ABSTRACT

Software quality is one of the objectives of software developers. To reach this goal, various efforts have been made such as a technical, formal inspection, documentation, and measure the quality of software through software metric. Software quality metrics provide the knowledge to understand the products, processes, and services at developed software. From the side of developers, the good quality software can be achieved by reducing or removing all possible errors in program. Early predictions of fault prone classes can be a well-intentioned step to improve the quality of software. Many numbers of quality models are recommended to map parameters of object oriented software like Extensibility, Reusability, efforts, manageability and cost. To find the quality of the product it is required to know more about the interdependencies of parameters of metrics and software quality parameters.

This study mostly focus on the aspect of improving reliability of a software by predicting and reducing the number of faults in the software using a novel approaches which have the ability to determine the properties of a class which is very vital in fault prediction. This research work attempts to find the faults at both design level and development level, thus the fault prevention can be achieved well which can lead to efficient software development.

In the first work, a set of new measures are proposed to find coupling and cohesion in a developmental system using Java reflection components to assess the usability. It will predict the fault in an object oriented system. Coupling and cohesion metrics are calculated by considering a number of relationships of a class. In this work these metrics
are calculated by using structural parameters like classes, methods and attributes. The structured information embedded in the source code. Classes, methods and attributes are retrieved in a package by using Java reflection. The retrieved information helps to measure the coupling and cohesion.

In the second work, the complexity of object-oriented system is measured at design phase to predict the fault-prone classes. The facility to predict the fault-prone classes can provide direction for software testing and improve the efficiency of development process. It built the Naïve Bayesian and k-Nearest Neighbors model to find the relationship between the design complexity and fault-proneness. The proposed models are empirically evaluated using four version of JEdit. The models are validated using 10-fold cross validation. The performance of prediction models were evaluated by goodness of fit criteria and Receiver Operating Characteristic (ROC) investigation.

The third work exploits the relationship between object oriented metrics (OOM) and the fault proneness of the design system in an empirical manner. The prominent design metrics may be cohesion, inheritance, coupling etc. Two aspects of fault prediction have been investigated in the proposed work. A statistical prediction for classifying faults and conceptuality to relate fault with classes have been suggested. A neuro-fuzzy approach is utilised for predicting and classifying the faults. Based on the observations, it is concluded, that the proposed model provides high accuracy in discrimination between faulty and fault-free classes. Besides the size of classes, the frequency of method invocations and the depth of inheritance hierarchies seem to be the main driving factors of fault proneness.

The experimental evaluation of the proposed research methodologies are conducted in the java simulation environment. The
comparison evaluation is made under varying parameters from which it is proved that the proposed research methodologies are better in its performance than the existing research methodologies.