# Data Acquisition

Research, other than those of theoretical nature, require data acquisition.
Data acquisition is broadly one of the following types-

- field survey type- as is usually performed in social sciences and many management research.
- observations from controlled real set-ups.
- observations from laboratory set-ups.
- observations from (computer) simulations.

In controlled set-ups, there are two types of inputs – the controls which have generally limited variations, and the actual independent variables which can have several discrete or continuous values.

Laboratory set-ups allow more detailed observations to be recorded. There is usually more control over the over-all set-up. But it is important to establish that the set-up adequately matches or models a real system or phenomenon. The run-time environment also may have differences that should be accounted for.

Many experiments are carried out in a simulated set-up. Simulation is closely tied with modelling.

In experiments, it is desirable to be able to provide input values automatically. There are two reasons for this- large volume of input values, and, repeatability.

If providing input values in an experiment replaces some real interface of the system, it becomes necessary to follow the pattern of real input-values. These patterns are often known to follow some distributions.

**Data quantization and approximation**

Quantization is inherent in digital representation, and quantization implies approximation. Compared to analog format this is not necessarily a drawback, since integrity of values can be better ensured in storage and propagation in digital format. Further, in experimental data infinite precision is not necessary, and a digital representation can be prepared up to the required precision (resolution).

In fact, it is more important to decide the precision level actually required. This can be estimated taking into account the fine differences that are *perceptible* in the system, and the analog precision of the measuring instruments used.

In data analysis high precision of acquired data may be difficult to be maintained in computations that multiply such values. Approximation is required in such situations. Care should be taken so that the order of the original values and the approximated values are not inverted (if original value $x$ is smaller than $y$, the approximated $x$ should not be greater than approximated $y$).