International Journal of Business, Economics and Management Works
Kambohwell Publisher Enterprises
Vol. 2, Issue 1, PP. 1-5, Jan. 2015
www.kwpublisher.com

The Review of Simulation for Business Organizations' Problems and Applications

Waled Khaled, Yuan Yongsheng, Sajjad Nazir

***Abstract*——** This paper is to show the general explanations about simulation and its importance in the modern world. This paper also shows us how the process of simulation is working step by step so it gives us the clear algorithm to apply simulation methods of any problem. It also defines the most important keywords which related to simulation methods. Moreover, in this paper, we explore the history of simulation and its developing and how it becomes one of the most widely using in the world in many fields. The importance of this research is to give us the general review about Simulation and how it is working on solving the problems. Furthermore, this paper shows how the operation of Simulation working step by step and how to apply them to act the real problem in a simulated one. The importance of this paper is also coming by reviewing the history of Simulation from its first use until now so it can be one of the best theoretical references for the researchers who interested in Simulation.

***Keywords*—** Simulation, Process of Simulation, Simulating System, the operation of Simulation, Business problems.

I. INTRODUCTION

Simulation is undoubtedly one of the more faceted issues you might face as an Industrial Engineer at the workplace (see [27]). This can also be one of the most significant for a society, regardless of the industry. Quality, safety and productivity shall be all impacted by simulation, if Problems occur in the office, manufacture floor, or in a store; see [20]. This paper is aimed to provide information about development Process simulation stage from infancy to the current stage where it is used as a powerful tool to increase the competitiveness and improving profits of the company. Simulation is widely used as a tool to increase production capacity; see, for example, [26].

The Easy-to-use Modeling Has resulted in low-priced the Packages political Would have been Unthinkable just a FEW year ago. The Simulation Technology Has shot up in value to other related industries. The Simulation industry is coming of age and is No longer rightly the domain of academics; see [23].

Due to the role of Simulation in developing all science, it has become one of the best interested sciences in the world. Furthermore, Simulation methods have been used widely in so many areas; in the industry, video games, learning, engineering, space experiments, business and so on; see [11].

In addition, Simulation by suiting the case study can be the best acting of the problem we are working on it because it give us a system and parameters very close to the real one. By exploring the history of Simulation we will find out the importance of Simulation in the development in the world and how it shared that developing because there are many fields of sciences have developed depending on simulation such as mechanics, physics and space; see [13].

II. LITERATURE REVIEW

The History of the Computer Simulation backs to World War II the Von Neumann When the Two mathematicians and Stanislaw Ulam Jon We're faced with the puzzling issue of the Behavior of neutrons; see [5]. Were hit the experimentation and the trial too costly and too complicated forum the issue was the analysis. Hence, the Roulette game wheel technique was The Suggested by the mathematicians. The Basic dates of regarding the occurrence of various events were known, into which the probabilities of the separate events were a merged in a step by step the Analysis to predict the outcome of the whole the Sequence of events; see [2]. With the remarkable successfully Techniques on the neutron issue, it had become the most popular and found many Applications systems in the business and industry; see [24].

III. THE METHODOLOGY

In the first section we will represent the history of Simulation and how its methods had improved to serve all case studies, and we will show how these methods had been used sufficiently and then how to apply it in other similar cases. In the second section we will define some of the most important keywords of Simulation: Model, Systems and Simulation and explain the term of these parts in the Simulation process and then how do they work together to get our Simulation process efficiently. In the third section we will explain about the simulating system and how to get it, then we will give a brief of this system and some of its properties and how do they consume in finishing our progress. In the fourth one we will represent the reasons behind using Simulation methods and show the importance of Simulation progress in acting real systems very successfully and easier rather than other methods. For example, in Simulation methods we have the full freedom to develop the system until we get the best

one which acting the real one very accurately then we examine it very easily and cheaply. In the fifth one we will explain how the Simulation process going on from the beginning (designing the simulating system) until we finish the process of getting the result of our work as we are working on the system in reality. In addition to that the figure 1 illustrates this progress very obviously and clearly and the lines can explain the directions of the progress and the step we have reached. In the sixth section we explore one of the most important Simulation applications nowadays; it is an application of Simulation in business and management problem and how our Simulation operation can solve these kinds of problem efficiently and successfully; see [6].

1-The history of Simulation:

Similarity workstations were mainly suitable for problems needing the answer of differential equations. Referent PCs used electronic DC loudspeakers configured as integrators and summers with a variety of non-linear, electronic and Electro-mechanical Apparatuses for duplication, separation, task generation, etc.; see, for example, [8]. These units were manually interconnected so as to produce a system that obeyed the differential equations under study. A great deal of ingenuity was often necessary in order to produce accurate, stable solutions. The electronics used vacuum tubes (valves), as did the early digital computers. The transistor was still some years in the future. See [4].

Computer Simulation was not a useful tool in 1950s.Simulation took a too long for results, too many qualified people required, as a result of a substantial amount of costs in both staff time and equipment. And the most daunting, were frequently ambiguous results. An example is the attempt to shape the data field for peak periods in the case telephony systems. This is because the system did not about based on queuing theory used during those days. A technology used Discrete Events the computer simulation was. The tools available for approach were an IBM 650 assembly language and mathematical equipment, system engineer and have been scheduled. The team accomplished less than half what they were put to do, takes twice the time and spent budgeting by a factor of two; see [25].

In comeback to these needs, a consolidating group was recognized composed of associates of part, Joint User's Set of ACM, and the Computer and Structures Knowledge and Cybernetics Groups of IEEE. This group intended the November 1967 Conference on Presentation of Simulation using the General Purpose Simulation System (GPSS). Highpoints of the consultation involved a speech by Geoffrey Gordon who spoke at length on "The Growth of GPSS" and around was a session on machine intervention for GPSS; see [22].

In the early 90s in the software as example of EMS version of GPSS / PC began to appear, which allows users of IBM-compatible personal computers to gain access to extra memory, over the 640K limit imposed by the original PC Architectural Engineering that. Extend the running Macintosh graphical simulation application behavior that supports both discrete and continuous event simulated. Mic military-presented SIM 3.0 modeling capabilities and features that were very easy to learn and use that training is no longer needed advisory services. He supported GPSS / H by a wide range of devices in the industry from personal computers and workstations to most UNIX VAX / VMS and central systems IBM. And offered are many extensions, which prevented users from having to type code in outdoor FORTRAN or "C". MAST provided one environment for the design and acquisition of operation of the manufacturing system. It requires no programming, no modeling. Was not even required to edit the text to study the production system; see [28].

Become a force imitation and clear as a tool in the mid-90s.Challenges facing by companies such as Universal Data Systems (very modern electronics assembly plant). The obstacle to transform the entire factory it to the shop where to send the individual unit to the next process immediately upon completion of it in the existing process flow hybrid. He was one serious reservation for this change is the impact on the stocks of finished goods. Experiments were performed using a simulated written in GPSS / PC program (Minutemen) using the IBM PC / AT. Entire program took 30 days to simulate the results were positively with the final full conversion of the plant an environment the flow shop environment compared with original batch; see [15].

After 2000 the use of Simulation has been increased due to the high technology revolution in the programming world and the main role of the Simulation in the industry in general. For example Simulation has become the main tool to examine the car's system and it is using widely in video games. In economics besides principally macroeconomics, the possessions of anticipated policy actions, such as fiscal policy vagaries or monetary policy changes, are simulated to justice their popularity. A mathematical model of the economy, having been built-in to historical economic data, is used as a proxy for the actual economy; proposed values of government spending open market operations, etc. are used as inputs to the Simulation of the model, and various variables of importance such as the inflation rate, the unemployment rate, the balance of trade debit, the government budget deficit, etc. are the outputs of the Simulation. The computer-generated values of these variables of interest are paralleled for different proposed policy inputs to define which set of effects is most desired; see [9].

2-Definitions of Simulation:

Systems, models, and Simulation

All professions use models of one form or another. But the word "model" does not always have the same meaning to business professionals, managers, scientists, and engineers.

System:

The real world can be observed as being poised of systems. A system is a set of related modules or entities that relate with each other based on the rules or operational policies of the system:

- Entities are the internal modules of the system. Entities are involved in the processes activities in which they interact with each other
- Operating policies, the types of controls and availability of resources are the external inputs to the system. They manage how the system maneuvers and thus how the objects interact; see [14].

Over time, the activities and interfaces of articles cause changes to the formal of the system; this is called system behavior or dynamics. Systems can be mathematically straightforward, such as a flower growing in the soil and turning towards the sun to maximize photosynthesis. Or they can be more difficult, such as supply chain operations composed of preparation, selling, scattering, production, and obtaining subsystems.

Model:

The model is a distant and simplified demonstration of a system at one point in time. Models are a constructed because they attempt to capture the sanity of the system. They are an oversimplification because, for efficiency, consistency, and ease of study, a model should capture only the most important aspects of the real system. Most models can be categorized by four basic types:

- A scaled representation of a physical object, such as a 1:18 die cast model of a Ferrari, a clay model of a proposed packaging bottle, or a scale model of the solar system.
- An analytical or mathematical formula that yields a static, quantitative solution. For example, an analytic model might consist of some independent sample observations that have been transformed rendering to the rules of the model. Communal examples of logical models are spreadsheet models or linear programming models.
- Mathematical explanation that incorporates data and expectations to rationally describe the behavior of the system. This type of model is normally dynamic it has a time component and shows how the system evolves over time. Extend Simulation products are tools for building mathematically-based, dynamic models of systems; see [1].

Dynamic modeling is the foundation for computer modeling. Thus, the word “model” will be used to mean a description of the dynamic behavior of a system or process. Extend simulation models typically have a time component and can show cause and effect and the flow of entities throughout a system (you can also create Extend Sims animations that show spatial relationships.

Simulation:

The Merriam-Webster Online Dictionary defines Simulation as “the imitative representation of the functioning of one system or process by the functioning of another”. This means that to determine how an real system functions, you would build a model of the system and see how the model functions; see [16].

Simulations running in Simulation time, an abstraction of real time. Simulation As the clock advances, the model determines if there Have Been changed, ITS Calculates values, and outputs the Prev. If the model is valid, the outputs of the Simulation at will be reflective of the performances or the behavior of the real system. Extend Simulation With That Means Sims Instead of interacting with a Real system you create a logical model That Corresponds to the real system in certain aspects. You simulate the operations or dynamics of the system, and then analyze one or more areas of interest. You order to reduce risk and uncertainty, so that you 'can make the Informed, Timely decisions; see [21].

3- What is simulating system?

Simulation of a system is the operation of a system model. The model may be configured and experimented with; usually, this is impossible, too expensive or too hard to do on the system it represents. Functioning model can be studied, and thus, the properties reflecting the behavior of the real system or the subsystem can be inferred. In its broadest sense, is a simulation tool for evaluating the performance of a system, existing or proposed, in various configurations of interest and for long periods of real time. Simulation is used prior to an existing system or a new embedded system is altered to reduce the chances of failure to meet specifications, to eliminate unforeseen obstacles, to avoid under- or over-utilization of the resources, and optimize your system performance. For example, simulation can be used to answer questions such as: What is the best design for a new telecommunications network? What are the associated resource needs? How will perform the telecommunications network when traffic load is incremented by 50%? How will a new the routing algorithm affects your performance? What do network protocol optimizes the network? What will be the impact of link failure? ; see [17].

4- Why Simulation becomes very important?

Simulation involves designing a model of a system and performs experimentation on it as it progresses through time. Models to see how a real-world activity conducted under various conditions and test several hypotheses, at a fraction the cost of performing real activity

One of the primary benefits of a model is that you can start with a simple approximation of the process and gradually refine the model as their understanding of the process improvement. This "step- wise refinement" allow you to get good approximations of a very complex problem surprisingly quickly. As you add improvements the model mimics more closely the process for real life.

5- How to process the Simulation model?

The figure below is to represent the process of our Model and how to act the real world in a case study very similar to the real one then do the subsequent steps of Simulation.

Real word System in study

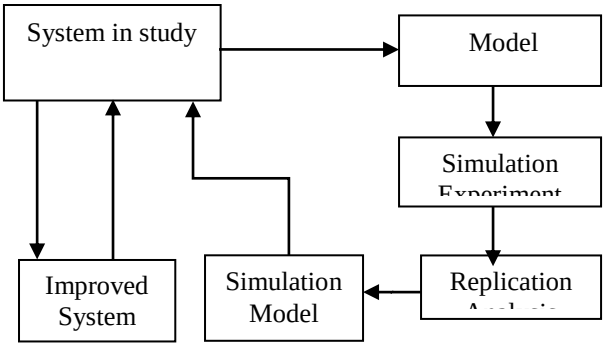

Figure1. Simulation Study Schematic; see [19].

6- Applications of Simulation:

Business Process Modeling Methods and Tools:

The growing business and academic concern in organizational variation has resulted in a multitude of approaches, methodologies, and techniques to funding these design efforts; see [18].

The reference [12] conducted empirically the review of existing technical methodologies, tools and for the Transfer business processes and to develop a framework to help the placement of tools and techniques that help in reengineering strategy, people, and management structure and size of the business process technologies. While simulation is mentioned as one of modeling methods in a survey in [12]. Though, the lack of molding implements is only a part of the problem. Perhaps even more significant obstacle for more widespread use of Simulation for business procedure modeling is a lack of consciousness of Simulation within the trade community; see [7]. Whereas the simulation model works by some fundamental steps as followed, the steps involved in developing a Simulation model, designing a Simulation experiment, and performing Simulation analysis are:

Step1. Recognize the problem.
Step2. Frame the problem.
Step3. Collect then process real method's data.
Step4. Formulate and develop the model.
Step5. Authenticate the model.
Step6. Detailing model for future use.
Step7. Select proper experimental design.
Step8. Establish trial conditions for runs.
Step9. Perform Replication runs.
Step10. Interpret and existent results.
Step11. Endorse further progress of action; see [10].

2-Discrete-event Simulation:

It is important to address the supporting role of Simulation for various business process change management approaches in the context of business process modeling. Five well known change management approaches are considered in this research: Total Quality Management (related to company-wide quality improvement initiatives), Just-in-Time (focused on inventory reduction), Business Process Re-engineering (involving a radical change of business processes in order to achieve better business performance), Process Innovation(focused on radical change of business processes and innovation of core processes) and Knowledge Management (related to systematic generation, codification and transfer of company knowledge); see [3].

CONCLUSION

This paper is to represent the general review of Simulation and the importance of simulation in the modern world. On the other hand, this paper is shows us how the process of simulation is working step by step so it gives us the clear algorithm to apply simulation method on any problem. Moreover, in this paper we explore the history of simulation and its developing and how it become one of the most widely using in the world in many fields. At the end we explain a case study of simulation in business and how simulation methods can solve such as these problems.

REFERENCES

[1] A. Chung. Simulation modeling, A Practical Approach, 2004.

[2] Akhilesh. Statistics for Management, 1E - Page 446, 2009.

[3] Asher Gupta, Dr. Kawaljeet Singh and Dr. Rajesh Verna. Applications of Simulation in business process, 2003.

[4] Belhadj Tami. A Computer aided architectural evaluation and design: a cost modeling experiment, 1989.

[5] C. Dennis Pegden, Randall P. Sadowksi, Robert E. Shannon. Introduction to Simulation Using SIMAN, 1991.

[6] Cees J. Hamelink. New information and communication technologies, social development and cultural change, 1997.

[7] Cork, Ireland, Paolucci, E., Bonci, F. and Russi, V. Redirecting Organizations Through Business Process Re-Engineering And Object Orientation. The European Conference on information Systems, 1997.

[8] D J Murray-Smith. Modelling and Simulation of Integrated Systems in Engineering, 372 pages, 2012.

[9] François Bourguignon, William H. Branson and Jaime de Melo. Macroeconomic Adjustment and income distribution: A Macro-Micro Simulation model, 1989.

[10] G. Evanno S. Regnaut & J. Goudet. Detecting the number of clusters of individuals using the software structure: a simulation study, 2005.

[11] Karlyn A. The source of innovation and creativity, 2005.

[12] Kettinger, W, J, Teng, J.T.C. and Guha S. Business Process Change: A Study Of Methodologies, Techniques And Tools, MIS Quarterly, 1997.

[13] Larry L. Constantine, Lucy A.D. Lockwood. Computers Software for Use: A Practical Guide to the Models and Methods of Usage, - 579 pages, 1999.

[14] Laudon K & Laudon J. Management Information Systems, 2006.

[15] M. C. (Mike) Albrecht, P.E. (AZ). Introduction to Discrete Event Simulation, 2010.

[16] M. Christie. Simulation in Support of CMM-based process improvement, 2011.

[17] Marc I. Kellner, Raymond J. Madachy, David M. Ra. Software process simulation modeling: Why? What? How? 1998.

[18] Mihail Stoica, Nimit Chawal and Namchul Shin. An Investigating of the Methodologies of Business Process Reengineering, 2010.

[19] R.K. Nema, Savita Nema, and Gayatri Agnihotri. Computer Simulation Based Study of Photovoltaic Cells/Modules and their Experimental Verification, 2009.

[20] Randell, L. On discrete-event simulation and integration in the manufacturing system development process. Lund University, 2002.

[21] Rene Alvarez, IE. M Eng computer Simulation…. What's that? Page 1-2, 2012.

[22] Richard E.Nance. Winter simulation conference, Pages 1307-1313, Simulation programming languages: an abridged history, 1995.

[23] Riel Miller, Wolfgang Michalski and Barrie Stevens. The promises and perils of 21st century technology: An overview of the issues, Paris 1998.

[24] Robeson, J. F., and R. E. Howe (Eds.). The Logistics Handbook, Free Press, 1994.

[25] St. Lucie Press Cappuccino, William C. Supply Chain Management: The Basics and Beyond, CRC Press, 1997.

[26] Thomas McDonald, Eileen M. Van Aken & Antonio F. Utilising Simulation to Enhance Value Stream Mapping: A Manufacturing Case Application. Rentespages 213-232, 2010.

[27] W. David Kelton, Randall P. Sadowski, Deborah A. Sadowski. Simulation with Arena, 2nd edition, 2001.

[28] Wei Wang. Knowledge based modeling system for the design and evaluation of flexible manufacturing facilities, 1989.

Waled Khaled is an assistant lecturer at College of Business, Damascus University, Syria. Now he is a master student at the College of Science, Hohai University in Nanjing, China. He acquainted the Bachelor degree in Business school/Applied Statistic from Damascus University in late 2010. His research interests focus on simulation theory, decision analysis, multi-criteria decision modeling, data envelopment analysis (DEA) and applications in banking. He has published many academic research work in the Damascus Research Journal and also in some domestic and international conferences. Email: waled.khaled123@hotmail.com

Yuan Yongsheng is a professor at the college of sciences, Hohai University, Nanjing, China. He has published many papers in nonlinear equations, Monte Carlo simulation method and he is interested in mathematical and statistical models. Now he is a lecturer in Hohai University at the college of sciences. Email: ysyuan3@hhu.edu.cn

Sajjad Nazir belongs to Hohai Business School in Hohai university, Nanjing. China. He has many publications related to business management. He has presented many papers in the international and national conferences. His area of research is, management, Human resource management, organizational behavior and research methods.
Email: sajjadnazir@hhu.edu.cn