

# Introduction

- The **design of experiments (DOE, DOX, or experimental design)** is the design of any task that aims to describe and explain the variation of information under conditions that are hypothesized to reflect the variation.
- The term is generally associated with experiments in which the design introduces conditions that directly affect the variation, but may also refer to the design of quasi-experiments, in which natural conditions that influence the variation are selected for observation.
- In its simplest form, an experiment aims at predicting the outcome by introducing a change of the preconditions, which is represented by one or more independent variables, also referred to as "input variables" or "predictor variables."
- The change in one or more independent variables is generally hypothesized to result in a change in one or more dependent variables, also referred to as "output variables" or "response variables."
- The experimental design may also identify control variables that must be held constant to prevent external factors from affecting the results.
- Experimental design involves not only the selection of suitable independent, dependent, and control variables, but planning the delivery of the experiment under statistically optimal conditions given the constraints of available resources.
- There are multiple approaches for determining the set of design points (unique combinations of the settings of the independent variables) to be used in the experiment.
- Main concerns in experimental design include the establishment of validity, reliability, and replicability.
- For example, these concerns can be partially addressed by carefully choosing the independent variable, reducing the risk of measurement error, and ensuring that the documentation of the method is sufficiently detailed.

## Discussion topics when setting up an Experimental design

1. How many factors does the design have, and are the levels of these factors fixed or random?
2. Are control conditions needed, and what should they be?
3. Manipulation checks; did the manipulation really work?
4. What are the background variables?
5. What is the sample size. How many units must be collected for the experiment to be generalisable and have enough power?
6. What is the relevance of interactions between factors?
7. What is the influence of delayed effects of substantive factors on outcomes?
8. How do response shifts affect self-report measures?
9. How feasible is repeated administration of the same measurement instruments to the same units at different occasions, with a post-test and follow-up tests?
10. What about using a proxy pretest?
11. Are there lurking variables?
12. Should the client/patient, researcher or even the analyst of the data be blind to conditions?
13. What is the feasibility of subsequent application of different conditions to the same units?
14. How many of each control and noise factors should be taken into account?

# MINITAB



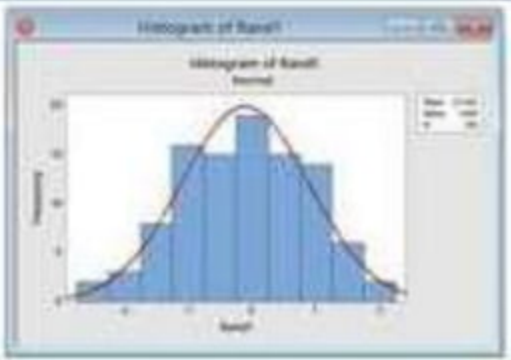
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Welcome to Minitab, press F1 for help.

Histogram of Rand1

Histogram of T1



Worksheet1.MTW

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
	Rand1	T1															
1	-1.0582	1															
2	-1.6716	1															
3	0.0090	0															
4	-1.0340	0															
5	0.9918	0															
6	-0.4933	0															
7	0.4200	1															
8	0.8796	0															
9	0.0090	0															
10	1.5140	10															
11	0.2007	11															
12	0.8818	12															

# DOE (design of experiments)

- DOE (design of experiments) helps you investigate the effects of input variables (factors) on an output variable (response) at the same time.
- These experiments consist of a series of runs, or tests, in which purposeful changes are made to the input variables. Data are collected at each run.
- You use DOE to identify the process conditions and product components that affect quality, and then determine the factor settings that optimize results.
- Minitab offers five types of designs: screening designs, factorial designs, response surface designs, mixture designs, and Taguchi designs (also called Taguchi robust designs).
- The steps you follow in Minitab to create, analyze, and visualize a designed experiment are similar for all types. After you perform the experiment and enter the results, Minitab provides several analytical tools and graph tools to help you understand the results.
- This chapter demonstrates the typical steps to create and analyze a factorial design. You can apply these steps to any design that you create in Minitab.

# Minitab DOE commands

- Minitab DOE commands include the following features:
  1. Catalogs of designed experiments to help you create a design
  2. Automatic creation and storage of your design after you specify its properties
  3. Display and storage of diagnostic statistics to help you interpret the results
  4. Graphs to help you interpret and present the results.
- In this chapter, you investigate two factors that might decrease the time that is needed to prepare an order for shipment: the order-processing system and the packing procedure.
- The Western center has a new order-processing system. You want to determine whether the new system decreases the time that is needed to prepare an order. The center also has two different packing procedures. You want to determine which procedure is more efficient. You decide to perform a factorial experiment to test which combination of factors enables the shortest time that is needed to prepare an order for shipment.

# Conclusion

- Minitab is use in educational, small, medium and even large organizations.
- It is offering lot of features including DOE.
- Designing of experiments is very important task in any of the research laboratories or company.
- This software provides very good features for designing and authentication on it.
- Minitab should ne updated time to time by the its company to meet the accurate and modern results on it.