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A Mathematical Study of Behaviour and Availability Analysis of Some Industrial System

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Abstract – An analysis of a problem requires the formulation first. Originally, problems can solve using statistical methods. Afterward this can do on; Laplace transform technique was used to solve the problems. There are many techniques of predicting the reliability of a system. The paper contains about the system model concept to produce mathematical model and analyze industrial system.

Keywords: Analysis, Manufacture, Industries, Performance, System, Reliability.

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INTRODUCTION

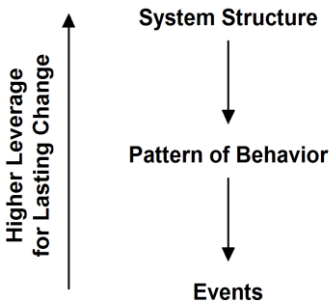
In the present scenario of spirited market to cut down manufacture costs and improve productivity and delivery performance of manufacturing systems of processing industries are the key objectives of manufacturing. Process Industries must provide continuous and long term production to meet the ever increasing demand at lower costs. The Reliability and Availability analysis of procedure Industries can advantage in terms of higher production, lower maintenance costs. The availability of complex systems and continuous process industries can be enhanced by considering maintenance, inspection, repairs and replacements of the parts of the failed units.

Since, we are living in probabilistic environment, so we need the knowledge of probability. Probability is necessary for mathematical study of reliability. Thus before proceeding further, we introduce first the fundamental idea of dependability.

The systems approach has beginnings far back in history. But as modern systems analysis has broadened, it has already begun to be controversial and misunderstood. The systems approach has quickly attracted overly zealous proponents and, as often, misinformed detractors. Substantial disagreement exists among the professionals as to how useful the approach is for the bigger problems of society, or for smaller ones when they are more "social" than "technological." This confuses the nonprofessional as to what the approach really is. It impedes its appropriate application. Some hail it as magic, a new all-powerful tool that can demolish any tough problem, engineering or human. Of course, there are always the doubters, the mentally lazy or ignorant who are annoyed with the entry of something new. And there are some aerospace engineers who have used the systems approach but only for narrow problems in their specialized field. They often do not realize they must extend their team capabilities considerably to handle complex social-engineering problems. Some experienced systems engineers go to the other extreme, certain the discipline is inappropriate for "people" problems. In this viewpoint, they are sometimes joined by experts schooled in the more unpredictable behavior of man. Some of these more socially trained individuals are concerned that the systems approach's disciplines cannot be applied successfully to the real-life problems of the human aspects of our civilization.

SYSTEMS PHILOSOPHY

The methods of systems thinking provide us with tools for better understanding these difficult management problems. The methods have been used for over thirty years (Forrester 1961) and are now well established. However, these approaches require a shift in the way we think about the performance of an organization. In particular, they require that we move away from looking at isolated events and their causes (usually assumed to be some other events), and start to look at the organization as a system made up of interacting parts.



System behavior and causal loop diagrams

We use the term system to mean an interdependent group of items forming a unified pattern. Since our interest here is in business processes, we will focus on systems of people and technology intended to design, market, produce, and distribute products or services. Almost everything that goes on in business is part of one or more systems. As noted above, when we face a management problem we tend to assume that some external event caused it. With a systems approach, we take an alternative viewpoint—namely that the internal structure of the system is often more important than external events in generating the problem.

PATTERNS OF BEHAVIOR

The systems approach gains much of its power as a problem solving method from the fact that similar patterns of behavior show up in a variety of different situations, and the underlying system structures that cause these characteristic patterns are known. Thus, once we identified a pattern of behavior that is a problem, we can look for the system structure that is known to cause that pattern. By finding and modifying this system structure, we have the possibility of permanently eliminating the problem pattern of behavior.

CONSISTENCY

Reliability contains rich mix together of essential concepts and sensible problems from the real world. In the wider sense, the word 'reliability' has a very significant meaning: Re and liability. It simply means that it is the legal responsibility, not once but again and again. The concept of reliability has been interpreted in many unlike ways in plentiful works out of which a few are listed below:-

(i) Reliability is the essential of the allocation of probabilities of failure free process from the instant of switch on to first failure.

(ii) Reliability is the likelihood that the piece of equipment will operate without failures for a given time underneath given in commission environment.

One of the definitions which have been accepted by most fashionable consistency establishment is given by the Electronics Industries Association (EIA) U.S.A. which states, "Reliability is the probability of an item performing its intended function over a given period of time under the operating conditions encountered;

APPLICATIONS OF RELIABILITY TECHNOLOGY:

a) Electrical and electronics manufacturing utmost work has been done which may be seen in the literature. Analysis of systems and reliability optimization are given in the literature.

b) Mechanical engineering applications are contained in Dhillon and Singh's book. It may be seen in literature. Singh applied the technology to process industries which may be seen.

c) The agricultural submission may be seen.

d) Applications to non-conventional liveliness systems.

e) The software reliability is given.

f) In civil and element engineering some work has been done on reliability but not very much. There is scope for work in these fields.

g) In the fields of robotics there is scope for work.

h) In biological sciences, there is good scope for the work.

TECHNIQUES OF PREDICTING THE RELIABILITY OF A SYSTEM

There are many techniques of predicting the reliability of a system. The following methods may be used to analyze and predict the reliability of a system.

- Regenerative Point Technique.
- Supplementary Variable Technique.
- Renewal Theoretic Approach.
- Markow Method.
- Laplace Transform Technique.

Problems solving using all this techniques required very drawn out mathematical calculations, which are exceptionally much time and energy overwhelming.

REGENERATIVE POINT GRAPHICAL TECHNIQUE

The Mean Time to System Failure (MTSF), Availability, Busy period of Server, number of Server's visits and number of Replacement etc. Regenerative Point Graphical Technique is very useful as;

1) Valuable results may be found without doing lengthy calculations.

2) Time is saved.

3) Energy is also saved.

4) Various parameters of system can evaluate quickly and easily.

SYSTEM MODELING

Modeling is the process of producing a model; a model is a representation of the construction and working of some system of interest. A model is similar to but simpler than the system it represents. One purpose of a model is to enable the analyst to predict the effect of changes to the system. On the one hand, a model should be a close approximation to the real system and incorporate most of its salient features. On the other hand, it should not be so complex that it is impossible to understand and experiment with it. A good model is a judicious tradeoff between realism and simplicity. Simulation practitioners recommend increasing the complexity of a model iteratively. An important issue in modeling is model validity. Model validation techniques include simulating the model under known input conditions and comparing model output with system output. Generally, a model intended for a simulation study is a mathematical model developed with the help of simulation software. Mathematical model classifications include deterministic (input and output variables are fixed values) or stochastic.

CONCLUSION:

This is a time of consciousness that science and technology are changing the world rapidly and that scientific discovery and technological development present potential powers even greater than those that have already so profoundly influenced our way of life. It is also a time when the typical citizen demands more be done about a growing list of serious shortcomings of society. It is not surprising, then, to ask whether we can connect the potency the scientific approach is felt to possess with the need for a superior attack on our unsolved problems.

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