Artificial Intelligence-Based Consumer Communication by Brick-and-Mortar Retailers in India Leading to Syllogistic Fallacy and Trap – Insights from an Experiment

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ABSTRACT

It is observed that a majority of organized brick-and-mortar (B&M) retailers in India believe that they have adopted the latest Artificial Intelligence-based consumer communication (AIBCC) tools/solutions and are yielding accurate outputs that can be used for interpretation, conclusion, and decision-making concerning consumer communications. This belief/assumption in itself is a classic example of a syllogistic trap. This study reveals that the B&M retailers in India are least worried about AIBCC tools/solutions *repeatedly* sending promotional/campaign messages to consumers based on their past transactional data till they come back again to the store without knowing the *'Purpose of Previous Purchase'*. This is mere because the cost of such communications is negligible (Just costs about 1 US dollar for sending 500 messages to a mobile phone number). We have also observed that the B&M retailers are unaware of the potential negative impacts of *false/fake/artificial* promotional/campaign messages being sent to consumers as a result of syllogistic fallacy caused by the AIBCC tools/solutions on the overall brand image in the consumers' minds. Experimentation results demonstrate that the existing belief of the organized B&M retailers in India which assumes that the AIBCC tools/solutions are accurate is just a misconception and does not hold. On the other hand, when we experimented by identifying two main gaps (input and output-level) in their existing AIBCC tool/solution for six months at over 35 percent stores of a select retailer, the real treatment effect indicated that the experimental group of stores has shown (i) two times higher rate of conversion to any promotional/campaign messages; (ii) 19 times better in capturing the 'Purpose of Purchase' field; (iii) 22% lesser consumer communication expenses; (iv) 22.80% higher revenue generation; and most importantly; (v) 4.25 times higher store-level profits in comparison with the control group of stores. We have also noted that in the control group of stores about 36% of the customers/consumers who have received the promotional/campaign messages from the automated AIBCC tool/solution were *not real consumers*. Besides finding evidence of the syllogistic fallacy and trap, our results are also consistent with our 'Theory of B&M Retailing in India and the concept of 'Debiasing by Instruction' by Evans et al.

Keywords: Indian Retail; Brick-and-Mortar Retail; Artificial Intelligence; Digital Analytics; Consumer Communication; Syllogistic Trap; Syllogistic Fallacy; Customer Relationship Management; CRM

1. BACKGROUND AND MOTIVATION:

Artificial Intelligence-based consumer communication (AIBCC) is one of the most sought-after domains across students, academicians, management consultants, researchers, and management practitioners. The emerging subfield of Information Communication and Computation Technology (ICCT) known as big data and business analytics that uses the basic principles of Artificial Intelligence (AI) focuses on handling huge amount of data continuously generated in any business or data capturing process and analyses it using various quantitative analytical techniques and mathematical models to study the pattern and descriptive information, predictive information, and prescriptive information for supporting the decision-makers to take optimum decisions to the problems related to future aspects of the business. Predictive analytics in various functional areas such as a) marketing analytics; b) retail analytics; c) pricing analytics; d) discounts and offers performance analysis; e) consumer purchase pattern analysis; f) consumer lifetime value estimations; g) consumers' future purchase forecast; h) financial analytics, and i) social media impact analytics are finding importance in the business environment for effective decision-making. Further, prescriptive analytics for optimizing the decisions with multiple objectives/portfolios, optimizing complex decisions, salesforce analytics, and Retail Analytics, etc also has a futuristic impact on effective business decisions [1-4]. Retailers globally have faced with a steadily increasing array of ICCT tools and solutions in different names serving different purposes and over 203 billion US dollars is expected to be spent on retail information technology every year worldwide and this is overwhelming to a majority of retailers as most of them are adopting new ICCT without even having a clear understanding of their importance [5].

The overall market size of the Indian retail industry was 950 billion USD in the year 2018 of which 97 percent was from brick-and-mortar (B&M) retailing is forecast to reach 1.75 trillion USD by the year 2026. In other words, at present, about 10 percent of the nominal gross domestic product of India is contributed by the retail industry in addition to accounting for 8% of employment [6]. Based on India's 2011 census, the Indian population is estimated to reach 1.38 billion by the year 2020 [7]. And by the year 2030, urban agglomerations in India could lead to a) an increase in the middle-class consumer segment by 3 times compared to the year 2010 which was at 22 million, b) an increase in the number of people living in the urban cities to 590 million, and most importantly c) an increase in cities with more than one million population to 68 [8]. India is one of the most sought-after countries for retailing opportunities globally, mainly because of the higher population consisting of the relatively younger population and higher penetration of internet users. Furthermore, despite India being dominantly represented by Tier-2, Tier-3, and Tier-4 cities are also witnessing rapid expansion of national and international brands/companies such as Housing, Automobiles, IT, Banking, and most importantly B&M Retail Stores into these cities owing to an exponential growth in the urbanization of Tier-2 and Tier-3 cities post-economic liberation, Government's interest and plans for improving basic infrastructure at Tier-2 and Tier-3 cities, relatively cheaper real estate, and most importantly steadily increasing disposable income level of consumers in Tier-2 and Tier-3 cities. These developments and numbers are clear indicators of upcoming changes that are expected in the way consumers will behave while choosing retail stores to fulfill their product needs. In addition to the humongous population, exponential growth in several working women, double-income families, middle-class consumer segment, increasing disposable income, rapid adoption of new trends/fashion, urbanization, the overall size of Indian retail industry, the rapid expansion of national and international brands into smaller cities, the emergence of modern retailing formats, and an enormous increase in internet penetration/usage providing new opportunities for existing retailers in India, simply *allure* more and more investment interest into B&M retailing in India. India is one of the largest countries with consumers belonging to the widest range of Religions, Regions, Languages, Cultures, Sub-Cultures, Ethnicities, and Socioeconomic backgrounds that makes it difficult for any organized B&M retailers to service the divergent needs of such consumers and also aim for taking the larger share of the retail market. It is reported that the organized retailing in India that was at 12 percent of the overall retail market in the year 2017, is expected to increase to *just* 25 percent by the year 2021 that is way too low in comparison with a majority of developing and developed countries [9]. Another reality is, over 80 percent of unorganized/small-scale B&M retailing in India is run by family-owned business houses that represent 9.6 million stores, and this is the largest number of small-scale stores present in a country! [10].

In the past retailers were at best using a few technology-driven tools and solutions such as a) barcode scanners; b) Video-carts; in-store coupon dispensers; frequent shoppers clubs; digital kiosks, and smart-networks [11-14]. Post-emergence of new technologies retailers around the world have adopted a) mobile apps; b) self-scanning; c) que-vision; d) smart shelves; gravity feed shelving systems; personalized promotions/pricing; scan and go, and in-store Customer Relationship Management (CRM) [15-17]. With the development of ICCT tools, retailers now are using the latest AIBCC solutions to process huge consumer transaction data recorded at the point of sale (POS), mathematically understand the transactions, apply *deductive reasoning (Syllogism)* to interpret/conclude about a consumer, and finally use this interpretation/conclusion to automatically send various transactional cum promotional communications to consumers. The hard reality is that India is yet to witness a successful large-scale organized B&M retailer like Walmart in the USA, Schwarz in France, H&M in Sweden, Inditex in Spain, Tesco in the UK, Fast in Japan, and so on. Moreover, even a few of these successful global retailers are also yet to witness success in the Indian market that is an even harder reality. Despite organized B&M retailers having access to the latest AIBCC tools/solutions and platforms in addition to having qualified and skilled personnel in the organization, unorganized B&M retailers having close to null adaptation of AIBCC tools/solutions have not given up the majority of their market share to organized B&M retailers which could be attributed to Indian consumer's buying and patronage behavior concerning B&M retail stores in India and most importantly the level of retailers' understanding of their consumers [18]. It is very difficult for a computer system or a software program that is mathematically modeled to capture consumers' purchase behavior and then use the transactional data to analyze and make tactical/strategical decisions concerning consumer communication.

The need for this research indeed was originated due to various gaps found in theoretical, descriptive, and empirical literature available concerning the AIBCC adaptation in the retail domain such as a) the majority of studies have focussed on finding out the advantages of adopting AIBCC tools/solutions in the retailing environment and dominantly for an e-commerce setup; b) absence of guidelines to effectively use AIBCC in the Indian context; c) a majority of organized B&M retailers in India follow and practice AIBCC tools/solutions incorporated by non-retail segments; e) inordinate dependence on the AIBCC tools/solutions for tactical and strategical decision-making across various levels of organization's hierarchy, and most importantly f) the level of consumer understanding of organized B&M retailers is poor in comparison with unorganized B&M retailers in India. Thus, we decided to understand the existing adaptation level and understanding of AIBCC of a few select national level B&M retailers in India; identify key loopholes in AIBCC adaptation; carryout an experiment; derive insights and inferences, and suggest appropriate adaptation methods for efficient usage of AIBCC.

2. APPROACH AND METHODOLOGY:

Secondary Research: Intense and in-depth analysis of data available in the public domain was carried to collect data relating to various aspects of B&M retailing in India through company websites, company annual financial reports, AIBCC tools and solution providers, trade, and business journals. Research works relating to Indian B&M retailers were surveyed extensively to collect insights, recommendations, and frameworks concerning AIBCC adaptation for B&M retailers in India.

Qualitative Primary Research: Series of open-ended in-depth direct interviews with employees representing all the departments and functions of about ten organized B&M retailers was carried to gain qualitative insights concerning B&M retailers' attitude and perspective toward AIBCC tools/solutions.

Quantitative Primary Research: In the first stage, one of the National level organized brick-and-mortar lifestyle retailers in India was selected who is operating stores all over India across a) high-street stores, b) mall stores, c) institutional stores, d) tier 1, 2 and 3 cities, offering multiple-categories and multiple-brands serving different consumer life-stage needs at mid to high price positioning and catering to pregnant women, new moms, babies, infants and kids up to 8 years. As part of the static group comparison experimental design, 35% of the stores were exposed to the experiment and others were not. The second was to expose the experimental group of stores to modify the data collection, analysis, and decision-making process concerning consumer communication. In the third stage, post-test primary data was collected and analyzed using appropriate statistical methods to validate the inferences and decisions made by the retailer using AIBCC applications in the control group of stores

in comparison to the experimental group. The last stage was to find insights and inferences from the experiment.

3. KEY FINDINGS AND INSIGHTS:

Pre-Test: Before the empirical study, we were able to derive qualitative insights through open-ended in-depth direct interviews with employees representing all the departments and functions of the ten organized B&M retailers in India chosen for the study. Key insights from the qualitative survey indicate that the retailers strongly had numerous beliefs and assumptions concerning AIBCC as listed below.

- We spend a lot of time and money in communicating to consumers using all the latest AIBCC tools and solutions.
- A majority of tactical and strategical decisions are made using inferences and interpretations derived from the AIBCC tools/solutions.
- Usage of AIBCC significantly reduces the time taken for data analysis and interpretation and helps to slice the big data into small and understandable groups.
- A large amount of inventory and sales data are collected, processed, analyzed, and stored using AIBCC tools/solutions without any hassle.
- AIBCC tools/solutions help us get real-time data that is useful in making real-time decisions.
- Post the AIBCC implementation, the Customer Relationship Management (CRM) team has better control over consumer communication owing to the real-time data accessibility.
- Decision-making is more data-driven, rather than mere gut feelings.

We understood that a majority of employees across various functions and departments at the central office were immensely satisfied with the AIBCC tools/solutions. *Nevertheless,* unanimously the employees at the store were not satisfied with the AIBCC tools/solutions that are deployed in their stores and managed by the central CRM team. Such a contradictory opinion between store employees and central office employees concerning the benefits of AIBCC tools/solutions motivated us to further deep dive into the detailed process flow of consumer communication. **Figure 1** depicts an end-to-end process flow of consumer communication adopted by organized B&M retailers using AIBCC tools/solutions. We were able to identify two main gaps in the entire process as detailed below.

Gap 1 (Input Gap): We have found this to be a serious gap as far as B&M retailing model is concerned. The accuracy of this data at the input stage determines the level of a syllogistic fallacy in consumer communications. It was observed that entry of consumer-related data such as Mobile Phone Number; E-Mail ID; Gender; Marital Status; Purpose of the Purchase etc., into the POS is done manually by the store personnel managing the POS/billing and the number of fields entered and the accuracy of the data entered into each of these fields was determined by the patience/motivation level of both consumers and the store personnel. The probability of entering *ONLY* the Mobile Phone Number of consumers was higher as this field was mandatory for both the consumer and the store personnel to proceed further for closing the transaction.

Gap 2 (Output Gap): Syllogistic that was applied by the AIBCC tools and solutions was purely based on the products being bought by the consumer *(automated)* and the consumer details entered by the store person *(manual)*. We have found that the syllogistic fallacy was less in cases where the consumer details entered manually were correct and complete for all the fields. We randomly interviewed consumers who never came back to the store despite repeatedly sending promotional/campaign messages. Surprisingly, a significant majority of consumers who were interviewed were *not the real consumers*, they have made a purchase/transaction on behalf of the real consumer. For instance, the AIBCC tool kept on sending promotional/campaign messages to a Male customer who once bought a Baby Clothing from a store to gift it to his Female colleague who recently delivered a Baby Girl.

The Experiment: Even though the qualitative exploratory stage of the study indicated possible causes for syllogistic trap/fallacy in the AIBCC tools/solutions being adopted by the retailers, it was necessary for us to empirically validate these causes. Thus, we designed a static group comparison experiment where the following key changes were made to the existing structure of AIBCC usage and the experiment was carried out for six months at 35% stores of one retailer among ten retailers in the study.

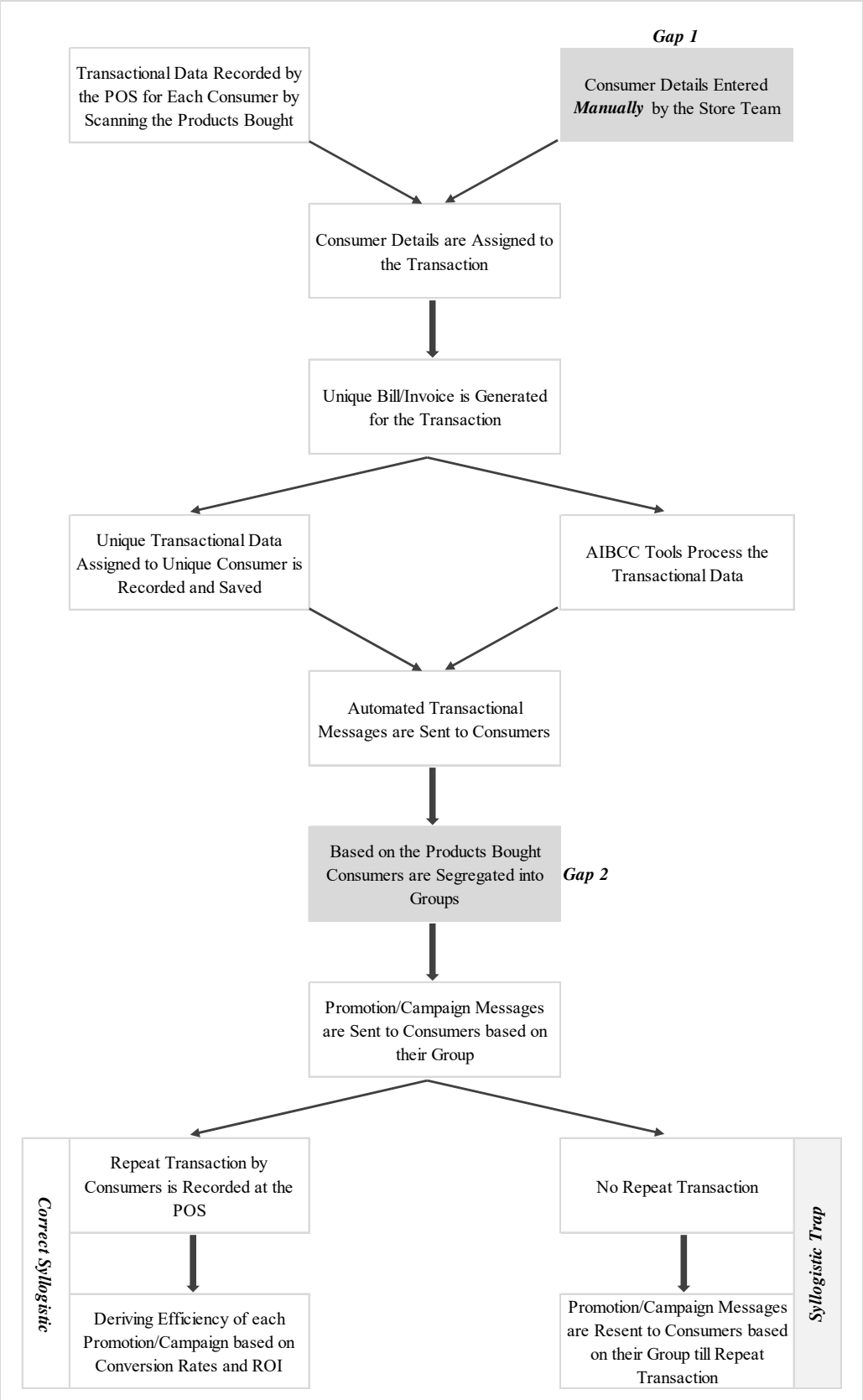

Figure 1: Process flow of AIBCC tools/solutions

Input-Side (Gap 1):

- Store personnel was given a special monetary incentive for capturing correct details of a customer across all the fields available during the transaction at the POS and the amount of incentive was kept higher for a greater number of fields being filled. An additional incentive was given for capturing the field named *'Purpose of the Purchase'* as getting this information from the customer needs additional efforts and skillsets by the store personnel in addition to having higher levels of consumer orientation.
- Customers were also given special '*promotional coupons*' for giving complete details.

***Output-Side (Gap 2)**:*

- AIBCC tool/solution in addition to the *'Purpose of the Purchase'* field being made a mandatory field was allowed to send automated promotional/campaign messages to customers/consumers for whom details were captured for all the fields (Group A).
- Customers/consumers other than 'Group A' were sent the automated promotional/campaign messages only once (Group B).
- 'Group B' customers/consumers who responded to the first automated promotional/campaign message through a repeat transaction were further grouped (Group C) to activate automated promotional/campaign messages.

Post-Test: Based on static group comparison test, the real treatment effect indicates that the experimental group of stores has shown i) two times higher rate of conversion to any promotional/campaign messages to customers/consumers; ii) 19 times higher in capturing the 'Purpose of Purchase' field; iii) 22% lesser consumer communication expenses; iv) 22.80% higher revenue generation; and most importantly v) 4.25 times higher store-level profits in comparison with the control group of stores as shown in **Table 1 and Table 2**. The experiment has also indicated that the AIBCC tool/solution was able to identify about 28% of customers/consumers as 'Group B' and only 5% as 'Group C' in the experimental group of stores that we're able to collect 78% of customer/consumer details fields. However, in the control group of stores in the presence of Gap 1 and Gap 2, we have noted that about 36% of the customers/consumers who have received the promotional/campaign messages from the automated AIBCC tool/solution were not the real consumers. Interestingly, the overall communication expenses per customer/consumer including the special incentive paid to store personnel and the customers/consumers to capture more accurate details across many fields was just 12.89% higher than the control group of stores.

Table 1: Real treatment effect across key factors in the experimental group as a percentage change over the control group

Factors ***Per store per month*** **Six Months Average**	**Real Treatment Change**
Sales Value	25.59%
Percentage of Sales Generated from Promotions/Campaigns	116.19%
Number of Unique Customers/Consumers	21.89%
Number of Unique Customers/Consumers with 'Purpose of Purchase' Field Filled	1801.49%
Average Number of Fields Capurted by the Store Personnel	197.52%
Number of 'Group B' Customers/Consumers Found	N/A
Number of 'Group C' Customers/Consumers Found	N/A
Special Incentives	N/A
Communication Expenses per Customer/Consumer	-22.00%
Total Communication Expenses Inclusive of Special Incentives	12.89%
Rate of Conversion for Promotions/Campaigns	116.19%

Table 2: Real treatment effect across key factors of overall store performance in the experimental group as a percentage change over the control group

Factors **Six Months Average**	**Real Treatment Change**
Average MRP of store	-8.02%
Average selling price of store	-9.08%
Annualized discount percent	8.05%
Overall bills generated per day per square foot	20.00%
Overall sale quantity per day per square foot	33.91%
Discount value per day per square foot	28.61%
Revenue per day per square foot	22.80%
Earning per day per square foot	27.19%
Profit per day per square foot	324.75%

4. DISCUSSION AND CONCLUSION:

The concept of syllogism can be traced back to the 2nd century in the 'Nyāya Sūtras' written by 'Gautama Buddha' from the Nyaya School of Indian Philosophy and in the Western Philosophy famously known as 'Aristotelian Logic'. A syllogism is deducing a conclusion based on a combination of major and minor premises [19]. For example, if all mortals die (major premise) and all men are mortals (minor premise) then applying the syllogism one can conclude that all men die, and this seems to be a reasonable conclusion or interpretation. But now consider another example. If all women are animals (major premise) and some animals are male (minor premise) then by applying syllogism logic if someone concludes that all women are male to be an unacceptable or false conclusion which is simply a *trap* and known as syllogistic trap. Such syllogistic fallacies can trap the logician irrespective of whether the syllogism is applied by human intelligence or by a computer system using Artificial Intelligence (AI). Moreover, AI is more susceptible to syllogistic traps just because, by nature it is artificial. For many centuries, the Aristotelian syllogism dominated the Western philosophers and believed that the syllogism is all about drawing valid conclusions based on *axioms* (assumptions) instead of verifying assumptions. Furthermore, philosophers focussed on the logic, rather than giving importance to verifying the assumptions over time.

In the 17th century, Francis Bacon started emphasizing the experimental verification of assumptions rigorously and strongly argued that we cannot take syllogism as the only best way of inferring and drawing conclusions. This emphasis brought the inductive approach to thinking and reasoning and was one the motivations for us to find the two main gaps and fill them help the AIBCC tool/solution to use inductive reasoning in addition to the standard deductive reasoning. 'Aristotle's theory of the syllogism played an important role in the Western and Near Eastern intellectual traditions for more than two thousand years, but it was during the middle ages that it became the dominant model of correct argumentation' [20]. In the 19th century, syllogism was modified to incorporate disjunctives (A or B) and conditional (if A then B) statements. Determining the distribution of every term in every statement is very crucial in determining the validity of syllogism failing which can lead to syllogistic fallacy/trap and such traps can easily occur owing to i) undistributed middle term; ii) illicit treatment of the major term; iii) illicit treatment of the minor term; iv) exclusive premises; v) affirmative conclusion from a negative premise; v) negative conclusion from the affirmative premise; and most importantly vi) the rapid response speed [21-27].

Based on this experimental research outcome, we would like to suggest B&M retailers in India that need to clearly understand the role of every AIBCC tool/solution available in the market based on their target consumers, product assortment, product roles, and long-term business goals. Retailers must not look at the store management team as resources for just managing store operations and handling consumer queries, rather, encourage them to give relevant inputs for the AIBCC tool/solution integrated with the POS system. Inevitably, the majority of inputs in B&M retailing for any AIBCC tool/solution

are originated from retail stores that are managed and controlled by the store team and they are the ones who have a direct connection with consumers. It is recommended that the retailers should not get carried away by what competitors might be doing. Few may be trying to impress their investors that they have adopted the best AIBCC tools/solutions without having any idea about the adaptation level; few may be trying to impress consumers by recommending them some products based on their previous purchase using AIBCC tools/solutions without knowing why the previous purchase/transaction was made by a consumer, and few may be trying to impress existing and potential employees by adopting some latest AIBCC tools/solutions.

It is very important to understand consumer's short-term and long-term purchase plans which can be known only when the sales personnel in the store has a required level of consumer orientation and has a clear understanding of every consumer he/she engages with in addition to understanding the *Purpose of Purchase*. Irrespective of new AIBCC tools/solutions emerging around the world, unless the adaptation is appropriate it would lead to incongruent decisions and a syllogistic trap concerning consumer communications. It is perfectly fine for any organized B&M retailer in India to compare themselves with the established retailers around the world in developed countries, but what is of higher significance is also to compare with unorganized B&M retailers in India who are still owning a significant market share and understand key reasons for their existence in the era of the so-called digital age. We were amazed to know that the latest ICCT tool the unorganized B&M retailers in India use is 'WhatsApp' through which they communicate with consumers regularly and they do not have access to any Big-Data analytical tools or AI tools which indirectly indicate that knowing your consumer and adapting the AIBCC tools/solutions based on the real understanding level of consumers is imperative [18].

Concepts such as i) debiasing by instruction [28], ii) human-led interaction of Theory of Brick-and-Mortar Retailing in India [29], and the experiment conducted on a larger sample and duration in this study indicate that the syllogistic fallacy and traps can be significantly reduced by ensuring accurate input information is captured by the POS system through a higher level of consumer orientation by the store personnel. Besides, we have also observed that consumer communication is more appropriate, real-time, customized, and relevant in the presence of input-driven sales personnel performance measures [30], a higher level of consumer orientation [31], and decentralized control systems [32-33].

5. LIMITATIONS AND SCOPE:

The main limitation of this study is the coverage of various stakeholders viz., the number of B&M retailers, product categories, consumer groups, employees, organizational forms, and price positioning. The second limitation would be that the empirical validation is restricted to some B&M retailers selected for the study and hence the generalizability of the findings and suggestions to other B&M retailers in India. The third limitation would be our ability to carry out true experimental design, at best we were able to carry out a static group comparison design. However, it provides significant inputs regarding syllogistic fallacy and traps to B&M retailers in India as we have rigorously pursued the experiment, empirical evaluations, qualitative explorations over 6 months in addition to incorporating elements from proven theories in the literature that are relevant in the Indian context. In addition to recommending researchers to carry such experiments at other B&M retailers to find out the levels of syllogistic fallacy and trap caused by the AIBCC tools/solutions, we also suggest researchers find out the negative impacts of false/fake/artificial promotional/campaign messages being sent to consumers by the AIBCC tools/solutions on the overall brand image in the consumers' minds.

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