotional resonance rather than just technological novelty

### 6.4. Managerial Implications

The findings offer clear guidance for supermarket managers and retail practitioners. Technology-enabled visual merchandising should be designed to enhance engagement rather than merely display information. Investments in digital and interactive visual technologies will be most effective when they actively capture attention, sustain engagement, and evoke emotional responses. Retailers should strategically place interactive displays in high-traffic and decision-critical areas and regularly refresh visual content to avoid consumer habituation. The results suggest that emotional resonance, rather than technological novelty alone, is critical for converting routine supermarket visits into impulse purchase opportunities, particularly in emerging markets such as India.

### 6.5. Limitations and Future Research Directions

This study has certain limitations. The cross-sectional design restricts causal inference, and future research could employ experimental or longitudinal methods to examine causal and temporal effects. The focus on supermarkets in Tamil Nadu limits generalizability across retail formats and cultural contexts. Additionally, the study concentrates on visual technologies, excluding other sensory cues such as sound or scent. Future research may explore multi-sensory retail technologies, cross-cultural comparisons, and the long-term effects of repeated exposure to technology-enabled visual merchandising on consumer behaviour.

## 7. Conclusion

This study demonstrates that technology-enabled visual merchandising influences impulse buying behaviour indirectly through visual engagement and emotional arousal, rather than through direct effects. By empirically validating a sequential mediation mechanism within the S–O–R framework, the study advances theoretical understanding of how retail technologies operate in physical store environments. The findings highlight the importance of engagement-driven and emotionally resonant visual strategies for supermarkets, particularly in the Indian retail context. Overall, the study provides a robust

foundation for future research and offers practical insights for leveraging retail technologies to enhance consumer experiences and impulse buying behaviour.

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