

## Lecture 01.04 Model-based descriptions of measurement<sup>7</sup>

Model-based descriptions of measurement frame measurement as

1. a concrete process of measurement object, measurement instrument, and their environment and
2. the construction of a theoretical and/or statistical model of the concrete process.

Correspondance between the measurement and the model are the primary consideration for the construction of models.

Two types of measurements are described:

instrument  
indications  
measurement  
outcomes

1. *instrument indications* or *readings* are the output of the concrete process of measurement, such as the dial position on a pressure gauge;
2. *measurement outcomes* or *results* are knowlege claims about measurement objects that usually include a statement of probability or uncertainty, such as “the pressure in the tank is  $50 \pm 3$  psi with 95% confidence.”

Measurement outcomes are model-dependent and the uncertainty calculation depends on assumptions about the effectiveness of the model, including the statistical models of uncertainty.

The primary requirement of model-based descriptions of measurement is twofold:

1. coherence of the assumptions of the model and background theory and
2. consistency across instruments and environments.

---

<sup>7</sup>See Tal (2017) for much more information.