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Integrating Qualitative and Quantitative Approaches: The Impact of AI Design on Consumer Perception and Buying Behavior in the FMCG Sector

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Abstract
The motivation behind this examination is to explore the relationship between AI designs, consumer perception, consumer buying behaviour, and consumer literacy in Pakistan's fast-moving consumer goods (FMCG). To apply ethnography to research the consumer's buying behaviour in the context of AI designs in the FMCG Sector. This study used the mixed-method approach, a quantitative exploration plan and utilised a survey method to collect data from 250 FMCG sector consumers in Lahore via an online self-administered survey. The paper applied SEM to examine the hypotheses and analyze the data. The qualitative portion used eight in-depth semi-structured interviews for data collection. The paper found that AI designs affected consumer perception (CP), consumer perception (CP) affected by consumer buying behaviour (CBB), and CP intervened in the impact of AI designs on CBB. Consumer literacy (CL) is moderated between consumer perception (CP) and consumer buying behaviour (CBB). The findings also reveal the positive impact of AI on consumer buying behaviour, through individual perspectives. The study adds to the works on the link between AI designs, CP, CBB, and CL in the FMCG business. It gives experimental proof to help the hypotheses that AI designs influence CP, CP influences CBB, and CP explains the impact of AI designs on CBB, CL moderated between CP and CBB. AI designs can enhance consumer perception and buying behaviour of FMCG products, leading to higher market performance and customer satisfaction. FMCG companies can use AI to innovate, customize, and educate their products and services for different consumer segments. The research aims to identify the association between AI designs, CP, CBB and CL in the FMCG industry. It offers an original viewpoint on how AI designs can improve CP, how CP can prompt CBB, and how consumer literacy is moderated between CP and CBB in the fast-moving consumer goods business.
Keywords: AI designs, consumer perception, consumer buying behavior, consumer literacy, FMCG sector

1. Introduction

The consumer packaged goods (CPG) or "fast-moving consumer goods (FMCG)" market is one of the biggest and most rapidly expanding sectors in the world (Sethi & Chaudhary, 2021; Vibhuti & Pandey, 2014). The "FMCG sector" comprises goods that are easily and economically sold, such as convenience foods and drinks, skincare, and products like soap, and housekeeping supplies (Meera, Mahalakshmi, & Padmaja, 2017). Apart from its ongoing modification to the growing desires of customers, behaviours, and predictions, the FMCG sector is one of the most unique and constantly evolving (Tien, Ngoc, & Anh, 2021). "The worldwide FMCG market was estimated at $11,490.9 billion in 2021 and is expected to grow at a compound annual growth rate (CAGR) of 5.1% from 2022 to 2031, or $18,939.4 billion. Around 420 million people are employed in the FMCG sector, which contributes significantly to the world economy by making up 10% of the GDP" (Costa & Ferreira, 2023).

Online ratings and reviews affect consumer purchase-making in online buying and selling platforms. The effects of online ratings and reviews on consumer trust, perceived risk, perceived value, and purchase intention (Kutabish, Soares, & Casais, 2023). The factors that influence the impulse buying behaviour of consumers, such as emotions, personality traits, situational factors, product characteristics, and marketing stimuli. The implications of impulse buying behaviour for consumer welfare and marketing strategy (Rodrigues, Lopes, & Varela, 2021). Using AI chat robots in educational institutions finds that AI chat robots can provide assistance doing study, personalized education knowledge, and skill advancement for students, as well as time-saving and academic support for scholars (Labadze, Grigolia, & Machaidze, 2023). Consumer awareness is the process of developing the knowledge, skills, and attitudes necessary to make informed and responsible decisions in the marketplace (Greeley, 2023). Consumers' perception and understanding of the impact on the ecology of different eatable wrapping materials, such as paper/cardboard, plastic, glass, different types of metals, and biodegradable plastic. The scientific assessment of food packaging's environmental sustainability from the consumer perception is based on factors including environmental expansion, recycling level, reuse rate, and decomposition rate (Otto et al., 2021).

The an absence of studies that focus on the consumer buying behaviour process as a whole, rather than on specific stages or outcomes (Kutabish, Soares, & Casais, 2023). The investigation does not examine the causal mechanisms or the mediating variables that explain how AI affects consumer behaviour and company performance (Dias et al., 2023). The association between AI-enabled customer experience and customer perception elements is not compared in the study across different forms of AI. Without making any distinction between various AI applications or techniques, the study approaches artificial intelligence as a homogenous and general term (Tulcanaza-Prieto, Cortez-Ordoñez, & Lee, 2023). The research does not investigate how customers in various situations and cultures observe the use of artificial intelligence (AI) and marketing that uses AI communications. Only investigated how consumers felt about AI and Intelligence-related marketing; no behavioural effects were seen (Chen et al., 2021). The study fails to address the possible dangers and difficulties associated with AI, including issues related to security, confidentiality, transparency, accountability, prejudice, and confidence, and how these may impact consumer behaviour and the way AI marketing is regarded (Gkikas & Theodoridis, 2022). The moderating and mediating elements that affect the connection between AI, consumer behaviour, and information sharing are not examined in this study (Olan et al., 2021).

"The self-expansion theory would be used with the framework of "What are the emotions generated during AI-consumer interactions, and how do they affect them individually and socially? (Alabed, Javornik, & Gregory-Smith, 2022). "The job replacement Theory would be used in this framework of, what are different consumption contexts where consumers desire interaction with digital assistants (Beeler, Zablah, & Rapp, 2022)". The social presence theory would be used with the framework of, which Chabot or voice bot communication style suits low-involvement or entertainment products. (Alabed, Javornik, & Gregory-Smith, 2022). "The Para-social theory would be used with the framework, what are the different consumer observations

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and responses while interacting with human versus AI agents"? (Lee & Park, 2022). "The theory of mind would be used with the framework, what AI designs or features can be used to influence the perception that AI can prevent deception and unethical behaviour of consumers toward it? (Kim et al., 2022). This study seeks to address the following theoretical gaps to address the research questions:

RQ1. Are artificial intelligence (AI) design and consumer perception (CP) related?

RQ2. Is there a relationship between consumer behaviour (CBB) and artificial intelligence (AI) design that is mediated by consumer perception (CP)?

RQ3. Does the relationship between consumer perception (CP) and buyer behaviour (CBB) become moderated by consumer literacy (CL)?

RQ4. In what ways, do consumers' buying behaviour evolve within AI designs in the FMCG Sector, as explored through ethnography?

The prime purpose of this study is to check the association between artificial intelligence (AI) design, and consumer perception (CP), consumer perception also influences CBB, while also looking at how consumer perception (CP), mediates the association between artificial intelligence (AI) design, and consumer buying behaviour (CBB). To assess how consumer literacy (CL) influences the correlation between consumer buying behaviour (CBB) and consumer perception (CP). To apply ethnography to research the consumer's buying behaviour in the context of AI designs in the FMCG Sector.

2. Theory and Hypotheses

2.1. Theory of Mind (ToM)

The ability to think cognitively concerning mental conditions, including feelings, thoughts, wants, and knowledge—both our own as well as that of others—is known as the theory of mind. It involves not just thinking about considering, but also making assumptions-based judgments or interpretations of behavior. It facilitates regulation, arguments, and planning of behaviours or psychological conditions (Franchin, 2023). The theory of mind (ToM), which is an essential component of communication and interaction in society, is a capacity to express the state of mind to himself and others. The capacity to forecast and comprehend the behaviours of others reveals the value of a theory of mind (Beaudoin et al., 2020). The theory of mind generally arises in the earliest phases of life, while adults have been the subject of some of the early research on the subject. One of the most popular methods for analyzing the theory of mind is the false-belief test, which gauges a person's opinion that other individuals could hold incorrect beliefs (Martins-Junior et al., 2011). Comprehending the theory of mind (ToM) is a necessary social-cognitive capability that demands that you take into consideration your own as well as other people's mental health (Cherry, 2020).

ToM may help experts grasp the requests and perspectives that students bring, and it can also help students develop their capacity for working feelings for others, and thinking about ethics (Estes & Bartsch, 2017). AI designs may be greatly influenced by theory of mind (ToM) notions, which assess the emotional and social components of the system in place of examining the mental states of viewers, employees, and surroundings (Kim et al., 2022). Developing consumer literacy may be accomplished through ToM competencies, such as grasping the perspective and objectives of businesses, producers, and potential consumers and also acknowledging emotions and assumptions that impact customer behaviour (Tao et al., 2022).

2.2. Operationalization of Variables

2.2.1. AI designs

"By 'general intelligent action' we wish to indicate the same scope of intelligence as we see in human action: that in any real situation behaviour appropriate to the ends of the system and adaptive to the demands of the environment can occur, within some limits of speed and complexity (Newell & Simon, 2007)". "Intelligence usually means the ability to solve hard problems (Minsky, 1985)". "AI is concerned with methods of achieving goals in situations in which the information available has a certain complex character. The methods that have to be used are related to the problem presented by the situation and are similar whether the problem solver is human, a Martian, or a computer program (McCarthy, 1988)".

2.2.2. Consumer Buying Behavior (CBB)

"Customer buying activities refers to the activities that consumers show in the process of seeking, purchasing, using, analyzing, and losing products and services that they expect will fulfil their personal needs. Customer activities include both physical activities and mental choices that result from those choices (Bloch, Sherrell, & Ridgway, 1986)". "(Rundle-Thiele & Bennett, 2001), defined consumer behaviour as the dynamic interaction of affect and cognition, behaviour, and environmental events which human beings conduct the exchange aspects of their lives." "Consumer behaviour as defined activities people undertake when obtaining, consuming, and disposing of products and services (Blackwell, Miniard, & Engel, 2001) ".

2.2.3. Consumer Perception

"A consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given by (Zeithaml, Berry, & Parasuraman, 1996)" and "based on an interactive relativistic consumption preference experience (Holbrook, 1994)", "customer perceived value creates a trade-off between product-related benefits and sacrifices in the perspective of current as well as potential customers in different phases of the purchase process (Woodruff, 1997)".

2.2.4. Consumer Literacy

''Awareness must precede attempts at control […]''. However, it is suggested that ''[…] awareness is not an all-or-none phenomenon (Chartrand, 2005)". Hence, "awareness deals with the question to which degree consumers consciously reflect on their behaviours". ''In situations where consumers are unable to fully understand the connections between their buying decisions and environmental consequences, […] heuristics and habit will become a stronger determinant of (non) pro-environmental behaviour (Koenig-Lewis et al., 2014)".

2.3. AI Designs and Consumer Perception

Four key elements are identified about the influence of AI on customer behaviour: consumer perception, consumer attitude, consumer trust, and consumer satisfaction. Based on the kind, level, and context of AI, it can have both beneficial and harmful effects on consumer behaviour (Dias et al., 2023). Customer perception and the AI-enabled customer experience are strongly and significantly correlated (Tulcanaza-Prieto, Cortez-Ordoñez, & Lee, 2023). Customers' perceptions of artificial intelligence are multifaceted and relational, focusing on emotion, functionality, and human-like comparisons. Although consumers acknowledge that AI marketing communication is unavoidable, its impact on their assessment of products is minimal (Chen et

al., 2021). Regarding AI technology employed in commerce, consumers perceive a moderate degree of risk; they give the most weight to ethical issues and the lowest weight to economic hazards. The consumers' risk perception is negatively correlated with their trust in AI technologies and positively correlated with their perceived usefulness of AI technologies (Aytekin et al., 2021). AI has both positive and negative impacts on consumers' identity and human skills and suggests that consumers should be aware of the risks and benefits of AI and that companies should use AI responsibly and ethically (Pelau, Ene, & Pop, 2021). Customers see artificial intelligence (AI) in the banking industry favourably because they think it may enhance the speed, convenience, and quality of financial products and services. Customer perceptions of AI in the banking industry are also impacted by psychological traits including loyalty, contentment, and trust (Ryzhkova et al., 2020). AI services have the potential to create value for consumers and suggest that service providers should focus on enhancing the perceived usefulness and ease of use of AI services, as well as the positive attitude of consumers (Wang, Huang, & Wang, 2020). The AI speakers have the potential to create value for consumers and suggest that marketers should focus on enhancing the consumers' perception and use motivation of AI speakers by providing useful, enjoyable, and trustworthy features and services (Lee et al., 2019).

H1: There is a positive and significant relationship between AI designs and consumer perception.

2.4. Consumer Perception and Consumer Buying Behavior

Consumer perception has a positive effect on consumer buying behaviour, the consumers tend to buy more when they have a favourable perception of the product and the brand (Hexian, 2023). Consumers place a greater emphasis on economic and efficiency factors in their consumer perception, which in turn leads to consumer buying behaviour when they are experiencing catalogues (Zhang, Hexian, & Li, 2023). The beneficial relationship between customers' perceptions and buying behaviour and their impression of the company's social responsibility (CSR) tends to be stronger among those with strong ethical indictments. Customers' perceptions of company social responsibility (CSR) are shaped by their awareness and familiarity with food safety concerns, as well as their level of confidence in the government, media, and food sector (Rathore et al., 2022). Product fairness, pricing fairness, non-deception, fair trade, and environmentally friendly goods are all included in the multidimensional concept known as "consumer perceptions of the ethics of retailers, or CPER". Positive word-of-mouth and purchasing behaviour have been beneficially influenced by the CPER, and the relationship is stronger for customers who have strong ethical convictions (Cheung & To, 2021). Consumers' perception of value positively affects their impulse buying behaviour, the more value they perceive, the more likely they are to buy impulsively (Yang et al., 2021). Consumers' perception of risk negatively affects their cross-platform buying behaviour, the more risk they perceive, the less likely they are to buy products or services on different platforms (Zhang & Yu, 2020). There is a significant beneficial connection involving the students' high level of perception and their purchasing behaviour about TV advertisements. Demographic characteristics like gender, age, income, and level of education influence students' opinions and buying choices (Elarbah & SHEBLİ, 2020). Customers' satisfaction and loyalty to the brand beef are enhanced by their views of food safety, which in turn has a favourable impact on their decision to repurchase and spread word-of-mouth behaviour (Kim & Jung, 2018).

H2: There is a positive and significant relationship between consumer perception and consumer buying behaviour.

2.5. Mediating Role of Consumer Perception

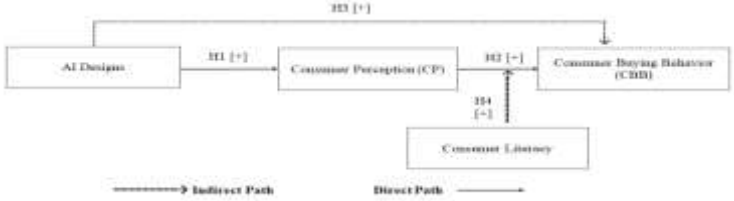
Consumer perception plays an instrumental part in moderating the negative impact of economic conditions on consumer buying behaviour, as it partially mediates the relationship between both of those factors (Hexian, 2023). Anthropomorphic creation in emotional AI supplies improves consumers' perception of happiness and boosts purchase intentions and brand perception. Greater intelligence increases the positive effects of anthropomorphic appearance since its impact is modulated by the AI product's level of intelligence (Zhang & Wang, 2023). The impact of society influences value perception and impulsive purchasing behaviour; that is when social support is high and the impact of value perception on impulsive purchasing habits is stronger (Yang et al., 2021). Perceived clarity of use is less significant than trust and perceived value as the main factors impacting customer attitudes and behaviour intentions toward AI in shopping online (Nagy & Hajdú, 2021)The research investigation regarding how the features of a product affect consumer attitudes toward AI recommendations provides a spotlight on the psychological basis of AI and human-technology interaction (Bawack, Fosso Wamba, & Carillo, 2021).

H3: Consumer perception mediates the relationship between AI designs and consumer buying behaviour.

2.6. Moderating Role of Consumer Literacy

Consumer health literacy has a positive effect on health information-seeking behaviour and health outcomes, such as self-efficacy, knowledge, adherence, quality of life, and health status (Sundell, Wångdahl, & Grauman, 2022). Customer perception is influenced by four factors: "quality, trust, psychological, and social", and customer perception positively affects consumer buying decisions.

Theoretical Framework



Buyers are more likely to pick up branded items when they get them at a lower rate, showing that the price decrease has a largely mediating function by reducing the impact of purchase intention on purchasing decisions (Dangi et al., 2021). Reading online feedback increases customers' perceived utility and pleasure value, which in turn makes them more likely to look around and make impulsive purchases. Consumers who have reduced impulsiveness are more affected by the utilitarian significance of online reviews, whereas consumers with high impulsiveness are more affected by the psychological significance of online evaluations and browsing behaviour (Zhang et al., 2018). Customer participation enhances consumers' perceived value, satisfaction, and trust in green products, which in turn increases their willingness to pay more. Customer participation is stronger for consumers with high impulsiveness than for those with low impulsiveness (Wei, Ang, & Jancenelle, 2018).

H4: The relationship between consumer perception and consumer buying behaviour is moderated by consumer literacy, such that the relationship is stronger with increasing levels of consumer literacy.

3. Methodology

3.1. Measures

Twelve question items of AI designs were adopted from (Schepman & Rodway, 2020). The item is "I am interested in using artificially intelligent systems in my daily life". The twelve positive items of a = 0.88. The most common Likert scale, ranges from 1 to 5, with 5 denoting strongly agree on the right-hand side and 1 denoting strongly disagree on the left-hand side. This scale is developed by (Schepman & Rodway, 2020).

The scale of consumer perception was adopted by (Iglesias, 2004). Four items have "I received an excellent service". Their alpha value of 0.80. The scale was developed by (Iglesias, 2004), based on the operationalization of different concepts. The scale uses a 5-point Likert scale.

The scale of consumer buying behaviour was adopted from (Bagga & Bhatt, 2013). They have developed the scale. In this scale seven items were adopted "I usually seek expert opinions online before purchasing a high-involvement (expensive) product", and their α-value is 0.73 and used a five-point Likert scale.

The scale of consumer literacy was adapted from (Monkman et al., 2017). Eight items have "I know what health resources are available on the Internet" and their α-value is 0.86. This study used a five-point Likert scale. The scale was modified according to the FMCG sector (replace the word "health" with "FMCG").

3.2. Data Collection and Sampling Technique

The population of the research would be *consumers* who are actively engaging with AI technologies in the FMCG sector. This includes individuals who use AI for shopping assistance, such as chat-bots, search engines, and other AI-driven tools that influence purchasing decisions. Given the global reach of the FMCG sector and the increasing integration of AI in consumer experiences, this population could potentially encompass a significant portion of the global consumer base. The offline methods could involve visiting retail environments where AI is implemented or conducting in-person interviews at locations where the target population frequents. For qualitative research, a smaller, focused sample is often more valuable. A sample size of *8 participants* can provide in-depth insights, especially if the selection is strategic to cover various demographics and user experiences with AI in the FMCG sector. For the *quantitative stance*, the self-administrated survey and the data collection from 235 participants of FMCG consumers will be used. *Non-probability convenience sampling* is suitable for this research because it allows for easy access to participants who are readily available and willing to participate (Dornyei, 2007). This method is particularly useful when studying a specific phenomenon within a certain context, such as consumer interactions with AI in the FMCG sector. *In qualitative research, open-ended one-on-one in-depth interviews* would be a suitable method for data collection. For a comprehensive understanding of consumer perceptions and behaviours regarding AI designs in the FMCG industry. In quantitative design, the self-administrative close-ended questionnaire was used and a five-point Likert scale was used e.g., 1 is strongly disagree through 5 is strongly agree. Ethnography research design will be used in the current study because explores the characteristics of how the customers of the FMCG sector interact with AI designs. (Dornyei, 2007). The consumer is the unit of analysis in this research (Hopkins, 1982). 550 Online self-administered questionnaires were distributed and received only 300 questionnaires. After receiving 300 questionnaires, some respondents partially respond to the questionnaire. After screening the questionnaire, the remaining 250 questionnaires were appropriate for data analysis. 50 questionnaires were discarded because not fully completed. The surveys were provided to all customers, regardless of gender, and age, of the FMCG sector in Lahore. Table 1 provides respondents' demographic information.

Table 1: Demographic Variables

Variables	Category	Frequency	Percentage
Gender	Female	85	46.0%
	Male	100	54.0%
Age	25-35	50	27.0%
	36-45	100	54.0%
	46-55	35	19.0%
Professions			
Area/Location			

3.3. Treatment of Missing Values

Missing data is an undeniable issue in model examinations by Little (1988), p. 287). Research in the social sciences has confronted challenges in managing missing data (Rezaei et al., 2016). According to Rezaei and Ghodsi (2014), imputation has been primarily important for experts among different methods to determine the concern of missing values. "Imputation methodology" by Rubin (1987) is a reenactment strategy that exchanges each missing datum with a collection of complete data >1 possible value (Schafer & Olsen, 1998). The review utilized nearly Little's assumption augmentation calculation in SPSS for the "imputation" of missing values.

3.4. Common Method Variance (CMV)

This study found a way, a couple of ways to control the common method bias issues. Firstly, we guaranteed secrecy to the respondents and insignificance too. Secondly, we additionally randomize the question items in the survey and make it impossible for the respondent to guess the variables whether dependent and independent or other variables (Podsakoff et al., 2003). The review suggests that CMV could be surveyed with the full collinearity test about SEM. Using the VIF resulting from a full collinearity test, the current study dealt with common method bias using this real-time approach (Kock, 2015). A VIF higher than 3.3 Hair et al. (2017) demonstrates that the model might be disgusting by the CMV. Thus, accepting the potential gains of VIFs with a full collinearity test lower than 3.3, the model could be viewed as liberated from CMV. The flow research showed

that the VIF value is under 3.3, which makes sense because there is no CMV in the information. As a result, the study found that CMV was not a problem in Table 2.

The nonresponse bias is a real and noteworthy modification between respondents to a questionnaire and those who were not concerned with the features of the study's attention (Lewis, Hardy, & Snaith, 2013). The exploration used wave assessment to assess the nonresponse bias. Responses before for instance around the start of the information assortment process, were named the "early respondents" while the responses close to the completion of the data collection process were named the "late respondents". Through a free example t-test, we initiate no huge alterations between the "early respondents" and "late respondents" proclaiming the obstacle of nonresponse liking.

4. Quantitative Data Analysis (Results)

4.1. Structural Equation Modelling (SEM)

The proposed model's parametric parts (measurement model) and hypotheses were analyzed using the PLS-SEM in this study. A two-stage technique for model assessment, estimated model assessment followed by SEM, was also proposed by Chin (2009). The exploration made sense of the PLS-SEM strategy considering different rationales; first, the PLS-SEM has flexibility to the extent that test sample size is essential and data normality. Second, smart-PLS was utilized for information investigation as it is considered a famous and high-level assessment method (Ali et al., 2018). Third, the PLS computation followed by the "bootstrapping method" was used to choose factor loadings, separate immense levels and, path coefficients. Last, PLS-SEM has been suggested as a higher inspection method for SEM (Nitzl, Roldan, & Cepeda, 2016). In the current investigation, consumer perception is a mediating factor between AI designs and consumer buying behaviour.

4.2. Measurement Model

Assessment properties of the proposed model like convergent validity (CV), internal reliability, and discriminant validity (DV) and regularly analyzed before testing the essential relationship of factors. We assessed internal consistency using a composite reliability (CR) score as CR is tolerably an unrivalled extent of internal consistency when diverged from Cronbach's alpha (Hair et al., 2017). A score of 0.60 on CR is considered accepted for examinations of an exploratory nature (Avkiran, 2018). AI designs received a CR of 0.85, a consumer perception CR of 0.80, a consumer literacy CR of 0.77 and a consumer buying behaviour CR of 0.88, in this study. As a result, the study's internal consistency and reliability were all good at this stage.

Table 2: Measurement Model

Variables & Constructs	Loading	VIF	a-value	AVE	CR
Artificial Intelligence (AI)			0.84	0.65	0.85
AID1	0.86	2.00			
AID2	0.70	1.80			
AID3	0.75	2.58			
AID4	0.74	3.02			
AID5	0.83	3.01			
AID6	0.79	2.99			
AID7	0.80	2.67			
AID8	0.82	2.66			
AID9	0.83	2.60			
AID10	0.84	2.63			
AID11	0.85	2.72			
AID12	0.89	2.79			
Consumer Perception (CP)			0.86	0.69	0.80
CP1	0.80	2.01			
CP2	0.80	1.70			
CP3	0.88	2.93			
CP4	0.77	2.00			
Consumer Buying Behaviour (CBB)			0.81	0.62	0.88
CBB1	0.80	1.55			
CBB2	0.82	1.76			
CBB3	0.86	2.18			
CBB4	0.67	1.62			
CBB5	0.65	1.65			
CBB6	0.67	2.25			
CBB7	0.75	2.54			
Consumer Literacy (CL)				0.80	0.77
CL1	0.66	2.53			
CL2	0.69	2.59			
CL3	0.72	2.25			
CL4	0.78	2.10			
CL5	0.85	2.20			
CL6	0.87	1.75			
CL7	0.72	2.25			
CL8	0.79	2.76			

Hair et al. (2017) explained that CV is "the extent to which a measure correlates positively with alternative measures of the same construct", (p. 112). Seeing the external loading of every item of a certain variable and working out the AVE are the most proposed ways to deal with choosing a CV (Hair Jr et al., 2014). An external loading values the more noticeable

representativeness of a question item for the connected variable (Memon et al., 2017). In existing research, the external factor loading went from 0.70 to 0.89 for AI designs, 0.77 to 0.88 for consumer perception, 0.65 to 0.86 for CBB, and 0.66 to 0.87 for consumer literacy. Likewise, all factors showed an accepted AVE score: AI designs (0.65), consumer perception (0.69), CBB (0.62) and consumer literacy 0.80 - accordingly affirming the united legitimacy.

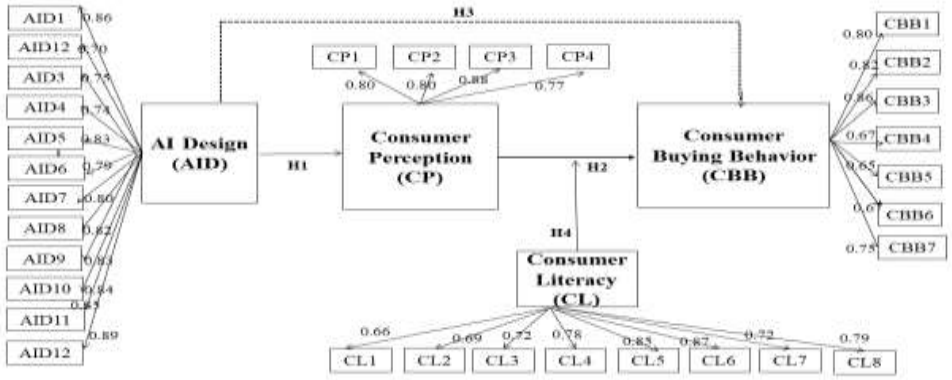


Figure 2 Measurement Model

According to Hair Jr et al. (2014), DV is "the extent to which a construct is truly distinct from other constructs by empirical standards" (p. 104). The HTMT technique was utilized to assess DV by Henseler, Ringle and Sarstedt (2015) and Fornell-Larker's system. There is a slight assortment in as far as possible values of HTMT. According to Clark and Watson (2016), it shouldn't cross the 0.85 threshold value; regardless, (Gold, Malhotra, & Segars, 2001) acknowledged that a 0.90 score for DV is similarly palatable. Results showed that DV for the examination build was undeniably settled at HTMT 0.85 level - in this way, approving that every variable in the model is assessing a remarkable thought. In addition, the DV was settled using Fornell-Larker's standard.

Table 3: Discriminant Validity of Variables

Construct & Items	AID	CP	CBB	CL
HTMT Ratio				
AID	0.176			
CP	0.346	0.844		
CBB	0.593	0.300	0.794	
CL	0.777	0.81	0.693	0.840
Fornell-Larker's Method				
AID				
CP	0.37			
CBB	0.29	0.83		
CL	0.56	0.44	0.70	

4.3. Structural Equation Modelling (Hypotheses Testing)

The research applied a bootstrapping strategy with 5,000 resamples to study the significance of our proposed model (Hair et al., 2017). H1 states that AI designs have positive and significant effects on CP. The b-value of 0.35 demonstrates that a one-unit expansion in AI designs is related to a 0.35-unit expansion in CP. At a 0.05 significance level, the effect is statistically significant because the t-value of 3.00 is greater than the threshold of 1.96 for a two-tailed test. The R2 of 0.16 demonstrates that AI designs make sense for 16% of the variety in CP. Therefore, H1 is supported by the data.

H2 states that CP directly influences CBB. A b-value of 0.41 indicates that an average 0.41-unit increase in CBB is correlated with an increase of one unit in CP. The impact is huge because the t-value of 4.10 is more prominent than the basic value of 1.96 for a two-tailed test at a 0.05 importance level. The R2 of 0.23 demonstrates that CP makes sense of 23% of the variety in CBB. Subsequently, H2 is supported by the data.

Table 4: Path Analysis

Hypotheses	Path	B	t-value	R2	Decision
H1	AID → CP	0.35	3.00*	0.16	Supported
H2	CP → CBB	0.41	4.10*	0.23	Supported
H3	AID → CP → CBB	0.19	2.50*		Supported
H4	CP x CL → CBB	0.13	2.01		Supported

Note: AID, artificial intelligence Design; CP, consumer perception; CBB, consumer buying behaviour and, CL, consumer literacy, *p < 0.05

H3 states that AI designs in an indirect effect on CBB through CP. The indirect effect is positive, as evidenced by the b-value of 0.19, which indicates that the mediation of CP results in an average increase of 0.19 units in CBB for every one-unit increase in AI designs. The t-value of 2.50 is better than the critical value of 1.96 for a two-tailed test at a 0.05 critical level, it is quantifiably indispensable to suggest that the measurably huge. In this way, H3 is supported by the data.

H4 states that consumer literacy (CL) is a moderated effect between consumer perception (CP) and consumer buying behaviour (CBB). The moderated effect is positive, as evidenced by the b-value of 0.13, which indicates that the moderation of CL results in an average increase of 0.13 units in CBB for every one-unit increase in AI designs. As shown in H4, consumer literacy

regulates the relation between customer perception and consumer buying behaviour (CBB), making this relationship stronger in the presence of consumer literacy levels in Figure 4. The relationship between consumer perception (CP) and CBB is moderated by consumer literacy (CL), as per the findings (H4: $\beta = 0.13$, $t = 2.01$ and $p < 0.05$). The associations between consumer perception (CP) and consumer buying behaviour (CBB) are higher at high levels of consumer literacy (CL) as seen by the curves displayed in Figure 3. Therefore, it is suggested that the relationship between consumer buying behaviour (CBB), consumer perception (CP) and consumer literacy (CL) is supported by our moderation analysis results. All the SEM results are in Table 4.

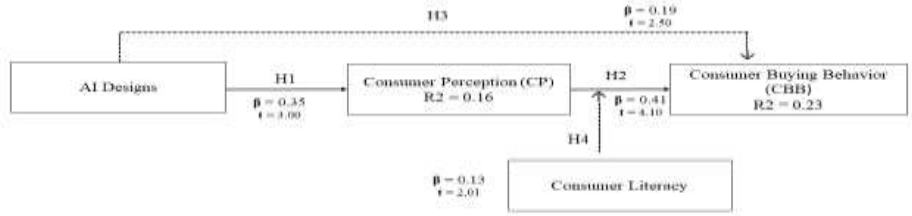


Figure 3: Result of Structure Equation Modelling

4.4. Qualitative Analysis of Interviews

The data analysis in this research is via *thematic analysis.* Use the semi-structured interview for conducting the data. There were eight interviews conducted with FMCG customers in Pakistan. Six major themes emerged e.g., AI design, customer attention, simplification of the shopping experience, reliability and trustworthiness, influence on consumer buying behaviour and repeated purchases. There are two themes used in this research. These themes are as follows; AI design, and its impact on consumer buying behaviour.

4.4.1. AI Design

All the participants focus on AI simplifying shopping by providing detailed information and comparisons. All interviewees acknowledged the significant impact of AI on their shopping behaviour. AI influence daily shopping; started using AI tools recently and found them effective. AI significantly impacts consumer behaviour by allowing users to check product reviews and make informed decisions. There are different opinions about the AI design of the different participants that are involved in this research:

According to Participant 1, concentrate on the balance;

In my opinion, discussed the balance between physical shopping and online shopping facilitated by AI. AI technology impacts daily life by providing detailed information and influencing purchasing decisions and selections.

According to Participant 2, focus on the need for legislation and ethical use;

In my point of view, recently started using AI for shopping and find it effective for accessing purchase items. Highlighted the need for legislation and ethical use to ensure trustworthiness. Mentioned that educated individuals are more likely to trust AI and make informed decisions.

According to Participant 3, focus on AI's role and the importance of authentic sources;

In my belief, AI's role is to reduce the need to physically search for products. Emphasized the importance of authentic sources to avoid scams. AI makes shopping easier by providing price comparisons, related products, and delivery information.

According to Participant 4, deliberate the reviews of products and initial difficulty;

In my assessment, stressed the importance of checking reviews before making a purchase. Highlighted the initial difficulty in understanding AI but acknowledged its usefulness over time. AI has a positive impact on daily shopping behaviour, making the process more efficient.

According to Participant 5, ease of access, discount and promotions and marketing convenience;

In my way of thinking, AI facilitates easier access to products compared to traditional market shopping. Regular online users often receive discounts and special offers. Online marketing is convenient for both customers and businesses.

4.4.2. Influence on Consumer Buying Behaviour

AI influences consumer perception through reviews, feedback, and personalized suggestions. Key factors include product quality, user feedback, and ethical use of data. AI plays a crucial role in consumer decision-making by providing alternative options and simplifying choices. All interviewees acknowledged AI's significant role in their consumer buying behaviour.

According to Participant 1**,** AI-generated feedback;

In my viewpoint, marketing models, colours, and AI-generated feedback significantly affect consumer perception. Feedback from AI influences purchasing decisions significantly.

According to Participant 2, AI helps in decision-making;

In my thoughts, factors like willingness to pay, education level, and awareness play a role in changing consumer perception. AI assists in decision-making by providing alternative options and detailed product information.

According to Participant 3, data privacy and security concerns;

In my feeling, data privacy and security are key factors in shaping consumer perception and buying behaviour. Facilitates decision-making by simplifying product comparisons.

According to Participant 4, ease of decision-making

From my standpoint, a positive perception is that AI is used correctly to make informed purchases. Initially complicates but ultimately eases decision-making as familiarity with AI increases.

According to Participant 5, the prevalence of online marketing, gender participation in online shopping and the risk of fake products**;**

From my perspective, online marketing is highly influential in shaping consumer behaviour. Women are increasingly participating in online shopping. The presence of fake products is a significant concern for consumers.

5. Discussion

The FMCG sector is a very broad area in business to consumer market. Therefore, consumers' perception of the products plays a crucial role in determining their buying behaviour and the market share of the FMCG companies. This research focuses on four hypotheses. The H1 hypothesis states that AI designs have a positive and significant effect on consumer perception. The H1 hypotheses provide the literature support with previous studies (Chen et al., 2021; Dias et al., 2023; Tulcanaza-Prieto, Cortez-Ordoñez, & Lee, 2023). The hypothesis was significant because the p-value < 0.05. AI designs can offer FMCG firms an edge over the competition, boost customer devotion, along with improving efficiency during operations (Edelman & Abraham, 2022).

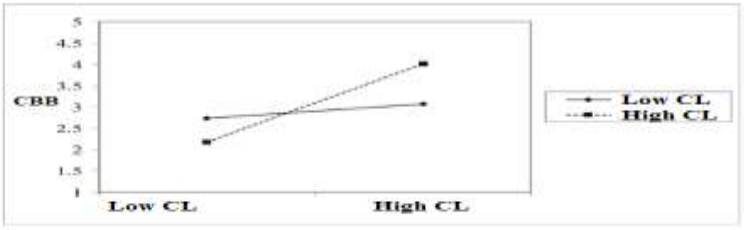


Figure 4: The moderating role of CL between CP and CBB

The association between consumer perception (CP) and consumer buying behaviour (CBB) is positive and real corresponding to the H2 hypothesis. Since the p-value is below the threshold value of 0.05, the hypothesis is deemed valid. Already existing research supports this theory (Chen et al., 2021; Hexian, 2023; Rathore et al., 2021; Zhang, Hexian, & Li, 2023). The hypothesis's findings in the FMCG market could be supported by the fact that consumers' perceptions of a range of product attributes—such as affordability, quality, company image, packaging, etc., have affected their purchasing decisions and, thus, their preferences, dedication, and satisfaction. High levels of rivalry as well as low profit margins, and a pattern of purchasing low-cost products that are readily used are features of the FMCG industry (Sethi & Chaudhary, 2021).

As to the H3 hypothesis, the relation between AI designs and consumer buying behaviour (CBB) is mediated by consumer perception (CP). Since the p-value is smaller than 0.05, the hypothesis is regarded as valid. The amount of pre-available research lends weight to this theory (Hair Jr et al., 2014; Nagy & Hajdú, 2021; Yang et al., 2021; Zhang & Wang, 2023). The hypothesis's decision may be explained through how AI designs may enhance marketing stimuli's utility, interaction ability to adapt, interaction and privacy thereby affecting how customers perceive them (Chen et al., 2021).

Contrary, to the H4 hypothesis, an association between consumer perception (CP) and consumer buying behaviour (CBB) moderates consumer literacy (CL). Since the probability value is under 0.05, the hypothesis has been accepted. Before this study supported this association (Dangi et al., 2021; Sundell, Wångdahl, & Grauman, 2022; Wei, Ang, & Jancenelle, 2018). Since CL moderates the relation, the degree of CL influences how much of an effect CP has on CBB. Customers who have little CL may be more convinced by advertising and promotion, whereas those who have greater CL may be more judgmental as well as knowledgeable about the FMCG items they purchase (Vibhuti & Pandey, 2014).

The participants unanimously agreed that AI greatly simplified shopping by providing detailed information and enabling effective product comparisons. All interviewees acknowledged the significant impact of AI on their consumer buying behaviours, noting that AI influenced their daily shopping activities and that they had recently begun using AI tools and found them effective. AI's role in consumer buying behaviour was particularly evident in allowing users to check product reviews and make informed decisions.

However, participants had differing opinions on AI design. According to *Participant 1*, it was important to balance physical and online shopping, facilitated by AI. The balance between physical and online shopping facilitated by AI highlighted how technology impacts daily life by providing detailed information and influencing purchasing decisions and selections (Chung et al., 2020). *Participant 2* emphasized the need for legislation and ethical use of AI. The necessity for legislation and ethical considerations ensures the trustworthiness of AI, especially for educated individuals who are more likely to trust AI and make informed decisions (Makridakis, 2017). *Participant 3* focused on AI's role and the importance of authentic sources. AI's role in reducing the need to physically search for products was crucial. Emphasizing the importance of authentic sources helped avoid scams, making shopping easier through price comparisons, related products, and delivery information (Davenport & Ronanki, 2018). *Participant 4* highlighted the significance of product reviews and the initial difficulty in understanding AI. The importance of checking reviews before making a purchase and acknowledging the initial difficulty in understanding AI underscored its long-term usefulness and efficiency in daily shopping behaviour (Brynjolfsson & Mcafee, 2017). *Participant 5* emphasized the ease of access, discounts, promotions, and marketing convenience provided by AI. AI facilitated easier access to products compared to traditional market shopping. Regular online users often receive discounts and special offers, making online marketing convenient for both customers and businesses (Huang & Rust, 2021).

AI was recognized for its substantial influence on consumer perception through reviews, feedback, and personalized suggestions. The key factors identified included product quality, user feedback, and ethical data use. AI played a crucial role in consumer decision-making by offering alternative options and simplifying choices, with all interviewees acknowledging AI's significant role in their buying behaviour.

Participant 1 noted the impact of AI-design feedback. In my viewpoint, marketing models, colours, and AI-design feedback significantly affected consumer perception, heavily influencing purchasing decisions (Luo et al., 2019). *Participant 3* raised concerns about data privacy and security. Data privacy and security were key factors in shaping consumer perception and buying behaviour, with AI facilitating decision-making by simplifying product comparisons (Bergemann & Bonatti, 2019). *Participant 4* emphasized the ease of decision-making provided by AI. While AI initially complicated decisions, it ultimately eased decision-making as familiarity with AI increased, leading to more informed purchases (Agrawal, Gans, & Goldfarb, 2018). *Participant*

5 discussed the prevalence of online marketing, gender participation in online shopping, and the risk of fake products. Online marketing was highly influential in shaping consumer behaviour, with an increasing number of women participating in online shopping. However, the presence of fake products remained a significant concern for consumers (Clemons et al., 2016).

The discussion revealed a consensus on the positive impact of AI on consumer buying behaviour, though individual perspectives highlighted varying focal points such as the need for balance, ethical use, authentic sources, initial challenges, and the convenience offered by AI. The influence of AI on consumer buying behaviour was similarly acknowledged, with attention to feedback, decision-making assistance, privacy concerns, and the complexities of online marketing. These insights underscore the multifaceted nature of AI's role in modern consumerism.

5.1. Theoretical and Practical Contribution

The study offers insights for FMCG businesses to use AI designs to improve their business productivity and customer satisfaction. It also adds to the establishment of a theoretical foundation that combines consumer perception, consumer buying behaviour, and consumer literacy. The issue of this study, which is relatively new and developing in the literature, is how AI designs affect consumer perception and CBB in the (FMCG) market. Consistent with earlier research, it also offers empirical proof for the beneficial and substantial impact of AI designs on customer perception. An attractive and novel finding that adds variety to the current theory of consumer behaviour is that it looks at the mediating role that customer perception plays in the interaction between AI designs and CBB. Additionally, it demonstrates how AI designs have the power to influence how customers view different marketing stimuli including utility, communication, adaptability, privacy, and relationships. It looks at the important and relevant moderating impact that consumer literacy has on the link between customer perception and CBB. Furthermore, it illustrates how consumer literacy varies among various groups of customers and how it might impact how much consumers are influenced by their initial thoughts of the items.

The fact that it offers novel ideas and data on the features of AI designs, consumer perception, CBB, and consumer literacy in the FMCG environment has significance for academics, legislators, and educators working in the industry. By improving consumer perception of FMCG stuff, AI designs may practically help FMCG firms gain revenue, customer loyalty, and operational efficiency. It indicates how customer perception affects consumer purchasing decisions, which may assist FMCG firms in customizing their item offerings and promotions to match the demands and preferences of their target market. It shows how customer perception affects consumer purchasing decisions, which may assist FMCG firms in customizing their product offerings and marketing plans to match the demands and preferences of their target market. The FMCG firms should maximize the application of AI in their operations for developing new products and innovation. This can assist FMCG firms in producing more consumer-friendly, customized, and adaptable products.

5.2. Limitations

The study's quantitative methodology could have underestimated the extensive range and breadth of customer perceptions and purchasing patterns in the FMCG industry. The use of qualitative techniques could offer a better complemented and complete comprehension of the phenomenon. The study's restricted scope may restrict how broadly its results may be applied to different contexts, cultures, or markets. The FMCG industry is a highly large and dynamic field, and customer behaviour can change based on the type of product, where you live, the state of the economy, or cultural conventions. The results may be more broadly applicable if a comparative or cross-cultural design is used.

5.3. Future Directions

“What are the emotions generated during AI-consumer interactions, and how do they affect them individually and socially”? (Alabed, Javornik, & Gregory-Smith, 2022). “What are the different consumer observations and responses while interacting with human versus AI agents”? (Lee & Park, 2022). The study can improve the curriculum and pedagogy of FMCG-related educational programs and courses, stimulate further study on these subjects, and offer guidance for choices in policies and laws regarding the use of AI in the FMCG industry. The findings from the research may also be impacted by variables like customer personality, motivation, engagement, trust, or contentment.

5.4. Conclusion

Customer perception and AI design are associated. The convenience, effectiveness, and attractiveness of AI-driven systems are all included in AI design. Well-designed AI tends to be more efficient, innate, and adaptable to user demands, which improves the user experience *(RQ1).* There is a relationship that is mediated by consumer perception between AI design and customer behavior. The activities and processes of decision-making that consumers engage in when utilizing AI technology are referred to as consumer behavior. Customers' perceptions of technology are influenced by AI design, and their behavior is consequently influenced by these perceptions. The ability of customers to comprehend and utilize AI technology is referred to as consumer literacy *(RQ2).* Customer literacy acts as a moderator in the relationship between buying behavior and consumer perception. Their conduct is thus influenced by the perspective they have *(RQ3).* Ethnographic studies in the FMCG sector reveal several ways in which consumer buying behavior evolves with AI designs; e.g., personalization and recommendations, convenience and efficiency, data-driven insights and trust and engagement *(RQ4).* The findings of this study offer a comprehensive foundation for knowing and using AI designs to improve customer happiness and marketplace performance, leading to theoretical as well as practical consequences for the FMCG industry. The research also suggests some directions for future research, such as exploring the ethical and social implications of AI designs and investigating the cross-cultural differences and similarities in consumer responses to AI designs.

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