

Module 2:

Data Collection Procedures

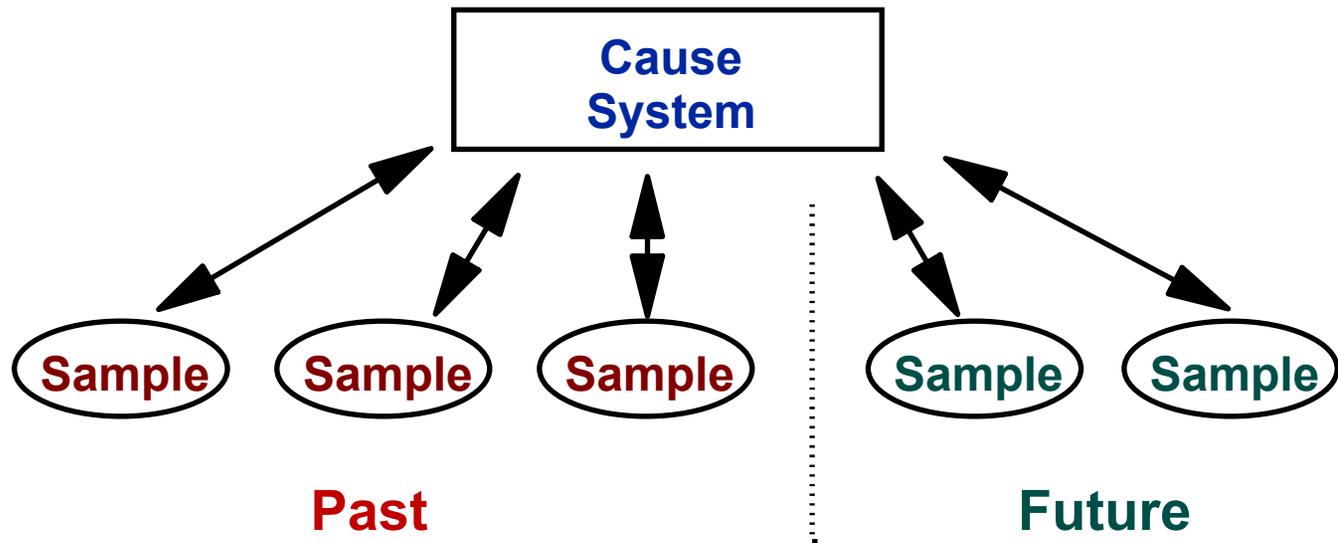
Objectives

- ❑ **The purpose of enumerative and analytical studies**
- ❑ **Considerations to take into account when developing a data collection plan**
- ❑ **Develop operational definitions**

Types of Statistical Studies

- **Enumerative Studies: Descriptive only**
- **Analytic Studies: Used for prediction**

Sampling for Analytic Studies



□ Judgment sample

① Based on Process Knowledge

- ◆ Subject Matter Knowledge
- ◆ Knowledge of Repeatability of Conditions

Data Collection Planning

- **Sampling procedures lead to the collection of data**
- **Collecting meaningful data involves the:**
 - **Data's relationship to hypothesis or theory**
 - **Use of a systematic approach**
- **Applies throughout the extended system**

Questions the Data Collection Plan Should Answer

- Why collect data?**
- What will you do with it?**
- What type of information will you collect?**
- How will you collect it?**
- Who will collect it?**
- Where will you get it from?**
- How often and how much data should you get?**

Why Do You Want the Data?

- **Must have a definite purpose**
 - ① **Describe activities**
 - ① **Control activities**
 - ① **Improve activities**

What Will You Do With the Data?

- **How will it be used?**
 - ① **For improvement**
 - ① **For description**
 - ① **For archives**
 - ① **For control**

What Types of Data Will Be Collected?

- **Attribute Data: discrete categories**
 - Total defects
 - Types of defects
 - Job classifications
- **Measurement data: measures along a continuum**
 - Time
 - Temperature
 - Weight

How Will You Gather the Data?

□ Indirect Observations

- ↻ Interview
- ↻ Survey
- ↻ Focus group

□ Direct Observations

- ↻ Check sheets
- ↻ Work diaries
- ↻ Data summary forms

Check Sheets

- ❑ **Systematic way to collect and organize data**
- ❑ **Time savings**
- ❑ **Stratification**
- ❑ **Simple**
- ❑ **Types**
 - **Tally check sheets**
 - **Location check sheets**
 - **Checklists**

Tally Check Sheet (Measurement Data)

Check Sheet

Purpose:

Product name:

Usage:

Specification:

No. of inspections:

Total number:

Lot number:

Date:

Factory name:

Section name:

Data collector:

Group name:

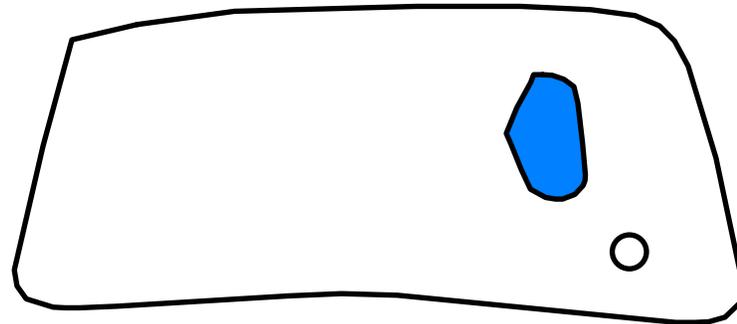
Remarks:

Dimensions	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2		
			Spec.				XXXX	XX		X	XXXXX	XX	Spec.						20	
				XXX		XXXXX	XXXXX	XXXXX	XX	XXXXX	XXXXX	XXXXX	XXXXX							15
			X	XXXXX	XXX						10									
				XXXXX			X			5										
Total frequency	X	XX	XXXXX	XX	X		0													
	1	2	6	13	10	16	19	17	12	16	20	17	13	8	5	6	2	1		

(Ishikawa, 1985)

Defect Location Check Sheet

Purpose:



Remarks

Date:

**Product
type:**

(Ishikawa, 1985)

Defective Cause Check Sheet

Equipment	Worker	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
		am 00X*	pm 0X	am 000	pm 0XX	am 000X XX*	pm 0000 XXX	am 0000 X**	pm 0XX	am 0000	pm 00	am 0	pm XX*
Machine 1	A												
	B	0XX*	000X X0	0000 00XX	000X X	0000 00XX *	0000 00X*	0000 0X	000X **	00XX *	0000 0	00X	000* X0X
	C	00X	0X	00	*	0000 0	0000 00X	00	0*	00#	00+	#0	0+
Machine 2	D	00X	0X	00	000*	000* #	0000 0X	0*0	00#	00## +	0**	+00X	XX0
		0 Surface scratches		X Cracks		# Improper shape		*		Incomplete		+ Others	

(Ishikawa,
1985)

Other Data Collection Methods

- **Work Diaries**
- **Data Summary Forms**
- **Archival Data**

Who Will Collect the Data?

- Employees**
- Supervisors**
- Teams**
- Computers**

Where Will the Data Be Collected (Sources)?

- Product/service individual users**
- Product/service organizational users**
- Equipment**
- Materials**
- Personnel**
- Environment**

How Often and How Much Data Will Be Collected?

- **Knowledge of the process is important**
- **Judgment Sampling Consideration**
 - **Random: Enumerative study**
 - **Judgment: Analytical study**
- **Sample size**

Operational Definitions

Elements of Operational Definitions

- ❑ **Determination of specific criterion (criteria)**
- ❑ **Measurement of product/service using specific criterion (criteria)**
- ❑ **Decision whether product/service conforms to criterion (criteria)**

W.E. Deming, 1986, *Out of the Crisis*, Ch. 9

Example of an Operational Definition

1) Criteria: 50% wool (Question: 50% wool throughout or 50% in specific location?)

2) Test: Cut 10 holes in the blanket, 1 or 1 1/2 cm in diameter, centered by random numbers. This will be our sample. Number the samples 1 to 10. Hand these 10 pieces to your chemist for a test. The chemist will follow prescribed rules and record x_i , the proportion wool by weight for sample i . Compute \bar{x} , the average of 10 proportions.

$$\bar{x} \geq 0.50$$

$$x_{\max} - x_{\min} \leq 0.02$$

3) Decision: If the sample fails on either criterion, the blanket fails to meet your specification

W.E. Deming, 1986, *Out of the Crisis*, Ch. 6

Exercises in Developing Operational Definitions

Summary

- ❑ **Difference between enumerative and analytical applications**
- ❑ **Considerations when making data collection plans**
- ❑ **Operational Definitions**