INFLATION BASED ON REPLACEMENT MODELLING FOR A NETWORK OF SYSTEMS.

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INTRODUCTION:

The thrust on the need for effective decision making in production and service sectors paved the way to develop several mathematical models in the face of reasonable degree of certainty. However in reality there are several kinds of decisions to be made by taking into account the great uncertainty about one or more future events. As a remedy, stochastic models are tailored to represent, to an extent, the complexity of the real situations and the uncertainty prevailing around these situations. It is a well-known fact that it is difficult to develop a model that represents the reality as close as possible and simple for analysis. Consequently, different models each representing one or more parameters associated with real life situations are developed. The present study is a contribution towards the development of mathematical and stochastic models that help in evaluating block replacement decisions for a block of items under the influence of macroeconomic variables and determining an age at which the replacement is economical.

NEED AND IMPORTANCE OF RESEARCH PROBLEM

Conventional models are available to determine the replacement age for different kind of items that deteriorate with time and that do not deteriorate but suddenly fail. For the items like machines, vehicles, machine tools, equipment etc. that deteriorate with time, models are available that consider the maintenance cost, resale value, depreciation cost etc. For the items like electric bulbs, tubes, tyres etc. that fail suddenly on usage, group replacement model is applicable.

However there are certain types of items viz. computer and computer based system, a block of LCD televisions in hotel industry, a block of pressure gauges in filling plants, a block of cutting tools in a work shop etc. that may not fail completely on usage. They fail partially and can be brought back to the functional state by doing some repairs. They consist of many intermediate repairable states between functional and complete failure states that are more realistic in practice. Over a period of time such items, on usage, switch from one state to another state and can be brought back to the functional state rather allowing them directly into complete failure state. Block replacement decision encompasses all these intermediate repairable states.

METHODOLOGY:

In the present study, four states- functional, minor repairable, major repairable and complete failure- are considered and four state transition probability matrix will be developed using the past data. A case study is proposed with a reference to a block of computer and computer based system. When intermediate states are not considered in between functioning and failure states, and then it is applicable to the class of items that fail completely on usage.

Higher order Markov process, a stochastic process, will be employed to compute the probabilities of transition from a given state to any other state for future time periods. With the help of these probabilities proportion of items that need minor and major repair, completely failed and in functional state will be calculated. This helps in the estimation of corresponding maintenance costs to be incurred for block of items at various points of future time periods.

Further to make the model more realistic, the effect of time value of money on replacement decision will have to be considered. Conventional models are available to evaluate different replacement strategies for a combination of similar machine tools of different ages considering and without considering money value. Here net present value criterion based on nominal interest rates does not reflect the real increase in the value of money.

Real increase in the value of money or purchasing power of money depends upon many macro economic aggregates and variables like Gross Domestic Product (GDP), Money supply, Capital formation, Inflation etc. Real interest rates canbe computed using Fisherman's relation that takes into account the inflation.

For this purpose the inflation (for *Computer and Computer based system)* over a period of time need to be studied, forecasted and compared with actual values for the known periods by employing various forecasting techniques to identify the underlying model that best fits the time series data. And inflation is to be predicted for the forthcoming time periods by the developed Regression model with trigonometric function, which yielded relatively minimal errors.

The model will further be intensified with the Weighted Moving Transition Probabilities (WMTP) technique to consider the spread of sizeable past data instead of single period data as in the case of first order Markov process. WMTP technique is a parsimonious model that approximates higher order Markov chain.

The cost analysis can also be made in evaluating the replacement strategies, for a block of computers and computer based system without considering and with considering the influence of inflation in Indian economic environment and an age at which the block replacement will be economical can be determined.

In continuation to this, it is also planned to evaluate the option of reengineering the computer networking process to reduce the cost of hardware, maintenance and support. For this Thin-client technology is thought of in lieu of replacement option. Thin client is a generic term for a group of emerging technologies that reduces costs of hardware, maintenance and support. Thin client solution can be very well used in IT intensive sectors such as banking, insurance, railways, core IT sector etc.