Cooperative traffic systems, where vehicles, infrastructure and travellers share information have the potential to increase not only traffic safety but also efficiency and comfort. In this thesis vehicles sharing information directly with each other using short-range wireless communication are studied. Such communication increases the awareness of the surrounding traffic environment beyond the line-of-sight range of traditional on-board sensors such as radar and cameras. As the awareness range is increased new methods for interpreting the traffic situation are needed which also model the effect of driving conventions such as traffic rules. As the first theme this thesis explores how models of driver conventions can be evaluated to detect deviations, or hazardous traffic situations, earlier.

As the second theme the thesis investigates how awareness of the communication environment itself can be achieved in order to address the shortcomings of high-frequency vehicle-to-vehicle communication. By utilizing vehicles as probes and cooperatively building and distributing a map of historical communication quality it is possible to estimate and adapt to changes in communication quality, leading to more dependable cooperative traffic functions.