ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

Use of Agent Based Simulation Modeling in Marketing

Salma

Dept. of M. Sc Software Technology, AIMIT, St. Aloysius College (Autonomous), Mangalore, Karnataka, India

ABSTRACT: Agent-based modeling and simulation (ABMS) is a new concept in marketing as well as the modeling systems which can help to clarify or explain how complex marketing situation emerge from simple decision rules. . Agents have behaviors, often categorized as simple rules, and interacted with other agents, which in turn influence their behaviors. By modelling agents individually, the full effects on the exists agents in their attributes and behaviors can be seen as it gives rise to the behavior of the system as a whole in agents. Marketing situation that are too complex for conventional analytical and approachesoften be modeled using this system of modelling. Agent-based modeling investigates aggregate simulating the behavior of individual "agents," such as consumers or organizations in the present modelling. Agent-based modeling techniques helps in building valid and credible simulation models. It include the importance of a definitive problem formulation, discussions with subject-matter experts. A simulation project is building a model and the skills required go well beyond knowing a particular simulation tool. Simulation is experimentation with a model. The behavior of the model imitates salient aspect Behavior of the system under study of the model to infer this behavior.

KEYWORDS: Agent-based modeling and simulation; Marketing situation;

I. INTRODUCTION

Simulation is the process of working on a model to develop level of understanding for interaction of system components. A model point in time represents simplified version of system at some particular point in time. Simulation process is used to compress time and space in an effective manner to give better understanding of system. Simulation and modeling is an effect and powerful approach to capture and analyze complex problem .Simulation is the best method to improve efficiency and to reduce cost. Simulation is widely used to analyze possible strategies for improvement of system performance. Simulation effectively analyzed and support model can save money on acquisition and live test to verify result. Simulation- the study of complex relationships- is the most valuable techniques in the business management, and has been greatly advanced in the last decades. Simulation is being widely used for modeling in many applications such as transport, logistics, communication networks,manufacturing, construction, health care, military etc. Simulation includes modeling of computer network and communication, real time System, mobile agents System engineering design, robotics, mechatronics, and air traffics and so on.

Following there is extensive use of simulations in various area and inthe advent of high-speed computers, in recent years, there was a growing interest in applying simulation techniques and to business problems including marketing. Simulation can be used forfurther industrial buying process and other fields. The complexity is all of the buying process, the large number of purchase determinants and the purchase situations requirements using this technology. This paper presents a review of application of simulation in marketing and the advantages of simulation as an effective marketing tool. The computer simulation design focuses on the industrial buying process and also focuses on the buyers and their responses to various marketing strategies is described as a generalized-micro analytic-interactive-simulation. Also the role of simulation as marketing management game is discussed. Marketing phenomena are often complex because they give out result of many individual agents (e.g., consumers, sellers, distributors) whose motivations and actions combine with simple behavioral rules can result in surprising patterns.

Marketing affects in affects product diffusion and influences the dominance of a brand in a market. There is an individual's decision as to which product to purchase. Many consumers may in fact be much more complex than the adoption rules of the individuals. Thus, simple rules of behavior can give rise to complex, emergent patterns. Agent-

ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

based modeling (ABM) is a tool that can help researchers understand and analyze these complex patterns The basic concept of ABM is that by describing simple rules of behavior for individual agents and then aggregating these rules, researchers can model complex systems, such as the procurement of services in a marketplace, the purchase of tickets for events, or the adoption of innovations. ABM can be applied to marketing, but we also provide guidelines for how to rigorously apply ABM. Marketing is fundamentally about the interaction of consumer (both individual consumers and other businesses) in a marketplace. It deals with how to reach those consumers, how they interact and how to tap in to the need and desires that those consumers have. Of course, from a marketing perspective there is a deep desire to develop model and detailed understandings of how consumers and businesses operate in these markets. In in fact, the basic entity within marketing is a consumer or business, then it would make sense when building a model, to construct that model such that the consumer or the business was the basic unit of representation. Marketing where ABM could play a critical role in bringing new and different insights.

II. WHY SIMULATION

Simulation reduces the cost of experimentation on system. A simulation model can evaluate proposed designs, specification and changes without committing resources to build the actual system. It can also evaluate various alternatives such as effects of policies, procedures, and new techniques without disrupting the actual system. It predicts future outcome of a system .Simulation provides an educational tool for teaching operators and process supervisors to show how the system will operate. Management, scheduling, maintainece, and operational strategies can explored with increased understanding of the complex interactions that exist in the process systems. Simulation provides a method for learning how to use problem-solving techniques. It helps in understanding the cause and effect relationships in a system by dynamic system modelling. It identifies bottlenecks, constraints, and effect relationship in a system by dynamic system modelling. It provides repeatability to study a system by running the simulation model multiple times. It can control the speed of the simulation. A simulation can be run over a few seconds or over a few weeks. By controlling the speed of a simulation, team member can analyse what happens over week within minutes or spend hours on understanding what happens in years.

III. LITUREATURE SURVEY

There are so many problems in business management that cannot be solved directly by inventory, queuing theory, linear, non-linear or dynamic programming. In some of the problems it is not possible to apply the tools and methods of standard operations research, as it is not possible that every time real system is following assumptions of defined quantitative models. individual agents and then aggregating these rules, researchers can model complex systems, such as the procurement of services in a marketplace, the purchase of tickets for events, or the adoption of innovations. An agent in an agent-based model is any autonomous entity with its own properties and behaviors; to develop an agent-based model, a researcher writes a description for each type of agent that details the agent's behaviors, properties, and the way the agent interacts with other agents and the environment.Agent modelling is usable due to the iterative model construction process. This Process starts with an initial description of the behaviour of individual components or agent behaviours as well as supporting data. This is then converted to functioning model that can be executed with the given data.The model that we will be developing is a model of consumer adoption—a version of the Bass model (1969). The original Bass model of innovation diffusion was an aggregate model of Diffusion; however, even in this aggregate model, two (p and q) of the three parameters (p, q, and m) Are related to individual-level characteristics. The rates of adoption are based on mass media (P) and word-of-mouth (q). In the original Bass model, the decision to adopt at the population Level is modeled as a hazard rate, but it would be interesting to examine how local social Networks affect an individual's decision to adopt (Valente, 1995). To examine this idea, we first build an agent-based model that produces similar results to the original Bass model. We then investigate what happens in a network version of the model.

IV. PROBLEM AND SIMULATION RESULT

The probability to estimate the numbers of single die, computer simulation is used to simulate the dice rolls, randomly generating a number from 1 to 6 during each simulation and to make a count of that particular number that repeats. It

ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

provides probability when the number appears under simulation. This is applied to solve variety of areas, including risk analysis, optimization, operational research, financial analysis, reliability modeling.

Financial Analysis of Investment Strategies:

Let's assume that in planning for your retirement, you are choosing to invest some of your money in the in the stock market andsome bank (NASDAQ and tied to the NASDAQ Composite Index). After researching the two investment vehicles, it is as following:

- The interest from the bank investment follows a Standard Deviation = 0.1141 and Lambda = 4.3106. And generalized gamma distribution with Mean = 1.7406.
- The profit from the NASDAQ investment follows a normal distribution with Standard Deviation = 28 and Mean = 13.

You will choose an invest X% of your income per year and the next Y years. Assume that your current income is $40,000 per year and, based on past history, that your income will increase yearly by a percentage that is normally distributed with Mean = 4 and Standard Deviation = 1.5.

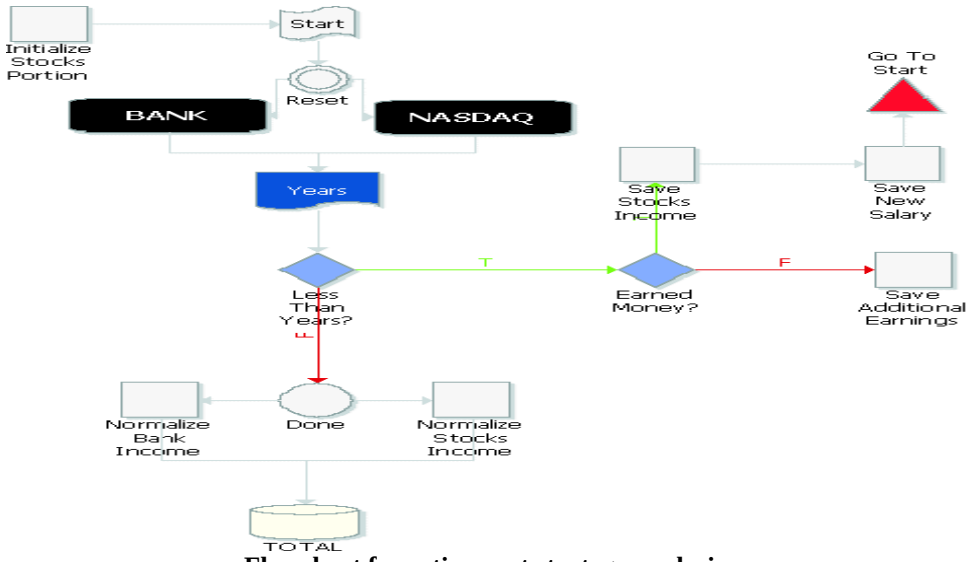
You will decide to put Z% of your investment money in the bank for the first year and the remainder in NASDAQ. The given volatility of NASDAQ, any profits made in the stock market at the end of each year will be transferred into the savings account for safe keeping. The amount invested in NASDAQ will not increase as your income increases every year. It will always be equal to the first year investment.

Retirement strategy, will perform the following analyses:

- Investment made as per the Estimate your income over the next 20 years if you invest 5% of your yearly income with 50% going to savings.
- Your investment incomewill compare after 20 years, varying the investment portion from 0% to 20% of your yearly income (with 50% going to savings).
- Varying the investment portion from 0% to 20% of your yearly income Compare your investment income after 20 years, and varying the amount invested in savings from 0% to 100%.

Simulation Solution:

The flowchart shows one approach to obtaining the desired results in simulation



Flowchart for retirement strategy analysis

Here the model relies on probabilities, constants and other variables that are based on the conditions of the scenario. Thus the Random Variables are used to obtain the returns expected from each investment vehicle based on the specified

ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

distributions/parameters. To calculate the amount of moneyEquation Variables are used that will be placed into each investment vehicle each year, and so on.
When flowchart model and the variables have been defined, we can vary the simulation options to obtain the results of interest. First, your income over the estimation for the next 20 years for a given investment strategy, we can use RENO's Sensitivity Analysis feature to perform a separate simulation run for each year from 1 to 20. After the software has performed simulations for 1,000 as for the first year, 1,000 simulations for the second year, and so on up to 20 years, the results from each run can be plotted against time, as shown in Figure below

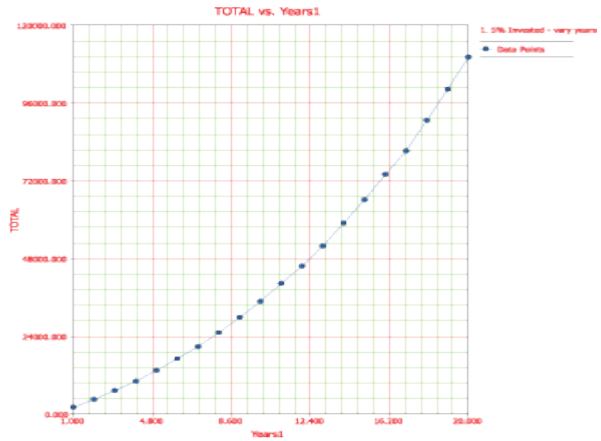
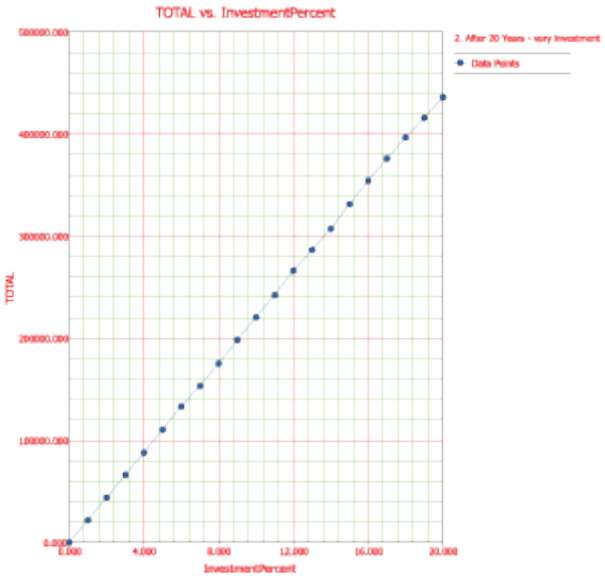


Figure 7: Investment income at 20 years

.Now compare your income after 20 years when investing various percentages of your salary, we can use the features of Sensitivity Analysis to perform a separate simulation and run for each percentage. After the software has performed 1,000 simulations for 0%, 1,000 simulations for 1% and so on up to 20%, the results from each run can be plotted against investment percentages, as shown in Figure.



Investment income over 20 yearswith varied investment percentages:

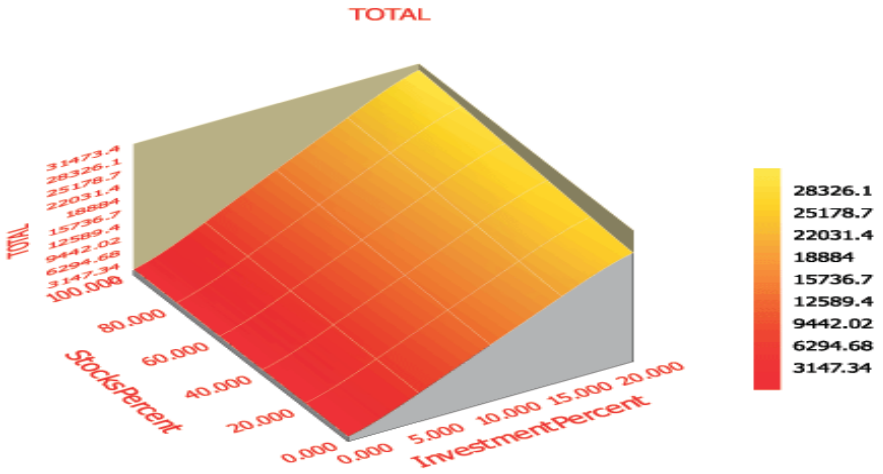
ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Special Issue 7, October 2015

Lastly, compare the investment income at various percentages of your salary and also with various portions of the investment going to each vehicle, thus you can instruct the software to vary both constants and perform separate simulation runs for each combination. The 3-D plot shows below about the results for investing 0 to 20% of your salary with 0 to 100% of that amount invested in the stock market.



V.CONCLUSION

Once the model has been verified and validated, we are now able to move beyond the model construction to discover new insights from the model. An agent-based model can be used as a computational experiment. To postulate an experiment, the researcher specifies a certain combination of inputs and varies one or more of the inputs to see how the changes affect the outputs. Once a series of experiments has been run, the results from the agent-based model can be analyzed using standard statistical approaches that are applied to any large dataset of empirical data. In today's rapidly changing marketing world where we have variety of customers increasing task point preferences. It becomes indiseperable count for customer's population by designing marketing activity. Traditional marketing models are impact of media activity optimizing budgets fail to recover demographics social interactions. The following steps help in building customers statements using different marketing survey data. Generating hypothetical customers for each of these identifying statement which resembles actual populations. Taking response as customer's level and aggregating to macroscopic level and validating model improve accuracy. As a result agent based model provides insights target audience, align, marketing, specialized messages deployed to effective media channels something traditional marketing face to deliver.ABM provides an approach that enables the concretization of many theories of consumer behavior in a way that is measurable and testable, while at the same time permits the inclusion and comparison of empirical data. Moreover, the realism of ABM facilitates model comprehension by managers and stakeholders. As the cost of computational power continues to decline and the ability to create more and more elaborate models continues to increase, ABM and other computationally intensive methods are likely to assume a larger role in our understanding of the world. Therefore, it is important for marketing researchers to understand how to rigorously use this new method.

REFERENCES

1. Agent-Based Modeling in Marketing: Guidelines for Rigor-William M. Rand University of Maryland
2. A Dynamic Agent-based Modeling Framework for Digital Business Models-Aneesh Zutshi, Antonio Grilo, Ricardo Jardim-Gonçalves.
3. Agent-based modeling: Methods and techniques for simulating human systems-Eric Bonabeau
4. Open Source Agent Based Modeling Frameworks-Russell K. Standish School of Mathematics and Statistic University of New South Wales.
5. Charles M. Macal Michael J. North Center for Complex Adaptive Agent Systems Simulation (CAS2) Decision & Information Sciences Division Argonne National Laboratory Argonne, IL 60439, U.S.A.
6. A Negahban and L Yilmaz* Auburn University, Auburn, USA.
7. William Rand Department of Marketing Center for Complexity in Business Institute for Advanced Computer Studies.