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SKU: 9781453386750-SOLUTIONS

Chapter 2
Project Profiling

Chapter Introduction

Project profiling enables an organization to effectively plan the execution of a project as well select a project manager with the appropriate knowledge and skills. This chapter discusses the different attributes and methods that can be used for creating a project profile and also describes the nature of projects as complex adaptive systems that change in response to events in the environment. The chapter also introduces students to the Darnall-Preston Complexity Index—a project profiling system that groups project attributes into four categories: internal attributes, external attributes, technological complexity, and ecological attributes.

1. Using a Project Profile

- Identify project attributes that can be used for project profiling.
- Define project profiling.

Section Outline

- There are **attributes**—characteristics of an entity or object—that are common among projects that allow the characterization or profiling of a project, such as:
  - Size
  - Location
  - Technology
- These attributes provide information about the project that will enable a manager in the parent organization to assign a project manager with the appropriate knowledge and skills.
- Project managers have not always been assigned to projects based on their skills and the skills required by the project.

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- Research by the Construction Industry Institute indicated that the number one criterion for assignment of a project manager to a project was availability.
- **Project profiling** is the process of extracting a characterization from the known attributes of a project.
- The characterization will provide a more comprehensive understanding of the project that should result in:
    - The development of an appropriate execution approach.
    - The assignment of organizational resources.

Exercises

1. Several types of project profiles use budget size, location, and technical knowledge.
2. Project profiling is the process of extracting a characterization from the known attributes of a project.
3. Describe how location can make a difference in the difficulty of a project.

   Answer should reflect the understanding that "location" can be used to indicate a project that is split up between two or more sites or that takes place in a state or country that is far from the company's home base.
4. Why is it valuable to create a project profile? Base your answer on the text of this chapter but use your own words.

   Answer should indicate that profiling helps understand the project and choose appropriate actions.

Project Profiling

Propose another attribute that might be used for project profiling besides budget size, location, and technical knowledge. Include the following in your answer:

- Describe the categories into which you would divide your attribute.
- Describe the skills or knowledge a project manager would need to work on a project in each of your categories.

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This can be a group activity. Possible attributes that can be used for project profiling include level of risk (high, medium, low), industry (retail, construction, technology), sector (public or private), type of work involved in the project (intellectual or mechanical), and tangibility of the final product. Ask students to present their findings to the rest of the class.

Additional Exercises

1. Compare the manufacture of an oil tanker to the construction of a football stadium. List the attributes or profiling characteristics that are common to both these projects that would allow them to be categorized together. Also identify those attributes that are unique to each project.

2. Project Profiling Models

- Identify different methods of typing projects.

Section Outline

- Aaron J. Shenhar and Dov Dvir developed a **typology**—a classification or profiling of items that have characteristics or traits in common—that reflected two dimensions:
  - Technological uncertainty
  - System scope
- Technological uncertainty ranged from low tech, medium tech, and high tech to super high tech.
- System scope ranged from assembly projects, to system projects, to array projects.
- Shenhar and Dvir identified different management patterns associated with project type as well as different management tools and practices.
- As the project system scope became more complex and larger:

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  - Project managers became more invested in formal planning and control issues.
- As project technology increased:
  - Project managers became more invested in processes to manage technical issues such as redesign and testing.
- Robert Youker identified basic differences in project types such as:
  - Uncertainty and risk
  - Level of sophistication of the workers
  - Level of detail in the planning
  - Newness of the technology
  - Time pressure
- Youker also looked at project size, duration, industrial sector, geographic location, number of workers, cost, complexity, urgency, and organizational design as attributes that help determine a project profile.

Exercises

1. The typology of Shenhar and Dvir used attributes of technological knowledge and project scope.
2. The typology of Youker used several attributes, including the number of workers.
3. What are the two attributes of a project that Shenhar and Dvir used to characterize projects?

   Technological uncertainty and complexity of scope

Simple versus Complex Profiles

Simple profiles are easier to use than profiles that consider many attributes. Compare the profiling method of Shenhar and Dvir with the profiling method of Youker. Address the following issues.

- Which profiling method would be faster and easier to communicate to team members? (Explain your choice.)
- Which attributes used by Youker but not used by Shenhar and Dvir do you think are important? Explain your answer and give an example of a

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situation where consideration of the attribute would make a difference to the project.

This can be a report submission. Student answers will vary.

Additional Exercises

1. Conduct an Internet search to find out about the different typologies in Project Management. Submit a two-page report on your findings.

3. Complex Systems and the Darnall-Preston Complexity Index

- Describe the characteristics of complex systems.
- Identify the categories used by the Darnall-Preston Complexity Index

Section Outline

3.1 Complex Systems

- The complexity of a system is usually determined by:
  - The number of parts or activities
  - The degree of differentiation between the parts
  - The number, type, and strength of relationships between parts
- Heterogeneous and irregularly configured systems are complex.
- Complex systems have multiple interacting components whose collective behavior cannot be simply inferred from the behavior of the components.
- Projects are complex **adaptive systems.**
  - Organization of elements that change in response to events in its environment.
- A key aspect of complex adaptive systems is **relationship dependence.**
  - Activities that are affected by events that change the characteristics of other activities.
- Activities must be studied and understood as interrelated, connected parts of the whole.
- **Complex Adaptive Systems Tend to Self-Organize**

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  - The organization of the project reacts to the nature of the work at any given phase.
  - Informally, the project team reorganizes information flows and priorities to support the current work of the project.
  - A good project manager facilitates adaptive behavior by minimizing the impact of formal authority and processes.
- **Complex Systems Adapt to Changing Environments**
  - A deterministic system is a system that will produce the same results if you start with the same conditions.
  - A nonlinear, or chaotic, system can produce wildly different results even if the starting conditions are almost exactly the same.
  - Projects are usually nonlinear systems.
  - Project managers develop an aggressive **change management process** to incorporate changes into the project planning and execution processes.
  - The adaptation to changes in the project's internal situation while also adapting to the external environment reflects the coevolving nature of a complex adaptive system.

3.2 Darnall-Preston Complexity Index (DPCI)

- A project profiling system that groups eleven project attributes into four categories:
  - Internal attributes
  - External attributes
  - Technological complexity
  - Ecological attributes
- The DPCI is a tool to assist project stakeholders in:
  - Developing a comprehensive analysis of the project environment.
  - Developing a project execution plan more aligned with the environment.
- The DPCI:

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- Assesses the complexity level of key components of a project and produces a unique project profile.
- Provides a benchmark for comparing projects.
- Helps define the experience, knowledge, skills, and abilities needed by the project manager.
- Has implications for the composition, organization, and skills needed by the project leadership team.
- Provides information for assessing the probability of success.

Exercises

1. Complex systems adapt to changes in their external and internal environments.
2. The Darnall-Preston Complexity Index (DPCI) groups project attributes into four categories: external, internal, technological, and environmental.
3. What are the characteristics of a system that make it complex?

   The answer should include the number of parts, how the different parts are from each other, and the number of connections between the parts.

Complex Systems

Consider the example of the drug manufacturing facility. Describe in your own words how this project demonstrated the attributes of a complex system.

Student answers will vary. A drug manufacturing facility can be considered a complex system as it involves several sophisticated processes such as milling, compounding and processing ingredients, packaging of medicines, and quality checks. All these processes are distinct from one another and are vital to the production process. The collective behavior of a drug cannot be directly inferred from the behavior of its individual ingredients. In a drug manufacturing facility, the product being made is affected by factors such as space conditions, cross contamination, temperature, and other environmental factors which reflect its adaptive behavior.

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Additional Exercises

1. What is meant by the "co-evolving nature" of complex adaptive systems? Give examples from your personal experience of working on projects that reflect this concept.

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4. Darnall-Preston Complexity Index Structure

- Describe each of the external attributes that contribute to project complexity.
- Describe each of the internal attributes that contribute to project complexity.
- Describe each of the technological attributes that contribute to project complexity.
- Describe each of the environmental attributes that contribute to project complexity.

Section Outline

- The DPCI is built on four categories of attributes:
  - External: Environmental attributes that are in existence at the beginning of the project, such as size, duration, and available resources.
  - Internal: Clarity of project objectives, the clarity of scope, the organizational complexity, and stakeholder agreement.
  - Technological: Newness of the technology and familiarity of team members with the technology.
  - Environmental: Legal, cultural, political, and ecological
- The DPCI was developed around four assumptions:
  - All projects are unique.
  - Projects have common characteristics.
  - These characteristics can be grouped together to create a project profile.

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- There is an optimum execution approach for each project profile and an optimum set of skills and experience for the project manager and execution team.

4.1 External Attributes

- These are issues that are typically:
  - Established early in the project definition phase.
  - Outside the direct control of the project management team.
- **Size**
  - Project size is a relative concept determined by:
    - The context of the industry
    - The experience of the team executing the project
  - The more the project size is outside the comfort zone of the company, the more stress is created for the project.
  - When a project is larger than the comfort zone of a company the results are typically:
    - Cost overruns
    - Schedule delays
  - When a project is much smaller than the company norm:
    - Resources are often misused.
    - Inappropriate work processes are utilized.
    - There are often increases in project costs.
  - The higher the stress level created by executing a project outside the comfort zone of the organization, the greater the impact on the complexity level of the project.
- **Duration**
  - Project duration is often set by the parent organization that charters the project with a deadline that reflects the business purpose of the project.
  - The project team also estimates the duration of the project and establishes a project end date based on:
    - Normal work (e.g., forty hours per week)

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        - The availability of resources
    - Sometimes the normal time needed to complete a project is longer than the time available. This creates additional stress on the project.
- **Resource Availability**
    - When resources are scarce or not available, additional management time and energy is needed to search for resources.
    - Both these situations place more stress on the project.

4.2 Internal Attributes

- The internal attributes are within the control or influence of the project manager.
- **Clarity of the Project Objectives**
    - The greater the confusion on the goals and objectives of the project, the greater the impact on the complexity of the project.
- **Clarity of Scope**
    - The lack of clarity and the amount of time needed by the leadership team to develop a clear scope will add to the project complexity.
- **Organizational Complexity**
    - Project complexity is influenced by:
        - The structure of the project's client organization.
        - The organizational decision-making processes.
    - A project with one client as the central point for all information has:
        - Only one relationship to manage.
        - A streamlined communication process.
    - Projects with a team representing the client require more of the project manager's time and energy to manage:
        - The client relationship
        - The communication process
- **Stakeholder Agreement**
    - A project's complexity level is influenced by:
        - The number of stakeholders
        - The business or emotional investment of the stakeholders

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- The ability of the stakeholder to influence the project outcomes or execution approach
- The degree in which the project stakeholders agree or disagree

4.3 Technological Complexity

- The technology of a project refers to the product of the project and not the technology used to manage the project.
- The newer the technology and the less familiar the project team is with the technology, the greater the stress and the contribution to the complexity of the project.

4.4 Project Environment

- The greater the number and difficulty of the issues related to the environment, the greater the influence on the complexity of the project.
- **Legal**
  - Permits
  - Security issues
  - Workforce laws
  - National, regional, and local taxes
  - Duties for equipment and material
- **Cultural**
  - Culture defines the meaning of work, truth, the value of nature, relationships, and how to communicate.
  - Rule-based cultures:
    - Inhibit risk taking through established rules and policies.
    - Are goal based and focus on plans and processes to achieve goals.
  - Goal-based cultures promote assuming risk to achieve goals.
  - Other cultural factors that contribute to project complexity include:
    - Language
    - The role of women
    - The religious role in daily activities
    - The concept of time

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  - The number of cultures represented on the project team
  - The number of cultures with which the project team must interface with

- **Political**
  - Every project operates within one or more communities that reflect organizational dynamics and power struggles.
  - The complexity of a project is influenced by:
    - The importance of the project to the organizational leadership.
    - The influence organizational leaders exhibit on project resources and activities.
    - The time and energy expended by the project team in managing these outside influences.
- **Ecological**
  - Projects have the potential to impact the living conditions or the health of people, plants, and animals.
  - Project complexity is influenced by:
    - The number of potential ecological attributes
    - The impact of each attribute

Exercises

1. The external attributes considered in the DPCI are relative size, duration, and available resources.
2. The internal attributes considered in the DPCI are clarity of scope, complexity of the organization, and agreement among stakeholders.
3. The technological attributes considered in the DPCI are newness of the technology and familiarity of the team with the technology.
4. The environmental attributes considered in the DPCI are legal, cultural, political, impact on the ecology, and impact of the ecology on the project.
5. Under what circumstances would a large project qualify for a low DPCI score?

   If the company is used to doing large projects

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6. Describe an organization structure that would receive a high score for complexity.

   The answer should parallel the definition of a complex organism described in section 3, e.g. large number of parts, differentiation of parts, and large number of interactions between parts.

7. Does the technology attribute refer to the technology used by the project team or the project itself?

   The technology attribute refers to the technology of the project, not the tools used to manage it.

8. Give an example of a cultural problem that would have a high-complexity score.

   The answer should display a knowledge of cultural factors that can influence project complexity.

9. Give an example of an ecological problem that would have a high-complexity score.

   The answer should display a knowledge of the environmental attributes.

Behind the Scenes

Stanley Portny advocates that a project manager research the source of a project to determine who had the original idea by asking questions of your boss, reading meeting minutes and feasibility studies, and checking other correspondence and contacts. The purpose of this investigation is to find out who is most likely to champion the project if you have trouble, who opposed the project, or whose interests will be harmed by the project. Consider this advice in light of the Darnall-Preston Complexity Index and answer the following questions:

- In which category would this belong? Explain your reasoning and refer to the definitions provided. A case can be made for putting it in more than one.

  This is more likely to be an internal attribute related to project stakeholders.

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- Which attribute is this?

  Stakeholder agreement
- What might you find that would increase the project's complexity and what might you find out that would reduce the complexity? Provide examples of each.

  Some of the factors related to stakeholder agreement that may influence project complexity include the number of stakeholders, the ability of stakeholders to influence the project outcomes or execution approach, and the degree in which the project stakeholders agree or disagree.

Additional Exercises

1. Today, an increasing number of clients expect project teams to minimize the impact of a project on the ecology. Using the Internet, provide examples of how project teams are developing means and methods to minimize the impact of the disruption in a manner consistent with the requirements as communicated by the client.

5. Exercises

Essay Questions

Write several paragraphs to provide more in-depth analysis and consideration when answering the following questions.

1. Compare the attributes used by the Darnall-Preston Complexity Index and those used by Youker. Which attributes are used in both typologies? Which attributes are not in common? If you chose to add one attribute to either typology what would it be? Explain your answer.
2. Complex Systems: a complex system adapts to changes in its external and internal characteristics. Describe a project with which you are familiar that has experienced changes in its external or internal characteristics during the life of the project and describe how the project manager and the management team changed their behavior to adapt to the new situation or how they failed to adapt and the result of that failure.

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Discussion

The exercises in this section are designed to promote exchange of information between students in the classroom or in an online discussion. The exercises are more open ended, which means that what you find might be completely different than what your classmates find and you can all benefit by sharing what you have learned.

1. Institutional Memory: One of the responsibilities of a project manager is to keep a history of past projects to create an organizational knowledge base. Do you think using the DPCI® as a basis for organizing those past projects would be useful? How would you go about creating a storage and retrieval system that uses the DPCI?
2. Environmental Impact: Describe a project that might have an impact on the environment and the steps the project manager might have to take. Describe the score you would give this attribute if you were using the DPCI.

End of chapter essay and discussion questions contain descriptions of the required elements of a response.

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