Module 7

DATA COLLECTION

What is Data Collection?

Data Collection helps your team to assess the health of your process. To do so, you must identify the key quality characteristics you will measure, how you will measure them, and what you will do with the data you collect.

What exactly is a key quality characteristic? It is a characteristic of the product or service produced by a process that customers have determined is important to them. Key quality characteristics are such things as the speed of delivery of a service, the finish on a set of stainless steel shelves, the precision with which an electronic component is calibrated, or the effectiveness of an administrative response to a tasking by higher authority. Every product or service has multiple key quality characteristics. When you are selecting processes to improve, you need to find out the processes, or process steps, that produce the characteristics your customers perceive as important to product quality.

Data Collection is nothing more than planning for and obtaining useful information on key quality characteristics produced by your process (Viewgraph 1). However, simply collecting data does not ensure that you will obtain relevant or specific enough data to tell you what is occurring in your process. The key issue is not: How do we collect data? Rather, it is: How do we obtain useful data?

Why do we need to collect data?

Every process improvement effort relies on data to provide a factual basis for making decisions throughout the Plan-Do-Check-Act cycle. Data Collection enables a team to formulate and test working assumptions about a process and develop information that will lead to the improvement of the key quality characteristics of the product or service. Data Collection improves your decision-making by helping you focus on objective information about what is happening in the process, rather than subjective opinions. In other words, I think the problem is... becomes... The data indicate the problem is... (Viewgraph 2).

Why do we need a well-defined Data Collection process?

For your team to collect data uniformly, you will need to develop a Data Collection plan. The elements of the plan must be clearly and unambiguously defined—operationally defined. You may want to pause here and review the Operational Definitions module before you go on.

Why does a team need Operational Definitions in order to collect useful data? Let's say three people are collecting data on the time it takes to perform a certain process step. Unless the exact moment when each action begins and the exact moment

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Why Collect Data?

To estabish a factual basis
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I think the problem is . . .

becomes

The data indicate the problem is . ..

when it ends are operationally defined, each data collector will observe and record data based on his or her own understanding of the situation. The Data Collection process will not be standardized or consistent. You will have collected data, but it probably won't be much good to you. Worse yet, you may make changes to your process based on flawed information.

Data Collection can involve a multitude of decisions by data collectors. When you prepare your Data Collection plan, you should try to eliminate as many subjective choices as possible by operationally defining the parameters needed to do the job correctly. It may be as simple as establishing separate criteria and a specific way to judge when a step begins and when it ends. Your data collectors will then have a standard operating procedure to use during their Data Collection activities.

When should we develop a Data Collection plan?

You should develop your Data Collection plan during the Plan Phase of the Plan-Do-Check-Act (PDCA) cycle. The PDCA cycle provides a framework for you to build an understanding of your process and how to obtain and interpret data that will lead to real process improvement.   Although they can be time-consuming, planning sessions are extremely important because this is when you establish the guidance that helps you obtain the right data.

What questions should the Data Collection plan answer?

Your team needs to develop the answers to the following questions as the basis for a sound Data Collection plan:

- Why do we want the data? What will we do with the data after we have collected them? The team must decide on a purpose for collecting the data (Viewgraph 3).

   In the Plan Phase, your team should develop a working hypothesis which will serve as a guide to future investigation of the process. This hypothesis is an assumption based on already existing data and observations, such as your process Flowcharts or a Cause-and-Effect Diagram the team has prepared. You develop working assumptions and collect data to determine the process changes that will improve the key quality characteristics of your product or service. Your proposed change should be stated as an "If . . . then" statement.

        IF we change Step X in our process by doing . . ., we believe
        we will THEN improve Y, which is a key quality characteristic
        of our product or service.

Making a Data Collection Plan

Why do we want the data?

What purpose will they serve?

Formulate your change statement:

If . . . then . . .

This action focuses your team on the specific quality characteristic you want to improve, and sets the stage for where you will collect the data.

● **Where will we collect the data?** The location (Viewgraph 4) where data are collected must be identified clearly. This is not an easy step unless you tackle it from the following perspective:

> Refer to the Flowcharts which depict both the current ("as is") state of the process and the proposed ("should be") state of the process after it has been modified. Focus on the process steps where the key quality characteristic you are trying to improve is produced.

> Collect data from these process steps. You must collect data twice. First, you **collect baseline data** before you make any changes in your process. These baseline data will serve as a yardstick against which to compare the results of the process after changes have been made. Then, you must **collect data after the change** has been imposed on the process. To compare the before and after process, you will probably want to translate your data into graphic form using a Pareto Chart, Run Chart, or Histogram. The use of these tools is explained in separate modules.

> Collect data on the key quality characteristic of the product or service at the end of your process. Again, before and after data must be collected. The comparison of before and after data validates whether the change actually improved the output of the process.

● **What type of data will we collect?** In general, data can be classified into two major types: **attribute data** and **variables data** (Viewgraph 5).

> **Attribute data** give you counts representing the **presence or absence of a characteristic or defect**. These counts are based on the occurrence of discrete events. As an example, if you are concerned with timely delivery of parts by your store keepers, you could develop a procedure that would give you a count of the number of supply parts they deliver on time and the number they deliver late (defects). This would give you attribute data, but it would not tell you how late a late delivery actually was. Two factors help determine whether attribute data will be useful:

>> Operational Definitions. You need to operationally define **exactly what** constitutes a defect. For the data collected in the example above to be useful, you would have to operationally define late. This may be a good time to review the module on Operational Definitions.

Making a Data Collection Plan

Where will we collect the data?

- Refer to the process Flowchart

- Identify steps where you expect changes

- Take data at those steps and at the end of the process

Making a Data Collection Plan

What type of data will we collect?

- Attribute data: Presence or absence
  of a characteristic

- Variables data: Specific measurement

>> Area of Opportunity. For counts to be useful, they must come from a well-defined area of opportunity. You obtain a single count, or value, from each sample, or area of opportunity. For example, if you are collecting data on the number of defective bayonets received in each shipment of 200, the area of opportunity is the 200-bayonet shipment. The number of defective bayonets in the shipment gives you one count, or data point.

> Variables data are based on measurement of a key quality characteristic produced by the process. Such measurements might include length, width, time, weight, or temperature, to name a few. Continuing with the parts delivery example, you could collect variables data by tabulating the time it took to process an incoming supply request from receipt to validation of the National Stock Number (NSN); or the time from validation of the NSN to identification of the stock bin where the part is located; or the time required to post the obligation in the OPTAR Log; or the total time from receipt of the request to delivery of the part. This measurement, time, could be used to determine how timely or late the deliveries were.

● Who will collect the data? Many teams struggle with this question, but the answer is simple: Those closest to the data—the process workers—should collect the data (Viewgraph 6). These people have the best opportunity to record the results. They also know the process best and can easily detect when problems occur. But remember, the people who are going to collect the data need training on how to do it, and the resources necessary to obtain the information, such as time, paper, pencils, and measurement tools.

● How do we collect the right data? You need to remember that you are collecting data for the purpose of improving the process, not the product it produces. Clearly, you want to collect the data that best describe the situation at hand. If you are going to use the data to make predictions about the performance of the process, you should collect small samples at regular intervals—let's say 4 or 5 units every other hour or each day. Since it is important to collect those 4 or 5 units in a short interval of time, you may want to use consecutive units or every other unit.

But remember, the cost of obtaining the data, the availability of data, and the consequences of decisions made on the basis of the data should be taken into consideration when determining how much data should be obtained and how frequently it should be collected (Viewgraph 7).

Making a Data Collection Plan

Who will collect the data?

Workers who perform the process steps

- Properly trained

- Provided with resources

Making a Data Collection Plan

How do we collect the right data?

- Small sample sizes

- Collect frequently

- Dependent on availability
  of data, cost, consequences

What Data Collection problems should we avoid?

Remembering that data form the basis for the effective, unemotional communication without which no process improvement effort can succeed, you need to avoid two significant problems associated with Data Collection.

Problem 1 - Failure to establish Operational Definitions (Viewgraph 8). You need to define, not simply identify, the following:

- When and how often you will collect the data
- How you will collect the data
- Units of measurement you will use in collecting the data
- The criteria for defects
- How you will handle multiple defects on single products

If you haven't thought about these issues, your Data Collection process may be doomed from the start. This is especially true when more than one person is collecting data. What is meaningful to one worker might not be to another. You have to take the time to develop adequate, clear-cut definitions, and train each collector to use those definitions.

Problem 2 - Adding bias to the Data Collection process. You can never eliminate   bias, but it is important to minimize it. Here are some ways your data can be biased (Viewgraph 9):

- The process of collecting the data may affect the process being studied. If you are trying to make a process faster, taking data may either speed it up or slow it down.

  > On the one hand, the workers may speed up the way they work in the process, thus skewing the data in their favor. This may occur if they have a perception that the variables data they are collecting will show that they could be more efficient, productive, or effective. Once the Data Collection effort ceases, they may return to their old pace of operations.

  > On the other hand, the burden of Data Collection may cause a slowdown in the natural flow of the process.

  If such events are affecting your improvement efforts, you need to alter your Data Collection plan.

Data Collection Problems

Failure to establish Operational Definitions

- When and how often to collect data
- How to collect data
- Units of measurement
- Criteria for defects
- Handling of multiple defects

Data Collection Problems

Adding bias to the collection process

- Slowdown or speedup
- Fear
- Errors in procedures
- Missing data

● The attitudes and perceptions of the data collectors can affect what they see and how they record data. If there is a sense that the data will be used against them, workers may use the data collection process to cast a favorable light on the process being studied. You have to get past this fear in order to collect accurate data. You might want to consider an amnesty program.

Data collectors need to be assured that their leaders realize that the data gathered in the past may have been tainted by fear. This requires a commitment by your leadership that the new information—possibly less glowing or flattering—will not be compared against old data or their perception of how your process operated in the past.

● Failure to follow the established Data Collection procedures can add errors to the data. This bias occurs when the Data Collection instructions, training, or checksheets are not adequately prepared and tested in an operational environment. You need to conduct initial training on Data Collection and then perform a small-scale Data Collection trial to see if it all works smoothly. The small-scale trial may uncover some problems which need to be ironed out before you can actively pursue a larger scale Data Collection effort. The trial may reveal that you need to make a minor change in the checksheet to make it clearer or easier to use, or that additional training on Operational Definitions is required to calibrate the eyes of the data collectors.

● Data may be missing. Don't assume that missing data will show the same results as the data you collected. The fact that the data are missing is a clue that they may be different from the rest. It is best to number the checksheets sequentially to make it easier to verify that you have them all and that all the required samples have been taken.

What do we use to collect data?

Data are frequently collected using checksheets—structured forms that enable you to collect and organize data systematically. Because each checksheet is used for collecting and recording data unique to a specific process, it can be constructed in whatever shape, size, and format are appropriate for the Data Collection task at hand.

Checksheets have three important uses (Viewgraph 10):

● Record information on the key quality characteristics of your process for analysis using tools such as a Pareto Charts, Histograms, and Run Charts.

● Provide a historical record of the process over time.

● Introduce Data Collection methods to workers and supervisors who may not be familiar or comfortable with collecting data as a regular part of their jobs.

Uses for Checksheets

- Record data for further analysis

- Provide historical record

- Introduce Data Collection methods

DATA COLLECTION   VIEWGRAPH 10

What types of checksheets are there?

The most common types of checksheets collect data either in tabular form or in a location-style format. Occasionally you may encounter a graphic-style checksheet. No matter which type you are using, make sure that it is clear, complete, and user-friendly. The three types of checksheets are described below.

- Tabular format. A tabular checksheet (Viewgraph 11)—also known as a "tally sheet"—is easy for you and your team to use when you simply want to count how often something happens or to record a measurement. Depending on the type of data required, the data collector simply makes a checkmark in a column to indicate the presence of a characteristic, or records a measurement, such as temperature in degrees centigrade, weight in pounds, diameter in inches, or time in seconds.

- Location format. A location checksheet (Viewgraph 12) allows you to mark a diagram showing the exact physical location of a defect or characteristic. An insurance adjuster's pictorial claim form detailing your latest bumper bruise is an example of a location checksheet.

Types of Checksheets
Tabular Format

JULY 94								
DEFECT	12	13	14	15	16	17	18	TOTAL
WRONG NSN	||	|	||	|	|	|		8
FAULTY MATERIAL	|	||		|		|		5
PMS NOT DONE	||	|||	||	|||	|	|||	||	16
INSTALL PROBLEMS				|		|		2

Types of Checksheets
Location Format

DATE: _____   COMMENTS: _____

DEPT: _____   _____
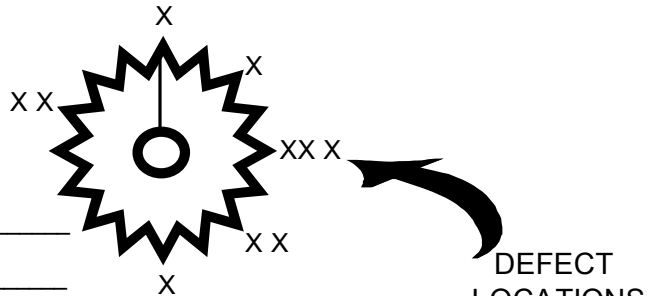
X

X

X X

XX X

X X

LOT NUMBER: _____   DEFECT

X   LOCATIONS

NUMBER OF BURRS: _____

INSPECTOR: _____

Location of burrs on a special gear marked with an X.

● Graphic format. Another way of collecting data is by using a graphic form of checksheet (Viewgraph 13). It is specifically designed so that the data can be recorded and displayed at the same time. Using this checksheet format, you can record raw data by plotting them directly onto a graph-like chart. Viewgraph 13 is an example of a checksheet which also produces a Run Chart as the individual data points are plotted and the adjacent points are joined with a straight line.

How do we develop useful Checksheets?

There is no standardized format that you can apply to all checksheets. Instead, each checksheet is a form tailored to collect the information needed to improve a specific process. Remember, a well-designed checksheet is the launching pad for an effective analysis in which data become meaningful information. With that in mind, here are some guidelines (Viewgraph 14) to help you develop useful forms:

● Involve the process workers in developing the checksheet for their process.

● Label all columns clearly. Organize your form so that the data are recorded in the sequence seen by a person viewing the process. This reduces the possibility of data being recorded in the wrong column or not being recorded.

● Make the form user-friendly. Make sure the checksheet can be easily understood and used by all of the workers who are recording data.

> Include brief instructions on the back of the form.

> Create a format that gives you the most information with the least amount of effort. For example, design your checksheet so that data can be recorded using only a check mark, slant mark, number, or letter.

> Provide enough space for the collectors to record all of the data.

> Designate a place for recording the date and time the data were collected. These elements are required when the data are used with Run Charts or other tools which require the date and time of each observation.

> Provide a place to enter the name of the individual collecting the data.

> Allow enough space so data collectors can write in comments on unusual events. This information could be entered on the back of the form.
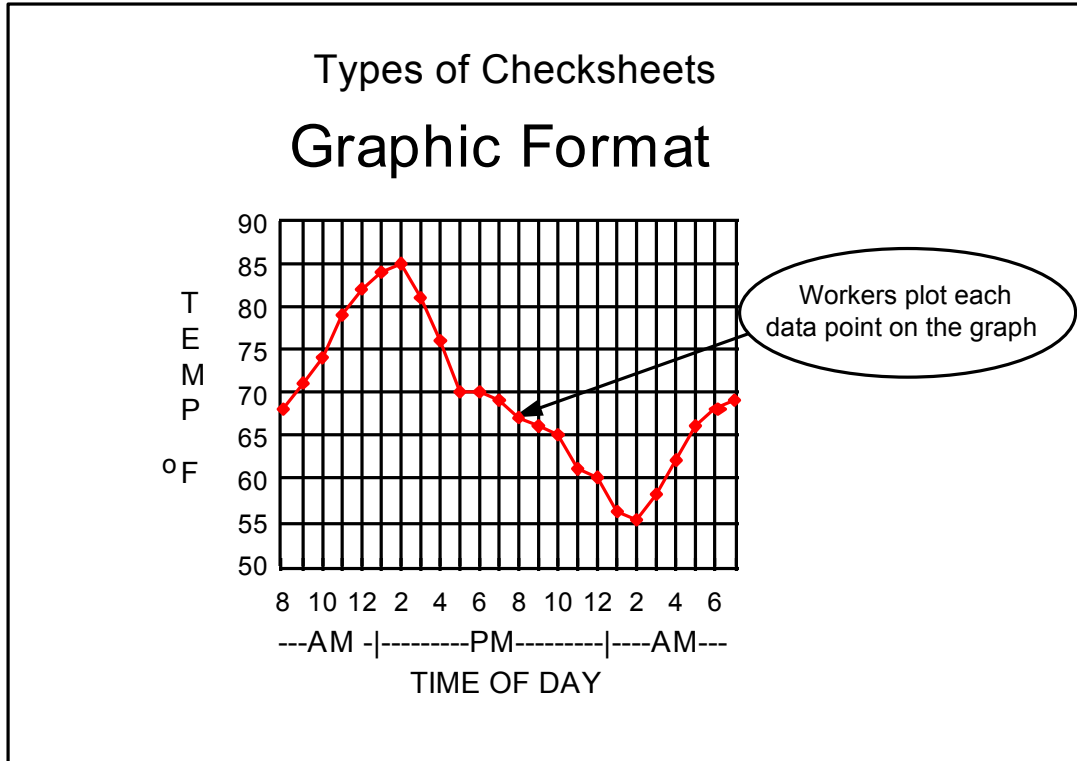
Types of Checksheets

Graphic Format

Workers plot each data point on the graph

Making a Useful Checksheet

- Tailored for specific purpose

- Workers help develop form

- Columns labeled clearly

- User-friendly format

How can we review what we've learned?

Now let's work through some examples that illustrate how to determine where to collect baseline data and how to use checksheets to capture them.

EXAMPLE 1 - Pharmacy Waiting Time: A team of hospital corpsmen working in a Naval Medical Clinic is attempting to improve service in the pharmacy by decreasing the time patients wait for their prescriptions (i.e., the key quality characteristic). The desired end state is reduced waiting time for the patients. The team proceeds as follows:

● They develop a Flowchart of the process (Viewgraph 15).

● After examining the Flowchart and discussing the steps, they conclude that a possible bottleneck in their process occurs at the point where a prescription is filled by the pharmacist. This is supported by general observations of team members.

● They develop a hypothesis along with their "should be" Flowchart.

● They opt to take baseline data using a checksheet to assess both the time required for the pharmacist's actions and the overall time required to process the prescription, as depicted in Viewgraph 16.

Pharmacy Example Flowchart

Pharmacy Example Checksheet

LEGEND: MAKALAPA NAVMEDCLINIC - 16 July 94 - Elapsed time to fill prescription - 1 every 30 mins
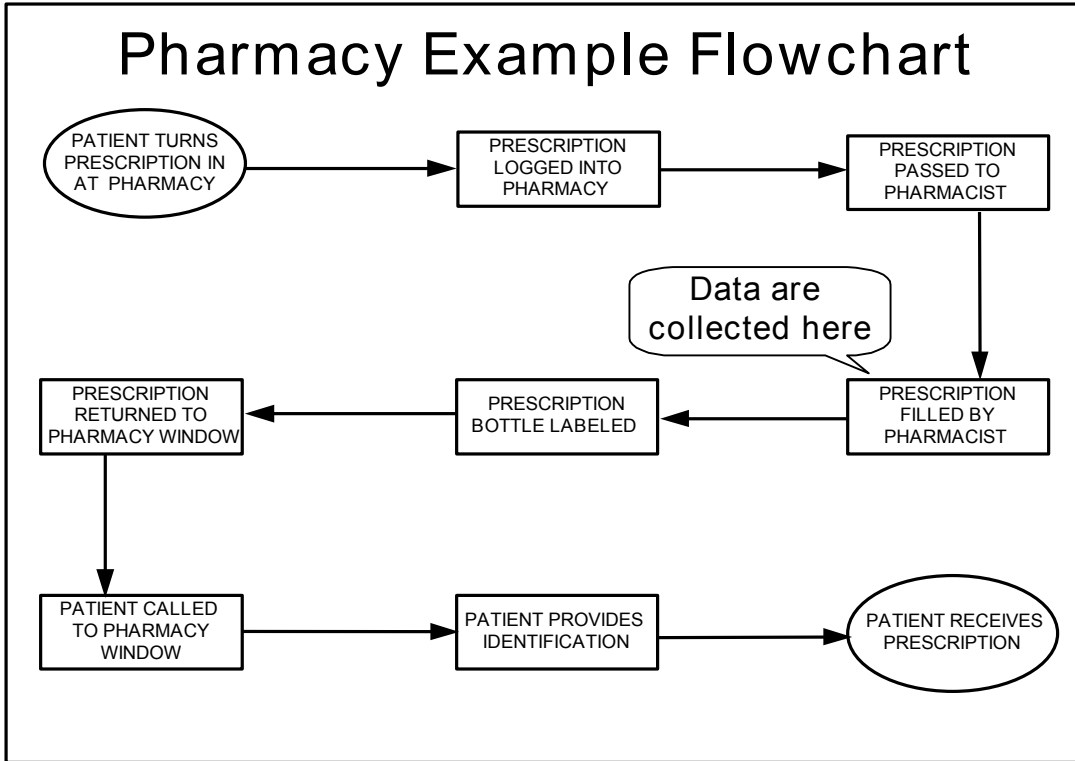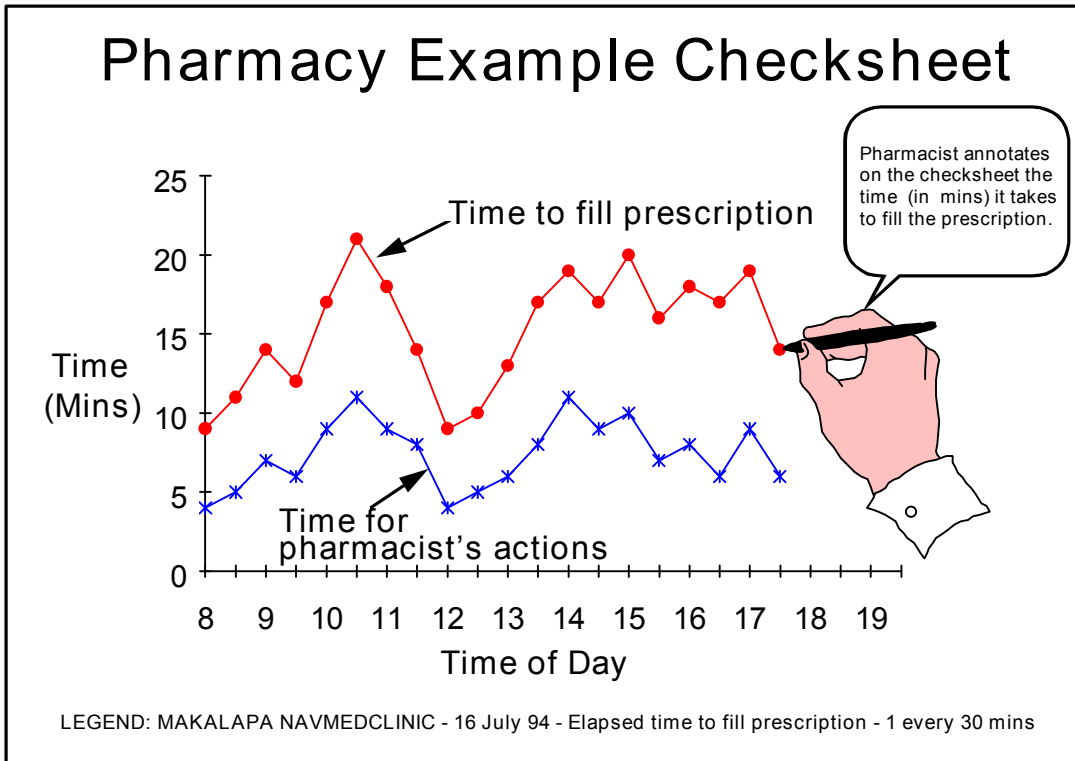
EXAMPLE 2 - Communications Gateway Site Setup Time: A team of Marines is investigating methods for improving the process to set up a communications gateway site for a tactical data link interface with Navy ships and aircraft. They want to reduce the time it takes to set up the site.

- They develop a Flowchart of their process (Viewgraph 17) and review it, identifying possible bottlenecks and slow operations.

- They hypothesize that they can improve their set-up time by focusing on the steps of the process dealing with unpacking the equipment.

- They opt to use a checksheet to take baseline data on that portion of the process as well as on the overall time to complete the installation and checkout (Viewgraph 18).

These two examples illustrate the point that you should collect data from the key process step or steps where the outcome can be most affected. But beware of making assumptions based only on a Flowchart. You should collect some initial data on all critical steps in the process. Then you should collect detailed data about steps that initially showed great variability, or those that took the longest to perform. Only when these data have been analyzed can the cause of pain in the process be identified and acted upon.

Can you give some examples of checksheets that work?

Remember, there are no standard Data Collection forms. Every checksheet is unique to the process you are investigating. Viewgraphs 19 through 22 at the end of this module are examples of checksheets that are well-designed for their purposes.

Careful design of your checksheet may allow you to collect two or more factors on a single form. This is illustrated in Viewgraph 22, which shows data collected for faults occurring on four shifts for each of two machines.

Gateway Example Flowchart

```
┌─────────────┐        ┌─────────────┐        ┌─────────────┐
│ Equipment is │       │ Equipment is │       │ Equipment is │
│ offloaded from│ ────▶ │  uncrated   │ ────▶ │ positioned at │
│ the vehicles │       │             │       │surveyed location│
└─────────────┘        └─────────────┘        └─────────────┘
                           │                          │
                       Data are                       ▼
                    collected here
┌─────────────┐        ┌─────────────┐        ┌─────────────┐
│Full system testing│◀─│Individual pieces│◀───│ Equipment is │
│ is completed │       │of equipment are│      │interconnected│
│             │        │    tested    │       │ electrically │
└─────────────┘        └─────────────┘        └─────────────┘
```

Gateway Example Checksheet

UNCRATING (IN MINS)		TOTAL TIME (IN MINS)	
160-179	|	0550-0599	| |
180-199	| / |	0600-0649	/
200-219	/ |	0650-0699	| / |
220-239	|	0700-0749	/ / |
240-259	⊬⊬⊤	0750-0799	⊬⊬⊤ ⌐
260-279	/ / / |	0800-0849	
280-299	| | |	0850-0899	/ /
300-319		0900-0949	/
320-339	|	0950-0999	| /
340-359		1000-1049	
360-379	|	1050-1099	/

LEGEND: Elapsed time (in mins) to uncrate equipment - 19 August 94 - MCBH Kaneohe Bay, Hawaii

Checksheet Example

MOUNT 31 GUNEX DATA

YARDS FROM THE TARGET	COUNTS
-180 YDS to -120 YDS	|||
-120 YDS to -060 YDS	卌
-060 YDS to 000 YDS	卌 卌 |||
000 YDS to 060 YDS	卌 卌 卌 卌
060 YDS to 120 YDS	卌 卌 卌 卌 ||
120 YDS to 180 YDS	卌 卌 卌 卌 ||||
180 YDS to 240 YDS	卌 卌 卌 ||||
240 YDS to 300 YDS	卌 卌 |||
300 YDS to 360 YDS	卌	
360 YDS to 420 YDS	||||

Data taken: USS CROMMELIN (FFG-37) at PMRF, 135 RDS BL&P, Mount 31, 25 June 94

Checksheet Example

BODY FAT DATA

DATA COLLECTORS SIMPLY PLACE AN X ON THE CHECKSHEET

Data taken: USS LEADER (MSO-490), all 80 personnel assigned, 25 June 94

Checksheet Example
GEAR DEFECT DATA

Defect Category	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	TOTAL
I.D. Size Wrong	I			I	II					I		5
O.D. Size Wrong		I										1
Nicks		II			II	II	II		I	I	II	12
Burrs			I	I	I		I	I	I	I	II	9
Tooth Geometry	I							I				2
Blemishes	I	II			I		I		I		II	8
Other			I									1
Total	3	5	2	3	5	3	3	3	2	3	6	38

Checksheet Example
EQUIPMENT BREAKDOWN DATA

	Machine A			Machine B			
Time OOC	Shift 1	Shift 2	Shift 3	Shift 1	Shift 2	Shift 3	Total
00-30 Mins		M				E	2
30-60 Mins	C			M			2
1 - 1-1/2 Hrs			E	E	H		3
1-1/2 - 2 Hrs		H				M	2
2 - 2-1/2 Hrs			H				1
Total	1	2	2	2	1	2	10

FAULTS: M = Mechanical, E = Electrical, C = Coolant, H = Hydraulic

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It is: How do we obtain useful data?

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To estabish a factual basis
for making decisions

I think the problem is . . . .

becomes

The data indicate the problem is . ..

Making a Data Collection Plan

Why do we want the data?

What purpose will they serve?

Formulate your change statement:

If . . . then . . .

Making a Data Collection Plan

Where will we collect the data?

- Refer to the process Flowchart

- Identify steps where you expect changes

- Take data at those steps and at the end of the process

Making a Data Collection Plan

What type of data will we collect?

- Attribute data: Presence or absence
  of a characteristic

- Variables data: Specific measurement

Making a Data Collection Plan

Who will collect the data?

Workers who perform the process steps

- Properly trained
- Provided with resources

Making a Data Collection Plan

How do we collect the right data?

- Small sample sizes

- Collect frequently

- Dependent on availability of data, cost, consequences

Data Collection Problems

Failure to establish Operational Definitions

- When and how often to collect data
- How to collect data
- Units of measurement
- Criteria for defects
- Handling of multiple defects

Data Collection Problems

Adding bias to the collection process

- Slowdown or speedup
- Fear
- Errors in procedures
- Missing data

Uses for Checksheets

- Record data for further analysis

- Provide historical record

- Introduce Data Collection methods

Types of Checksheets
Tabular Format

JULY 94

DEFECT	12	13	14	15	16	17	18	TOTAL
WRONG NSN	=	I	=	I	I	I		8
FAULTY MATERIAL	I	=	=	I	I	I		5
PMS NOT DONE	=	≡	=	≡	I	≡	=	16
INSTALL PROBLEMS				I		I		2

Types of Checksheets
Location Format

DATE: _____

DEPT: _____

COMMENTS: _____

LOT NUMBER: _____

NUMBER OF BURRS: _____

INSPECTOR: _____

x x

x

x

x x

x

x x x

DEFECT LOCATIONS

Location of burrs on a special gear marked with an X.

Types of Checksheets
Graphic Format

Workers plot each data point on the graph

T E M P °F

TIME OF DAY

Making a Useful Checksheet

- Tailored for specific purpose

- Workers help develop form

- Columns labeled clearly

- User-friendly format

Pharmacy Example Flowchart

```
┌─────────────────────┐
│  PATIENT TURNS      │
│  PRESCRIPTION IN    │
│  AT PHARMACY        │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PRESCRIPTION       │
│  LOGGED INTO        │
│  PHARMACY           │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PRESCRIPTION       │
│  PASSED TO          │
│  PHARMACIST         │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐        ╭─────────────╮
│  PRESCRIPTION       │        │  Data are   │
│  FILLED BY          │◄───────│  collected  │
│  PHARMACIST         │        │  here       │
└─────────────────────┘        ╰─────────────╯
          │
          ▼
┌─────────────────────┐
│  PRESCRIPTION       │
│  BOTTLE LABELED     │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PRESCRIPTION       │
│  RETURNED TO        │
│  PHARMACY WINDOW    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PATIENT CALLED     │
│  TO PHARMACY        │
│  WINDOW             │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PATIENT PROVIDES   │
│  IDENTIFICATION     │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  PATIENT RECEIVES   │
│  PRESCRIPTION       │
└─────────────────────┘
```

Pharmacy Example Checksheet

LEGEND: MAKALAPA NAVMEDCLINIC - 16 July 94 - Elapsed time to fill prescription - 1 every 30 mins

Time (Mins)

Time of Day

Time for pharmacist's actions

Time to fill prescription

Pharmacist annotates on the checksheet the time (in mins) it takes to fill the prescription.

Gateway Example Flowchart

Equipment is offloaded from the vehicles

Equipment is uncrated

Data are collected here

Equipment is positioned at surveyed location

Equipment is interconnected electrically

Individual pieces of equipment are tested

Full system testing is completed

Gateway Example Checksheet

UNCRATING (IN MINS)		TOTAL TIME (IN MINS)	
160-179	/	0550-0599	//
180-199	///	0600-0649	/
200-219	//	0650-0699	///
220-239	/	0700-0749	///
240-259	////	0750-0799	////
260-279	///	0800-0849	//
280-299	///	0850-0899	//
300-319		0900-0949	//
320-339	/	0950-0999	//
340-359	/	1000-1049	
360-379	/	1050-1099	/

LEGEND: Elapsed time (in mins) to uncrate equipment - 19 August 94 - MCBH Kaneohe Bay, Hawaii

DATA COLLECTION

VIEWGRAPH 18

Checksheet Example
MOUNT 31 GUNEX DATA

YARDS FROM THE TARGET	COUNTS
-180 YDS to -120 YDS	|||
-120 YDS to -060 YDS	卌
-060 YDS to 000 YDS	卌 卌 |||
000 YDS to 060 YDS	卌 卌 卌
060 YDS to 120 YDS	卌 卌 卌 ||
120 YDS to 180 YDS	卌 卌 卌 卌 ||||
180 YDS to 240 YDS	卌 卌 卌 ||||
240 YDS to 300 YDS	卌 卌 |||
300 YDS to 360 YDS	卌	
360 YDS to 420 YDS	||||

Data taken: USS CROMMELIN (FFG-37) at PMRF, 135 RDS BL&P, Mount 31, 25 June 94

Checksheet Example

BODY FAT DATA

NUMBER OF PERSONNEL

Personnel	00	04	08	12	16	20	24	28	32	36
22										
20					xx					
18			xx	xx	xx					
16			xx	xx	xx	xx				
14			xx	xx	xx	xx				
12			xx	xx	xx	xx				
10			xx	xx	xx	xx	xx			
8			xx	xx	xx	xx	xx			
6			xx	xx	xx	xx	x			
4		xx	xx	xx	xx	xx	xx	x		
2		x	xx	xx	xx	xx	xx	xx	x	x
0										

PERCENT BODY FAT

DATA COLLECTORS SIMPLY PLACE AN X ON THE CHECKSHEET

Data taken: USS LEADER (MSO-490), all 80 personnel assigned, 25 June 94

Checksheet Example
GEAR DEFECT DATA

Defect Category	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	TOTAL
I.D. Size Wrong	I			I	II					I		5
O.D. Size Wrong		I										1
Nicks		II			II	II	II	I	I	I	II	12
Burrs			I	I			II	I	I	I	II	9
Tooth Geometry	I					I						2
Blemishes	I	II		I	I			I			II	8
Other			I									1
Total	3	5	2	3	5	3	3	3	2	3	6	38

Checksheet Example
EQUIPMENT BREAKDOWN DATA

Time OOC		Machine A			Machine B			Total
		Shift 1	Shift 2	Shift 3	Shift 1	Shift 2	Shift 3	
00-30 Mins		M					E	2
30-60 Mins	C		E	M				2
1 - 1-1/2 Hrs					E	H		3
1-1/2 - 2 Hrs		H	H				M	2
2 - 2-1/2 Hrs								1
Total	1	2	2	2	1	2		10

FAULTS: M = Mechanical, E = Electrical, C = Coolant, H = Hydraulic