Lesson Two

Developing an Information Gathering Strategy
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1. **Why You Need This Lesson**

Information gathering is critical to any technical project. In order for the project to be a success, you need to think about the information you need and how you will analyze it. All too often projects fail because the wrong information was collected, or it was analyzed improperly. In other case, projects failed because they didn’t use the information available. Excessive information collection can also be a problem.

Read the case study. Doug could have made the project a success if he had a better information collection strategy.

**Case Study:**

Doug Parker was employed as a Quality Engineer at Enterprise Hardwoods. His assignment was to determine what to do about cracks in finished boards. He talked to the employees and they all commented on the problems with saw blades. He wrote up a recommendation to purchase a higher quality blade. The results were disappointing. Cracks did not reduce, and the company wasted over $50,000 on new blades.
2. **What Is In This Lesson**

In this lesson, you will learn how to develop an information collection and analysis strategy. Once you complete this lesson, you will be able to:

- Determine the specific information required.
- Determine the most appropriate approach for information collection.
- Determine the information collection design conditions.
- Determine the amount of information needed.
3. **Determining Your Information Needs – Mind Map**

When you begin to think about the information you will need, you need to ask yourself some basic questions about the project. These questions are unique to each project, but there is a common approach you can take that can help you.

A mind map is a useful tool for thinking about the project. Consider the following example.

Your assignment is to develop a new system for improving freshmen student performance in a college of engineering. Start with a blank sheet of paper. Put a brief label for your project goal in the center of the paper. Now think about the major factors that are likely to influence your project’s goal. These are shown as ovals around your goal. Go to the next page to see an example of how this is done.

You may want to review your mind map with others to be sure you have included all of the key factors to be considered.

**Key Point:**

A mind map is a simple way to think about all of the possible influences on your project.
Example: Mind Map

- College Teachers
  - Course Design
  - Teacher's Ability
- Improved Student Performance
  - Test Score Results
  - Challenge
  - Math/Science classes
  - Support Services
    - Tutoring
    - Personal Counseling
  - Campus Environment
    - Party atmosphere
    - Campus Environment
    - Residence halls
- Student Ability
  - Science Ability
  - Math Ability
  - Study skills
  - Motivation discipline
  - Time management
4. **Identifying Information Needs from the Mind Map**

Once you have the mind map developed, you can begin to identify the information that you need. Start with the center oval. In our case, this is student performance. For the center oval, ask yourself: “What information do we need to indicate what the problem is?” The answer to this question for our student performance example might be

- Student grade point average (college)
- Credit hours completed

Obviously we would need information on these two performance measures.

Next look at each of the major factors that can explain student performance. Make a list of the information that might be obtained for each of the ovals. Let’s take a look at the oval for high school preparation. What information might you collect that relates to high school preparation? While there is no correct answer to this question, you would probably look at information on

- ACT/SAT test scores
- High school grades in math/science
- High school rankings

Now look at the other factors. What information might you collect that relates to these factors? Make a list before you go to the next page of the lesson.

**Q:** Is there any rule of thumb for the number of major factors to examine?

**A:** Typically 3-7 major factors should encompass most situations.
5. **Developing a Process Information Gathering Strategy**

The additional information that you might look for includes:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>College teacher</td>
<td>Math/Chem grades in different courses</td>
</tr>
<tr>
<td>Student ability</td>
<td>Placement scores for math and chem.</td>
</tr>
<tr>
<td>Student ability</td>
<td>High school GPA</td>
</tr>
</tbody>
</table>

Note that we don’t have information listed for campus environment or support services. Since campus environment and support services are the same for every student, there is no differentiation in the information that would help us predict student performance. In other words, students with the same campus environment and support services could get a 4.00 GPA or a 0.00 GPA.
6. **Deciding on Your Information Needs Strategy**

Once you have made a list of the information you might collect, you need to decide on the actual information you need. Information collection takes time, and it costs money. In many cases, you can’t collect all of the information you might want.

When you decide on your information needs, think about these questions:

- How much effort will it take to collect the information?
- How likely is the information to be a significant factor in the analysis?
- Is the information likely to present insights that other information does not?

Let’s look at the information we might collect for student performance.

<table>
<thead>
<tr>
<th>Information</th>
<th>Collection Effort</th>
<th>Significance</th>
<th>Unique Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT/SAT scores</td>
<td>Hard</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>2. High school grades in Math &amp; Science</td>
<td>Hard</td>
<td>Moderate</td>
<td>No – also included in HS GPA</td>
</tr>
<tr>
<td>3. High school rankings</td>
<td>Easy</td>
<td>Mod-Low</td>
<td>Yes</td>
</tr>
<tr>
<td>4. Math/Chem grades</td>
<td>Easy</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>5. Placement scores</td>
<td>Easy</td>
<td>High</td>
<td>No – Also reflected in ACT/SAT scores</td>
</tr>
<tr>
<td>6. High school GPA</td>
<td>Easy</td>
<td>High</td>
<td>No – Could link to grades in HS Math/Science</td>
</tr>
</tbody>
</table>
Here is the reasoning for the information possibilities.

| 1. ACT/SAT scores          | - These are on the electronic application  
|                           | - They are likely to be significant because of past trends  
|                           | - They give a unique insight  
| 2. High school grades in Math/Science | - This will require an analysis of each transcript  
|                           | - This may not be that significant because of grade inflation  
|                           | - This information is also in the overall GPA  
| 3. High school ranking    | - This is available on the Education Department website  
|                           | - This may not be significant since students coming from the same high school have vastly different GPAs.  
|                           | - The insight is unique  
| 4. Math/Chem grades       | - This information is available electronically  
|                           | - The information may be significant in identifying bad instruction  
|                           | - The information does give unique insights  
| 5. Placement scores       | - The information is easy to collect  
|                           | - The information is significant based upon past experience  
|                           | - The information duplicates ACT/SAT scores  
| 6. High school GPA        | - The information is available electronically  
|                           | - The information is significant based upon past trends  
|                           | - The same insight would also be available in specific math/science scores  

Based upon this analysis, the information to be collected would be:

- ACT/SAT scores
- Math/Science grades in college
- High school GPA

**Case Study:**

Jacob was asked to work with an employee team in a candy company. The team had identified 2 variables that could affect the line speed. When Jacob looked at the variables, he was able to reduce the variables to three. While the other 19 variables affected line speed, they didn’t represent variables that could be managed. Once the number of variables was reduced, Jacob was able to show the team how they could quickly determine the best line speed to use.
7. **Options for Information Collection**

There are a number of options for information collection. These are shown below.

1. **Pre-Existing Information** – This is information that already exists on forms or in databases.
2. **Structured Observation** – This is information that you need to collect by observing the process. Typically there is a specific information collection template used in this information collection effort.
3. **Information Collection Form** – This is information that you ask others to collect as part of their job. For example, a machine operator might record any machine malfunctions that occur.
4. **Surveys** – This is information that represents the opinions of others. A form is developed to capture these opinions.
5. **Focus Groups** – This is a process for capturing comments/opinions of a group in response to a series of questions asked of them. It has the same intent as surveys but is more flexible.
6. **Structured Interview** – This is a way of capturing facts and opinions based upon a person’s experience. A specific set of interview questions is used.
7. **Nominal Group Technique** – This is a process for identifying problems or ideas from a group. This process also has a ranking element to identify the highest priority problems or ideas.
8. **Benchmarking** – This is a process of identifying how others handle a specific task or process. For example, NASCAR is often the benchmark for improving setup times or change overs.
9. **Fishbone Diagram** – This is a way to capture key issues related to a process. This is often a starting point for observations.
10. **Process Map** – This is a way of capturing the flow through a process.

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**Key Point:**

Typically a project will use a combination of several information collection approaches.
Case Study:

Example: Student Performance in College

The project on student performance used several information collection approaches. Pre-existing information was available on:

- College GPAs
- College hours completed
- HS GPAs
- Test scores
- Math/Science grades in college

A series of focus groups were used to identify why some students did not perform as well as they should have. These focus group results were then used to develop a survey on student study practices. A benchmarking study was also done of military training programs to see how they dealt with performance.
8. **Evaluating the Information Collection Options**

Typically a project involves more than one information collection approach. Shown below are summaries of when to use each approach.

**Capturing Process Information**

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-existing information</td>
<td>▪ Already available</td>
<td>▪ May not be accurate</td>
</tr>
<tr>
<td></td>
<td>▪ Inexpensive</td>
<td>▪ May not be complete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ May need to be put into electronic format</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ May need to be sampled if too voluminous</td>
</tr>
<tr>
<td>Structured Observations</td>
<td>▪ You can collect the information you want</td>
<td>▪ May take a lot of time</td>
</tr>
<tr>
<td></td>
<td>▪ Provides extra process insights</td>
<td>▪ May have to wait for the situation to occur</td>
</tr>
<tr>
<td>Information Collection Form</td>
<td>▪ You can collect the information you want</td>
<td>▪ May not be accurate</td>
</tr>
<tr>
<td></td>
<td>▪ Inexpensive</td>
<td>▪ May have resistance</td>
</tr>
<tr>
<td></td>
<td>▪ Doesn’t require much extra effort</td>
<td>▪ May have to wait for the situation to occur</td>
</tr>
<tr>
<td>Structured Interviews</td>
<td>▪ You can collect non-quantitative process information</td>
<td>▪ May take a lot of time</td>
</tr>
<tr>
<td></td>
<td>▪ Provides extra process insights</td>
<td>▪ Depends on the skill of the interviewer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ May not be accurate</td>
</tr>
<tr>
<td>Nominal Group Technique</td>
<td>▪ Good for generating ideas and priorities about a process</td>
<td>▪ Not used to collection information on the actual process</td>
</tr>
<tr>
<td></td>
<td>▪ Simple to do and quicker than interviews</td>
<td></td>
</tr>
<tr>
<td>Benchmarking</td>
<td>▪ Good to get ideas from others</td>
<td>▪ Not used to collect information on the actual process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Can be time consuming and expensive</td>
</tr>
<tr>
<td>Fishbone Diagram</td>
<td>▪ Good for looking at big picture</td>
<td>▪ Not used to collect information on the actual process</td>
</tr>
<tr>
<td></td>
<td>▪ Good first step</td>
<td></td>
</tr>
<tr>
<td>Process Map</td>
<td>▪ Good for identifying details about how the process works</td>
<td>▪ May be many versions. Will need to decide how detailed to get</td>
</tr>
<tr>
<td></td>
<td>▪ Good initial step in analyzing a process</td>
<td></td>
</tr>
</tbody>
</table>
9. **Selecting the Information Collection Design Conditions**

No process is constant. Every process has many variations. Some of these variations are by design and others are by lack of process consistency. One of the critical decisions in capturing process information is to decide on the most appropriate design conditions for your project.

Essentially the design conditions represent the situation under which you are going to collect information. Here are some questions that you need to ask yourself about the selection of design conditions.

1. **Under what degree of “stress” do you want to observe the process?** For example, you may want to investigate the process when it is at peak utilization. In other case, you may want to observe the process under normal conditions.

2. **Do 80-20 conditions apply?** If yes, can you limit your process study by observing only the “20%” of the process that is the most significant?

3. **If the process information is vast, can you sample the information to reduce your effort?** If yes, how will you sample this information?

Once you answer these questions, you should have a better idea of how to select the conditions under which you want to observe the process.
10. **Determining the Amount of Information to Collect**

One critical question whenever you collect information is: “how much information do I need?” For quantitative information, you can use confidence intervals to answer this question. But in most cases, you will also be having qualitative information for which there is no clear answer to the question of how much information to collect.

Even when the information is qualitative, there is a convergence process that occurs in collection information. At first, you gather information that offers a variety of insights. As the information process continues, you will find many of the insights start to repeat themselves. Other insights may fade in importance as additional information is presented, and the insights appear to be isolated and not trends. When this convergence occurs, the information collection can be concluded.

In some cases, information may not be accurate. The journalism profession uses the two-source rule to validate the information provided. A similar rule could be used in a technical project. Information needs to be validated from additional sources. The information collection process should continue until there is a clear indication of validity.
11. **Summary**

The key points presented in this lesson are as follows:

1. A mind map is a useful way to identify information needs.

2. When you decide on the information you need, think about:
   - The difficulty of collecting the information.
   - The significance of the information.
   - The unique insights provided by the information.

3. There are a number of options for collecting information. These include:
   - Pre-Existing Information – This is information that already exists on forms or in databases.
   - Structured Observation – This is information that you need to collect by observing the process. Typically there is a specific information collection template used in this information collection effort.
   - Information Collection Form – This is information that you ask others to collect as part of their job. For example, a machine operator might record any machine malfunctions that occur.
   - Surveys – This is information that represents the opinions of others. A form is developed to capture these opinions.
   - Focus Groups – This is a process for capturing comments/opinions of a group in response to a series of questions asked of them. It has the same intent as surveys but is more flexible.
   - Structured Interview – This is a way of capturing facts and opinions based upon a person’s experience. A specific set of interview questions is used.
   - Nominal Group Technique – This is a process for identifying problems or ideas from a group. This process also has a ranking element to identify the highest priority problems or ideas.
   - Benchmarking – This is a process of identifying how others handle a specific task or process. For example, NASCAR is often the benchmark for improving setup times or change overs.
   - Fishbone Diagram – This is a way to capture key issues related to a process. This is often a starting point for observations.
   - Process Map – This is a way of capturing the flow through a process.

4. Most projects use a variety of information collection approaches.

5. You need to think about the design conditions when you collect information.

6. You need to collect enough information so that the insights gained from the information begin to repeat themselves.
12. **Assignment**

Prepare an information gathering strategy that contains the following:

- A mind map of the project.
- The specific information you will need (show the analysis that led to your decision.)
- The approaches you will use to gather information. Show the approach used for specific type of information.
- Describe the design conditions that are relevant for the information you will collect.