Many processes in nature are stochastic.

The reason is that often we can focus on a system consisting of a few degrees of freedom and we cannot control exactly the interaction with the rest. Typically it is small, but on a long term it can change the fate of the system substantially.

One way to treat this is by a stochastic description of processes. For example a gas of free particles, where the scattering is treated probabilistically.

Lifetime of electrons in orbitals. Spontaneous decay.

The way to do this is the Master Equation

In quantum mechanics there is also the fact that quantum states also have a phase, which is more sensitive to the interaction with the environment.
Loss of the information about the phase is called decoherence. Is much faster than spontaneous decay

Master equation describes time evolution, due to stochastic effects, which hoverer can be modeled, of probabilities.

Quantum Master equation also describes evolution of phase coherence.

Both master equations can be derived for given physical models by different kind of assumptions/approximations:
Weak coupling, markovianity (loss of memory), ...

Typical (quantum) systems:
Qubits/decoherence
Quantum Dots
Electric transport across microscopic systems (quantum dots/molecules)
Scattering of particles
Photon cavities, loss
Spontaneous decay, lifetime of quantum states