The SRGMs presented in the thesis are based upon Non Homogeneous Poisson Process (NHPP). The NHPP models are based on the assumption that the software system is subject to failures at random times caused by manifestation of remaining faults in the system. Hence NHPP is used to describe the failure phenomenon during the testing phase. Some of the models proposed in the thesis have been developed with different severity of errors, which assumes that the software system consists not only single type of fault but may contain different types of faults according to the testing effort needed to remove them. Most of the models proposed in the thesis have been developed in imperfect environment, which assumes that the new faults may introduce during debugging process or faults that are causing failures are not removed successfully and also some of the proposed models in the thesis have been developed with the concept of dynamic fault and testing effort function.

The applicability of the models proposed in the thesis is shown by validating them on software failure datasets obtained from different real software development projects. The comparisons with established models in terms of goodness of fit; The Akaike Information Criterion (AIC), Mean Square Error (MSE), Sum Of Squared Errors (SSE), Coefficient of Multiple Determinations ($R^2$), has been presented.