Modelling the Consumer Purchasing Behavior

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Abstract—**This paper presents an Agent Based Model(ABM) of consumer purchasing behavior with respect to three competitive products. The behavior of the consumers is analyze based on the price and the quality of the products. Furthermore, personal, psychological and cultural factors which affect the consumers also considered in this study. This study helps retailers to identify the products which can be sell more under different circumstances. Then can select the product type to be keep in the stock under current situation. Ultimately this simulation study gives one the potential to cope with the dynamic changes and the complexities in the real-world business environment.**

Keywords—**Agent Based Modelling, Consumer buying behavior, Simulation**

I. INTRODUCTION

Ground and most important stage of marketing environment is Buying Stage where buyers buy the products from the retailers. All the marketing strategies are based on how the consumers, make their purchases and therefore the consumer or the customer is the main entity in the total marketing environment. Therefore, understand the behavior of consumers accurately make the entire business flow success.

Buying Behavior of consumer is a summation of attitudes, preferences, intentions and decisions taken by them. The process that customer buys a product or service is different for each individual and each category of products. Consumers are varied based on demographics, psychographics, socio-economic and other reasons which makes it complex to profile them.

There are several external and internal factors which affect the consumer buying behavior [2]. Further, external factors can be categorized as cultural and social factors while internal factors categorized as personal and psychological factors. Cultural factors include buyer culture, sub culture and the social class. The social factors which impact the consumer behavior are reference groups, family and the role and status of the consumers. A person's age, education, profession, income, personality and life style are the personal factors which make individual's purchasing behavior heterogeneous. Individual's perception, motivation, learning, beliefs and attitudes are the main psychological factors that affect the consumer buying behavior [2].

With the complexity of the individuals purchasing behavior, it makes much difficult for retailers to predict the products which are going to purchase by their customers. Therefore, the losses which result from making poor decisions have caused marketing scholars and practitioners to constantly search for better ways to predict the outcomes of alternative strategies. The development of simulation techniques increased the ability to handle complex problems through the use of formal, symbolic models [1]. A technique called Agent Based Modelling and Simulation (ABMS) handle the behavioral aspects of the environment.

ABMS is a bottom-up technique that has offered robust tool to cope with the complexities in a complex system environment [3]. ABMS is a relatively new approach to modelling complex systems composed of interacting, autonomous 'agents'. Agents have behaviors, often described by simple rules, and interactions with other agents, which in turn influence their behaviors. By modelling agents individually, the full effects of the diversity that exists among agents in their attributes and behaviors can be observed as it gives rise to the behavior of the system as a whole [5].

II. METHODOLOGY

The literature review is the initial phase of the study that conduct to discover the studies that have been already done. Through literature clearly identify the factors that could influence consumer buying behavior and identify the simulation techniques which can be used to model the consumer purchasing behavior. The factors that affect the consumer buying behavior are can be categorized in to cultural, social, personal and psychological factors. Further, the quality and the price of the products also affect the consumer decision making. ABMS is a new approach to model this kind of complexities in the environment. Therefore, ABMS was selected for the model development.

The next phase of the study is the model design. When designing the agent based model the modeler has to identify the entities, the agents which can be people, products, companies and etc, defines their main behavior and put them in a certain environment. The main entities in this study are products and customers. For the modelling, three competitive products are taken to evaluate. The identified agents in the study are customers. The behavior of the customers according to the social, cultural and psychological factors are concerned in this study. Further, how customers behave with respect to the price and quality variations of the products are concerned.

The final phase of the study is model development. The designed prototype is developed throughout this stage. For that, a suitable agent based simulation software, Netlogo had been selected. Netlogo is a programmable modelling environment for simulating natural and social phenomena. Using the Netlogo, 300 agents which are customers had been created. Their respond for three competitive products had been evaluated with respect to cultural influence, personal influence, psychological influence, shopping threshold, price and quality. In the model, user can evaluate the variations by changing the level of above factors. The model had been developed to vary the behavior of the consumers randomly with respect to the considered factors. The retailer can study the emergence of macroscopic properties by simulating the behavior of agents and their interactions at a microscopic level.
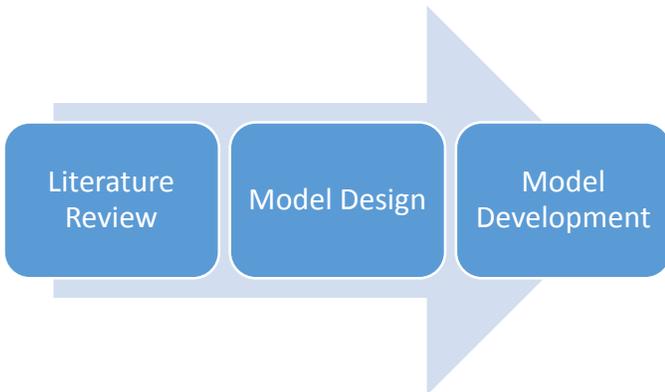

Fig. 1. Methodology of the simulation study

III. RESULTS

The respond to the three competitive products with respect to price and quality of the products and the various consumer buying behavior factors are considered on this study. After that, the consumer choice is determined on this study as the final output. After that, all the combinations of customers and products are extract to an excel sheet using the plot graph.

Fig. 2. Consumer buying behavior based on the quality of the products

Figure 2 depict the consumer buying behavior when the quality of the products changes while other factors remained constant. It has been concluding that, when the quality of the products increasing, consumers tend to buy high quality products.

Fig. 3. Consumer buying behavior based on the quality of the products

Figure 3 depict the consumer buying behavior when the price of the products changes while other factors remained constant. It has been concluding that, when the price of the products increasing, consumers tend to buy high quality products.

Likewise, retailer can change the impact of other consumer buying behavior factors and make the decisions based on the results. By analyzing the simulation results retailers can select the most selling products under different circumstances. This help to reduce surplus of products, can arrange the shells in proper manner and many more.

IV. CONCLUSION

The necessities of the individuals in the modern society become complex. As a result of that, the consumers become more heterogeneous which make complex for retailers to identify how their customers respond to products. The factors which affect the consumer buying behavior are price and quality of the product and personal, psychological, social and cultural factors of the consumers.

This study is conduct to analyze the purchasing behavior of consumers based on the personal, psychological and cultural factors and price and quality of the products. This study simulates the purchasing behavior of the consumers under different levels of the above factors. Based on the results of the study, retailers can make their decisions such as which product to keep in stock, how the shells have to display in the shop and etc.

V. FUTURE WORK

This study focus only on the cultural, personal and psychological factors and this study can be further improving by considering social factors. Further, this study does not focus on the dietary preferences of the consumers. In future studies, this simulation study can be further improving to consider the decision rules which create by the dietary preferences. After that, the different consumers and product clusters can be generating by improving this study.

The agent based simulation software use for this study is Netlogo which is python based. But the Netlogo cannot be use in a broad area in the simulation purposes. Therefore, there are limitations in this software when we modelling a complex environment. Repast is a Java based simulation software which support object oriented programming. It is more flexible and has many options when compared to Netlogo. By using Repast, this study can be enhanced and can be improve by adding more complexities in order to enhance the accuracy of the study.

VI. REFERENCES

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