



## JUROJIN – PUTTING PRIOR KNOWLEDGE TO USE

Safety critical components must not fail even in very demanding customer usage. Statistical testing of several hundred components without failure is necessary for even 99 percent reliability. A joint project with ZF applies prior knowledge from historical data sets to improve the predictive accuracy.

1 Schematic process for the use of various sources of prior knowledge

Attempts to reduce the high costs through longer test duration or greater load placement on just 5 to 10 components, makes the certification test less selective and only components that are substantially better than the requirement will pass. At the same time, all manufacturers have accumulated experience: thousands of similar components have been successfully produced in series for many years. The systematic use of historical data for the certification test was difficult in the past. A human had to assess how well each individual data set transferred over to the current component generation. Automation was never an option.

### Prior knowledge from historical data sets

The joint project with ZF resulted in a process that we have implemented in Jurojin. It automatically generates a single individual knowledge model from any number of historical data sets. Bringing this prior knowledge into a smaller sample using Bayesian statistics, produces a level of quality that traditionally would have needed a much larger sample size. The design and planning of certification testing is significantly more efficient now. Our near term goal is to achieve a savings of 10 percent or more in the sample size.

### Random Effect Meta-Analysis

The new process can accommodate many types of historical data sets: whether the sample size is large or small, and no matter if there are just suspended items or all of the components have been tested until failure. The Random Effect Meta-Analysis we use automatically assigns the correct weighting to each data set (depending on sample size, consistency of the sample, and compatibility with other samples).

As the new, smaller size samples are also suitable for this format, the effect will be even greater in the coming years. Jurojin supports the entire process:

- Evaluates historical data and stores it in a database
- Combines many prior sources of knowledge in a Beta-distribution
- Uses the Beta-distribution for cost savings in the test plan

