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Professional Services

INTRODUCTION TO PROJECT MANAGEMENT

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PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK® GUIDE), 6TH EDITION

- Materials in this class are based on the text, A Guide to the Project Management Body of Knowledge (PMBOK® Guide)-Sixth edition.

INTRODUCTION TO PROJECT MANAGEMENT

- This presentation provides a basic overview of the discipline and establishes a foundation for the rest of the course.

PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK® GUIDE), 6TH EDITION (1)

- PMI defines the PMBOK as "knowledge within the profession of project management."

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 1.

PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK® GUIDE), 6TH EDITION (2)

- The PMBOK contains knowledge that is "generally recognized as good practice."

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 2.

PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK GUIDE), 6TH EDITION (2)

- It is an Important resource for managing individual projects.
- It does not contain all processes.
- Not all processes are applied to every project in every instance.
- Processes can be applied in different ways at different levels in different projects.
- The PMBOK is based on *The Standard for Project Management* (an American National Standard Institute or ANSI) standard (1.1.1).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 2.

PRESENTATION TOPICS

- The project and project management
- Project processes (best practices)
- What motivates organizations to become involved in projects
- The project manager
- Project management office

PROJECT

- "A project is a temporary endeavor undertaken to create a unique product, service, or result."

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 4.

A PROJECT PRODUCES

- a product that stands on its own (an end item) or is a component of another end item.
- an ability to carry out a service.
- an outcome or result.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 4.

IS *IT* A PROJECT?

- A project is a temporary enterprise. It has a scheduled…
  - beginning date or
  - ending date.
- A project is a unique venture. A project creates a unique …
  - product,
  - service, or
  - result.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 4.

PROJECT CHARACTERISTIC: SPECIFIC OUTCOME

- A project will have a specific outcome (Mintzer, 2002; Portney, 2001).
- Note that the outcome could be delayed.

PROJECT CHARACTERISTIC: WELL-DEFINED PLAN

- "A project requires a plan of action defining what needs to be done ..." (Mintzer, 2002, 2).
- Unfortunately, not all projects have a well-thought-out plan.

PROJECT CHARACTERISTIC: RESOURCE CONSUMPTION

- Good projects have a budget and all projects consume resources (Mintzer, 2002; Pinto, 2007; Portney, 2001).

PROJECT CHARACTERISTIC: CUSTOMER FOCUSED

- A good project is "customer-focused" (Pinto, 2007, 4).

PROJECT CHARACTERISTIC: MEASURABLE

- A project "can be evaluated on [its] own ..." (Mintzer, 2002, 2).

PROJECTS DRIVE CHANGE

- Organizations are in a current state (or in a current condition).
- Organizations want to move to another state (or change to another condition).
- Projects assist organizations in moving from one state to another state (or change from one condition to another condition).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 6.

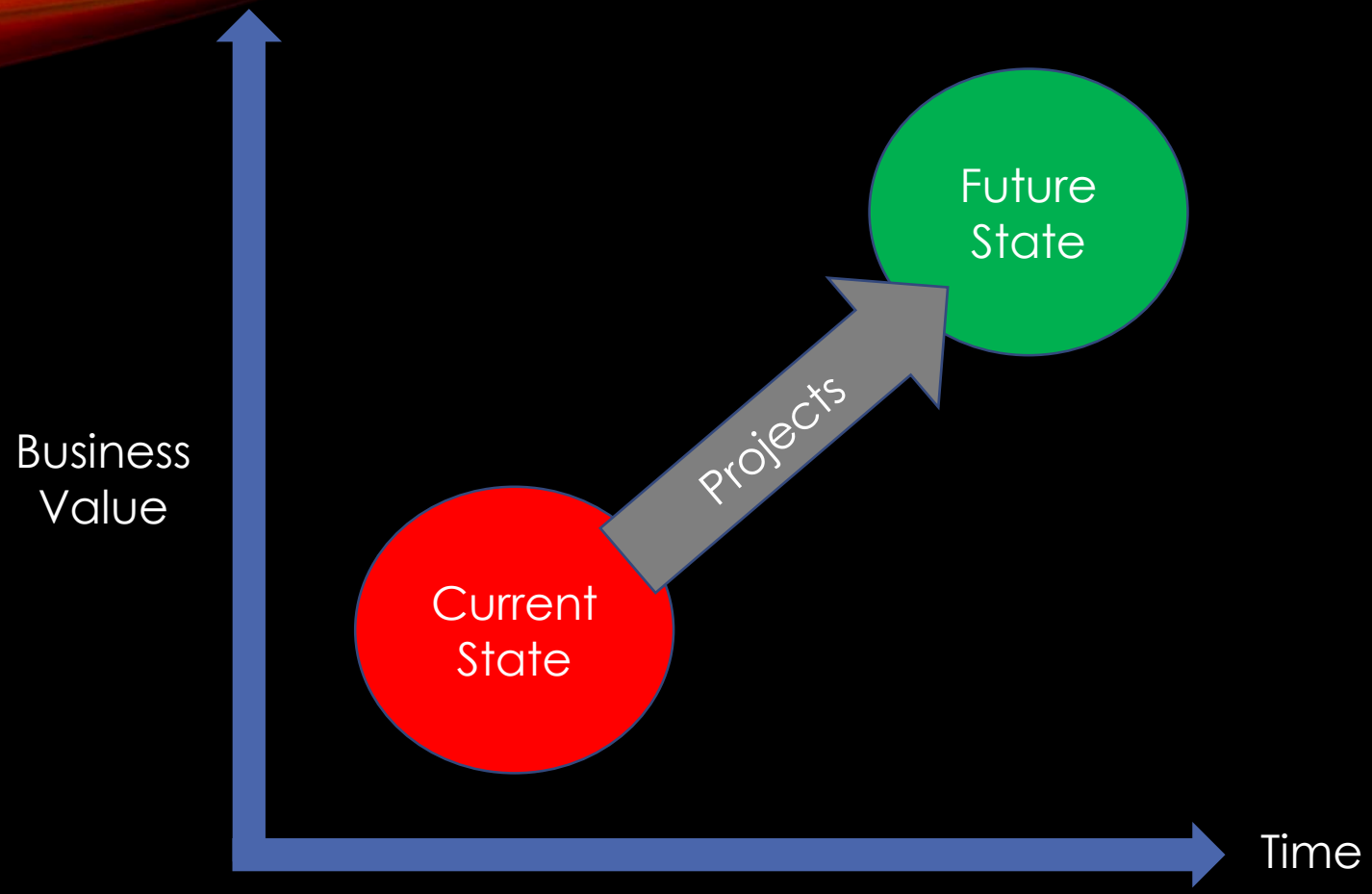

Figure 1-1. Organizational State Transition

PROJECTS CREATE TANGIBLE OR INTANGIBLE VALUE

- Tangible value examples include money and market share.
- Intangible value examples include goodwill and reputation.

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CONSTRAINT INTERDEPENDENCE

- Constraints influence a project (e.g., limits on funding).
- Constraints are often interdependent.
- Example: Increasing the schedule often increases the budget.
- Project managers determine project constraints (e.g., cost, schedule, scope, and quality).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 42.

PROJECT GOALS ARE ALIGNED TO THE STRATEGIC PLAN

- Whatever the project produces, it should complement the organization's strategic plan.
- Note: In the West, a strategic plan usually has a time horizon of three to five years.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 17.

WHAT IS PROJECT MANAGEMENT?

- "Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements."

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 10.

WHEN DOES A PROJECT END?

- A project ideally ends when its goals have been accomplished.
- A project can end for any number of reasons. Some examples include:
  - Changing priorities
  - Customer bankruptcy
  - Mismanagement
- A project is successful if stakeholders' (read customer's) expectations have been satisfied or surpassed.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 34-35.

PROGRAM MANAGEMENT

- A program contains two or more projects that are related in some way and can be managed more efficiently by taking advantage of their interdependence.
- In some instances, programs may exhibit certain characteristics of ongoing operations.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 14.

PORTFOLIO MANAGEMENT (1)

- Portfolio management is a strategic management technique that assembles projects or programs together because they can be more effectively managed as a group as opposed to separate entities.
- Portfolio management is a centralized approach to managing projects and programs.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 15.

PORTFOLIO MANAGEMENT (2)

- Portfolio management involves determining what projects will and will not be selected for development (e.g., on the basis of return on investment) and be included a portfolio.
- Senior management is usually responsible for portfolio management.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 15.

PROGRAMS VERSUS PORTFOLIOS

- A key difference between program and portfolio management is programs contain related projects.
- Portfolios contain projects or programs that are not directly related but are placed together to achieve an overall strategic objective.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 16-17.

PROGRAMS VERSUS PORTFOLIOS EXAMPLE (1)

- Aircraft Program
  - Avionics Project
  - Fuselage Construction Project
  - Wing Assembly Project
  - Engine Project

- ***These are related projects that are more efficiently managed together than individually.***

PROGRAMS VERSUS PORTFOLIOS EXAMPLE (2)

- Energy Portfolio
  - Nuclear Project
  - Coal Project
  - Wind Project
  - Solar Project

- ***These are unrelated projects that are managed together to maximize a strategic objective (e.g., profit).***

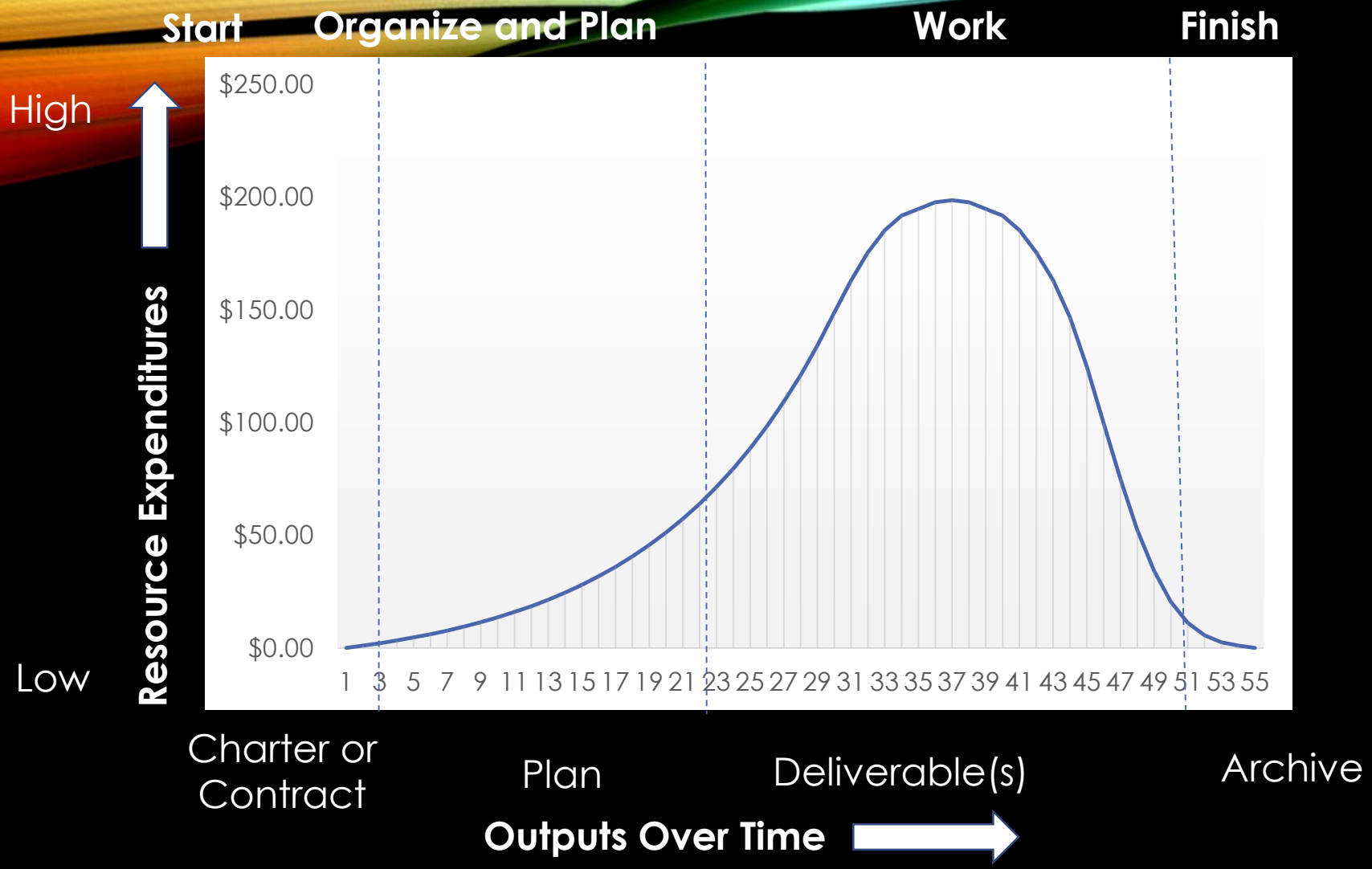

Figure 1-2. Example Non-Aggregated Expenditure of Resources Over the Life of the Project

PROJECT LIFE CYCLE

- A project life cycle illustrates the start and finish of a project.
- It is divided into any number of phases to facilitate management.
- The combination of phases is a project life cycle.
- The end of each phase produces a deliverable.

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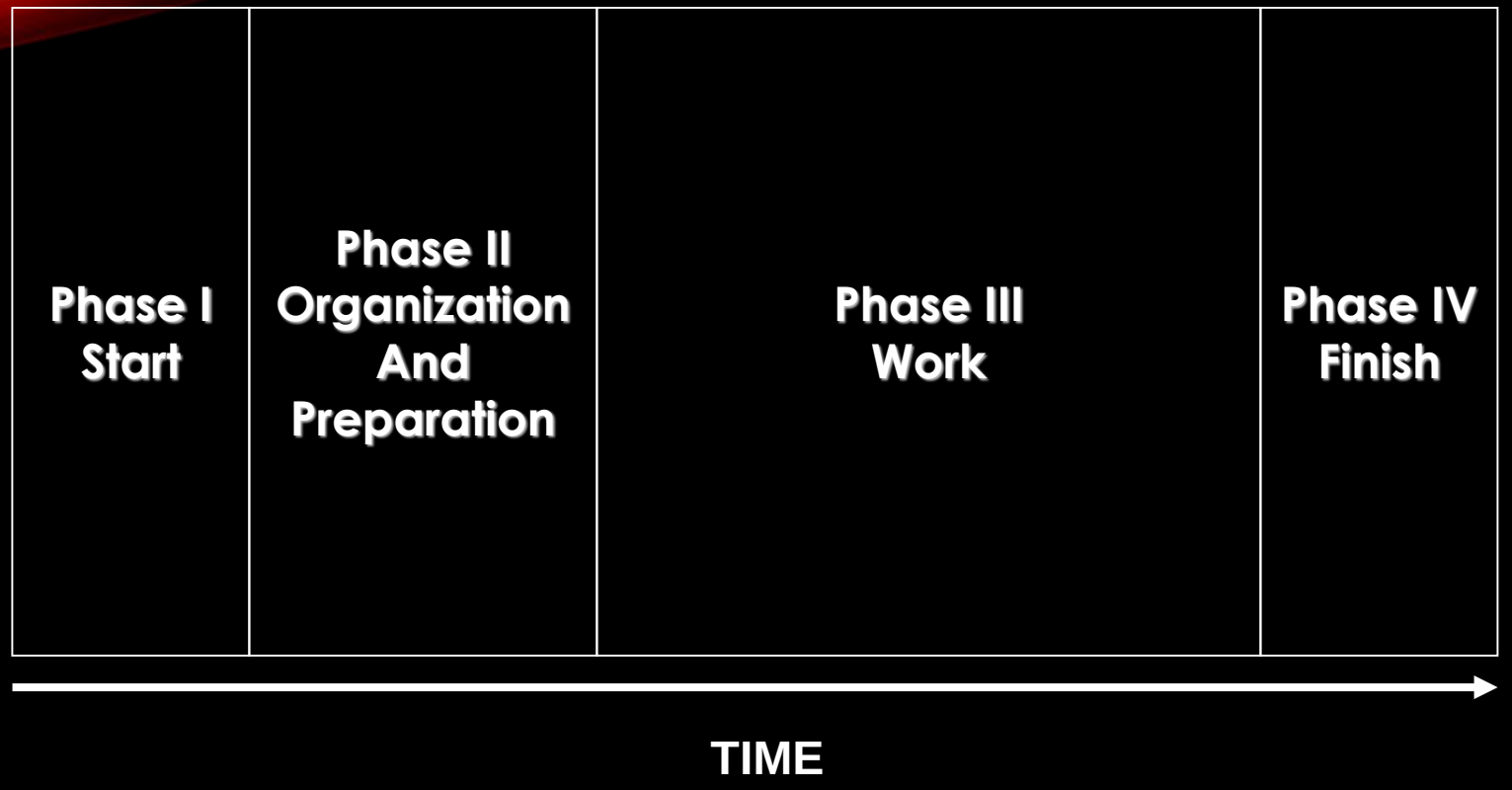

Figure 1-3. Project Life Cycle Example

PHASES

- Phases make a project easier to manage by dividing a project into part for ease of management from a temporal perspective (i.e., time units).
- A project can have any number of phases (there is no one size fits all).

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*Not a complete list

PHASES ADDRESS WHAT?*

- **WHO**
  - Who will be the stakeholders
  - What skill levels will needed
- **WHAT**
  - What deliverables will be created
  - What leases and rentals will be needed
  - What outside goods and services will be needed (from contractors, vendors)
  - What are the risks
  - What resources (e.g., materials, personnel) will be needed
- **HOW**
  - How will the deliverables be assessed (e.g., metrics)
- **WHEN**
  - What work will to be performed (during the phase)
- **REMEDIES**
  - What will be the remedies (contractual and otherwise) for deliverables that do not meet specifications

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PHASE-END REVIEWS (1)

- At the end of each phase, an assessment of key deliverables and other important project parameters (e.g., cost) is conducted.
- Phase-end reviews are also called gate reviews, phase exits, stage gates, and kill points. A kill point implies a project may be cancelled if the phase-end review is unfavorable.

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PHASE-END REVIEWS (2)

- A phase-end review can ascertain whether or not a project should progress into the next phase.
- Phase-end reviews can identify areas where changes can increase the efficiency and effectiveness of the execution of a project. In some instances, these changes must be made before a project can proceed into the next phase.

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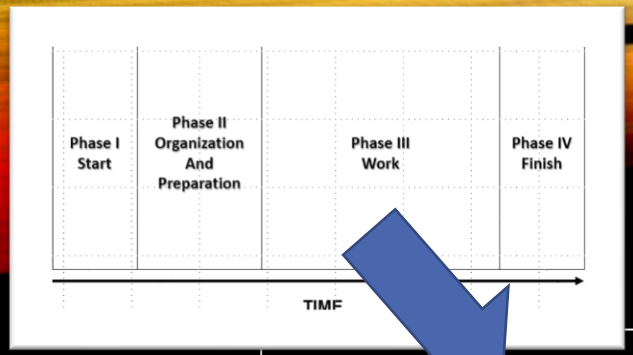
PRODUCT LIFE CYCLE

- A product life cycle describes the cyclic nature of product management from development to maturity or, in some cases, dissolution.
- A product life cycle contains the project life cycle.

UPGRADES

- After a project has been completed and a product is delivered to a customer, the customer may want to make changes to the product.
- Minor upgrade: If the changes are minimal, the customer can implement the changes without disrupting ongoing operations.
- Major upgrade: If the changes are substantial, the customer should treat the changes as a new project that produces a new product (deliverable).



Project Life Cycle

Production Operations and Maintenance
(Minor Upgrades)

Product Retirement

Major Upgrades

Figure 1-4. Product Life Cycle

LIFE CYCLE COSTING

- A project's product, process, or result can have extensive post-project costs (i.e., operations and maintenance).
- Life cycle costing is a strategy in which a project team takes into account how the project will be handled after it is complete.

PROCESS

- Processes are used to manage projects (49 in the *PMBOK® Guide*).
- Processes are like "best practices" established through research, custom, or experience.
- Processes consist of a group of coordinated and interdependent actions whose ultimate purpose is to achieve a product, service, or outcome.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 22.

THE CHARACTERISTICS OF PROCESSES

- Just as project produces something unique, there are many ways to manage a project.
- It is unlikely that all *PMBOK Guide* processes will be used to manage project. However, all processes should be examined.

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Figure 1-5. Process Map

Figure 1-5. Process Map

WHAT ARE INPUTS?

- Inputs can be modified by tools and techniques (e.g., template).
- Inputs can influence a process (e.g., government standards).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 708 (defined).

WHAT ARE INPUTS?

- Inputs can come from inside the project (e.g., template).
- Inputs can come from outside the project (e.g., organizational infrastructure) or even outside the organization (e.g., government standards).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 708 (defined).

WHAT ARE TOOLS AND TECHNIQUES?

- Tools and techniques may modify inputs (e.g., template).
- Tools and techniques may be influenced by inputs (e.g., organizational infrastructure).

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 724, 725 (defined).

WHAT ARE OUTPUTS?

- Outputs are the results of being acted upon by tools and techniques.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 712 (defined).

PROCESS EXAMPLE: PROJECT CHARTER TEMPLATE

- Input: Project charter template (a pre-defined form with blank spaces) is the input in this example.
- Tools and Techniques: Research and analysis informs the author of the charter on how to fill in the blank spaces in the template.
- Output: The charter is the primary output. The charter is the filled in template. Note that the template itself has been converted (filled in) at the end of the process and no longer exists. In this sense, the input has been modified by the tools and techniques into something else.

PROCESS EXAMPLE: GOVERNMENT STANDARDS

- Input: State and federal government standards are the inputs into the develop project charter process in this example.
- Tools and Techniques: Research and analysis of government standards informs the author of the charter on what will appear in the charter.
- Output: The charter is the primary output. What is in the charter is influenced by the government standards. Note that at the end of this process, the government standards are not modified.

PROJECT MANAGEMENT SYSTEM

- A project management system is the conglomeration of all the processes used by an organization to manage a project.
- The project management system is found in the project management plan.

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PROJECT MANAGEMENT PROCESS GROUPS

- They are five major process groups.
- **Initiating**, **Planning**, **Executing**, **Monitoring and controlling**, and **Closing**

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BUSINESS CASE

- **Market demand**
- **Organizational need**
- **Customer request**
- **Technological advance**
- **Legal requirement**
- **Ecological impacts**
- **Social need**

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MARKETPLACE REQUIREMENT (MARKET DEMAND)

- A change in a market may require an organization to undertake a project to successfully meet the challenges of that new demand.
- Example: Gasoline prices rise. As a result, fuel-efficient cars become more popular. Car manufactures build more fuel-efficient vehicles.

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BUSINESS NECESSITY (ORGANIZATIONAL NEED)

- A change in organizational business conditions may necessitate a project be undertaken to maintain adequate customer service.
- Example: Rising overhead costs in a corporation motivate it to undertake a project to reduce staff functions and simplify processes.

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CUSTOMER APPEAL (CUSTOMER REQUEST)

- An organization may undertake a project at the behest of its constituency.
- Example: An accounting department in a corporation asks the information technology department (in that same corporation) to create new finance software.

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TECHNICAL INNOVATION (TECHNOLOGICAL ADVANCE)

- A technical innovation may lead an organization to embark on a project to take advantage of that advance.
- Example: A new mobile application enables dry cleaning home delivery. As a result, a local dry cleaner undertakes a project to enable home delivery (e.g., transportation system, training).

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STATUTE (LEGAL REQUIREMENT)

- In some instances, an organization may be required by law to undertake a project.
- Example: The Environmental Project Agency enacts a law that requires commercial building owners to make changes to their properties.

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SOCIAL CONDITION (SOCIAL NEED)

- An organization may perceive a pressing social need that can be resolved or ameliorated by undertaking a project.
- Example: An organization builds a water filtration system to increase access to potable water in an impoverished area.

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ECOLOGICAL IMPACTS

- An organization may undertake a project whose primary goal is to reduce the influence of something in the environment.
- Example: An organization builds a series of noise barriers (baffles) between an airport and a nearby community.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 78.

PROJECT BUSINESS CASE CRITERIA AND OPTION CATEGORIES

- How important is the project to fixing or addressing the issue:
  - Required
  - Desired
  - Optional
- Options:
  - Do nothing
  - Do the minimum work possible
  - Do more than the minimum work possible

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 31.

STAKEHOLDERS

- Stakeholders can often exercise influence over project.
- Special emphasis is given to key stakeholders.

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KEY STAKEHOLDERS

- Customer
- Sponsor
- Portfolio manager
- Portfolio review board
- Program manager
- Project management office (PMO)

- Project manager
- Project team member
- Functional Manager
- Operations Manager
- Seller/Business Partner

CUSTOMER (KEY STAKEHOLDER)

- Customers are individuals or organizations using whatever the project produces (this stakeholder is usually considered the most important).

SPONSOR (KEY STAKEHOLDER)

- Sponsors provide project resources.
- They usually resolves resource issues and other conflicts.
- Sponsors are usually senior management.

PORTFOLIO MANAGER (KEY STAKEHOLDER)

- Portfolio managers are senior executives responsible for managing projects or programs that are grouped strategically.

PORTFOLIO REVIEW BOARD (KEY STAKEHOLDER)

- A portfolio review board is typically made up of senior executives who decide what projects will be adopted by their organizations.

PROGRAM MANAGER (KEY STAKEHOLDER)

- Program managers are individuals tasked with managing like projects.

PROJECT MANAGEMENT OFFICE (PMO) (KEY STAKEHOLDER)

- If a PMO exists in an organization, it can be a stakeholder in project management processes.
- PMOs can provide administrative support (e.g., policy, methodology, and templates), training, guidance, and personnel and communication management for projects.

PROJECT MANAGER (KEY STAKEHOLDER)

- The project manage is responsible for achieving project goals and is also responsible for the overall supervision of a project.
- The project manager is tasked with managing expectations of other stakeholders.

PROJECT TEAM MEMBER (KEY STAKEHOLDER)

- Project team members are the persons working on a project.

FUNCTIONAL MANAGER (KEY STAKEHOLDER)

- Functional managers are individuals tasked with managing people in a specialized area who are permanently assigned to a functional element in an organization.

OPERATIONS MANAGEMENT (KEY STAKEHOLDER)

- People in operations management are tasked with managing people who are directly involved in producing an organization's product or performing a service for an organization.

SELLER/BUSINESS PARTNER (KEY STAKEHOLDER)

- Seller/business partners are individuals or organizations that provide products or services to an organization performing the project.
- These stakeholders are not part of an organization performing the project.
- They are also known as vendors, suppliers, or contractors.

MANAGEMENT

- "The process of planning, organizing, *leading* [emphasis mine], and controlling the work of organization members …" (Stoner et al., 1995, G-5).

PROJECT MANAGER

- Again, the project manager is tasked with the overall responsibility for achieving project goals.
- The project manager is usually assigned by the organization executing project.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Page 52 (defined).

PROJECT MANAGER CHARACTERISTICS

- Knowledge: Specifically, what the project manager knows about managing projects
- Performance: What the project manager is able to achieve through the application of project management methodologies, knowledge, and so on
- Personal: How the project manager positively influences a project through his or her leadership, attitude, and so on

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 51-52.

PROJECT SUCCESS MEASURES

- Project success measures are used to evaluate the relative worth of a project to an organization.
- It is also used to evaluate how well a project achieved (economic) objectives at the conclusion of a project.
- Decision models are also extensively used in measuring the relative worth of a project.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 34-35.

CONSTRAINED OPTIMIZATION PROBLEM (DECISION MODEL)

- "A nonlinear programming problem in which there are constraint functions" (AccessScience, 2005).
- It includes linear, dynamic, integer, and multi-objective programming algorithms.

BENEFIT MEASUREMENT METHODS (DECISION MODEL): COST-BENEFIT ANALYSIS

- Scoring methods
- Cash flow analysis techniques

COST-BENEFIT ANALYSIS (CBA) (1)

- CBA measures financial gain (benefit) against the resources (cost) expended to complete a project.
- When considering which projects to select, benefit is the same as revenue (not profit).
- Benefit/cost ratio > 1 is *good*.

COST-BENEFIT ANALYSIS (CBA) (2)

- CBA is reported as a ratio (e.g., 5:7; costs are outweighed by the benefits by five (5) to seven (7)).
- The larger the ratio (costs versus benefits), the better the project.

SCORING MODEL (1)

- Also known as a weighted scoring model, it evaluates two or more projects by assigning or scoring each project using multiple weighted measurements.
- The first step is to have an individual, group, or committee determine what the most important measurements are with respect to project selection.
- Next, have an individual, group, or committee assign a weight to each measurement.

SCORING MODEL (2)

- Then, for each project being evaluated, have an individual, group, or committee assign a score to each measurement.
- Finally, for each project, multiply the score for each measurement by a weight for each measurement. Sum the results for each project.
- A project with largest score is the best investment.

SCORING MODEL EXAMPLE: STEP 1

Measurements

Ease to produce software

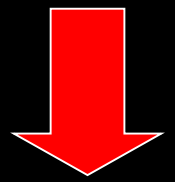
Ease to update software

Ease to train employees

Ease to implement software

This is a software project, a committee selects the most important measurements

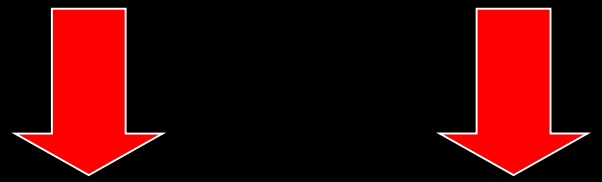
SCORING MODEL EXAMPLE: STEP 2



Measurements	Weight
Ease to produce software	5
Ease to update software	4
Ease to train employees	3
Ease to implement software	3

A committee then assigns weights to each measurement. In this example, ease to produce software has a higher weight (is more important) than ease to train employees.

SCORING MODEL EXAMPLE: STEP 3



Measurements	Weight	Project A	Project B
Ease to produce software	5		
Ease to update software	4		
Ease to train employees	3		
Ease to implement software	3		

The alternatives being considered are then added to the model. In this example, there are two possibilities (A and B).

SCORING MODEL EXAMPLE: STEP 4

Measurements	Weight	Project A	Project B
Ease to produce software	5	5	4
Ease to update software	4	4	5
Ease to train employees	3	4	3
Ease to implement software	3	2	5

For each alternative, assign a score for each measurement. A higher score is a better score.

SCORING MODEL EXAMPLE: STEP 5

Measurements	Weight		Project A			Project B
Ease to produce software	5	x	5	=	25	4
Ease to update software	4	x	4	=	16	5
Ease to train employees	3	x	4	=	12	3
Ease to implement software	3	x	2	=	6	5

For each alternative, multiply each score by each measurement. Project A is shown here …

SCORING MODEL EXAMPLE: STEP 6

For each alternative, sum the results. The largest number is the best alternative (Project B in this example).

Measurements	Weight		Project A	Project B
Ease to produce software	5	x	5 = 25	4 = 20
Ease to update software	4	x	4 = 16	5 = 20
Ease to train employees	3	x	4 = 12	3 = 9
Ease to implement software	3	x	2 = 6	5 = 15
			59	64

CASH FLOW ANALYSIS TECHNIQUE

- Payback period
- Discounted cash flows
- Internal rate of return

PAYBACK PERIOD

- A payback period is an interval required to recoup the initial investment in a project.
- It is the least accurate of techniques.
- It does not take into account the time value of money.

PAYBACK PERIOD EXAMPLE

- Initial investment = $20,000
- Year 1 cash income from project = $10,000
- Year 2 cash income from project = $10,000
- Payback period = 2 years (or 24 months or 104 weeks)

DISCOUNTED CASH FLOW

- Money is worth more today than it will be tomorrow. This concept is known as the time value of money.

DISCOUNTED CASH FLOW FORMULAS

- Future Value (FV) = PV x $(1+i)^n$
- Present Value (PV) = FV ÷ $(1+i)^n$
- Net Present Value (NPV) = $(\sum(FV \div (1+i)^n)) - I$
- Where:
  - *i* = interest rate
  - n = number of payment periods
  - I = initial investment

FUTURE VALUE EXAMPLE

- If I spent $10,000.00 on a project (initial investment), what is the value of that money three years from now at 4 percent interest per year?
- FV = $10,000.00 x $(1 + .04)^3$
- FV = $11,248.64

PRESENT VALUE EXAMPLE

- I expect to earn $12,000 on a project in four years. Given an interest rate of 4 percent, what is the present value?
- Project PV = $12,000 ÷ $(1+ .04)^4$ = $10,257.6

CALCULATING NET PRESENT VALUE (NPV)

- This is the value of a project based on the sum of its present values over time (usually a number of years).
- In order to calculate NPV, you must have the projected return for each year for a project.
- NPV is often used to compare two or more projects.

NET PRESENT VALUE (NPV)

- All things being equal, projects that have larger returns earlier are better than projects than have larger returns later.
- Reject a negative NPV.
- NPV is most conservative of the techniques.

NET PRESENT VALUE EXAMPLE (1)

- Project Y has an initial investment of $15,000. The interest rate is 4 percent. The projected income schedule is listed below:

Year	Income	PV
1	$9,000	$8,653.85
2	$4,000	$3,698.22
3	$3,000	$2,666.99
Total	$16,000	$15,019.06
Less Investment		$15,000
	NPV	$19.06

NET PRESENT VALUE EXAMPLE (2)

- Project Z has an initial investment of $15,000. The interest rate is 4 percent. The projected income schedule is listed below.

Year	Income	PV
1	$1,000	$961.54
2	$3,000	$2,773.67
3	$12,000	$10,667.96
Total	$16,000	$14,403.17
Less Investment		$15,000
	NPV	<$596.83>

COMPARING PROJECTS Y AND Z USING NPV

- Project Y has a positive NPV of $19.06. Project Z has a negative NPV of -$596.83. Project Y is larger than Project Z. Hence Project Y is a better investment than Project Z.
- Notably, Project Z has a negative NPV, which means it is not a viable project.

INTERNAL RATE OF RETURN (IRR) DEFINITION

- "[IRR] is the return that a company would earn if it expanded or invested in itself, rather than investing that money elsewhere" (Investopedia, 2006).
- "[IRR is] the interest rate that makes net present value of all cash flow equal zero" (Investopedia, 2006). That is, NPV = 0.

INTERNAL RATE OF RETURN (IRR)

- IRR is the interest rate when a present value income equals an initial investment.
- Like Net Present Value (NPV), we assume the interest rate does not change.
- Like NPV, the highest IRR is the best investment.
- That is, IRR produces the same accept/do not accept decision as NPV.
- IRR requires a calculator or computer to calculate.

INTERNAL RATE OF RETURN (IRR) EXAMPLES

- Project Y (interest rate 4%)
  - Net Present Value = $19.06
  - IRR = 4.08%*
- Project Z (interest rate 4%)
  - NPV = <$596.83>
  - IRR = 2.43%*
- *Calculated using Microsoft Excel

OPPORTUNITY COST

- In a situation in which at least two opportunities exist, the opportunity cost is the cost associated with the (second best) opportunity not selected.

OPPORTUNITY COST ASSUMPTIONS

- Opportunity cost involves a pairwise comparison.
- Opportunities are bounded by a time frame.
- Outcomes are known.

OPPORTUNITY COST EXAMPLE A

- I have three food options. I can only choose one option to consume. My favorite option is two apples. My second favorite option is one banana. My third favorite option is three pears. I pick the two apples option. Which of the following is my opportunity cost?
- A. Two apples, B. Three pears, or C. One banana
- Answer C is correct.

OPPORTUNITY COST EXAMPLE B

- Project A earns $750,000, Project B earns $1,000,000, and Project C earns $500,000. You can only pick one project. You believe Project A is the best option. You believe Project B is the second best option, and you pick Project A. What is the opportunity cost?
- The opportunity cost associated with selecting Project A is $1,000,000.

OPPORTUNITY COST EXAMPLE C

- You make $75 an hour.
- You decide to attend a concert instead of working. The concert is two hours long and costs $25.
- What is the opportunity cost of attending the concert?
- The opportunity cost of attending the concert is $150 (two hours of work missed).

SUNK COST

- Sunk cost is a cost that has already been expended and cannot be recovered.
- Normally, decisions about projects are not made with reference to sunk cost.

MURDER BOARD

- A murder board is a committee that examines every possible negative aspect of project being considered for development.
- A cost-benefit analysis associated with a project is explored. If a project is deemed substantially deficient, it will be ended ("killed").

DEPRECIATION

- Some assets have a finite lifespan and will lose their value over time.
- For tax purposes, you can often deduct the value of assets through depreciation over time.
- There are two basic types:
  - Straight-Line (also known as Standard)
  - Accelerated

STRAIGHT-LINE DEPRECIATION

- Annual Depreciation Cost =

$$\frac{\text{Cost of Fixed Asset} - \text{Salvage Value}}{\text{Life Span (Years)}}$$

- Where:
  - Salvage = scrap value; note: may be zero
  - Equal decline in asset value from year to year

ACCELERATED DEPRECIATION

- Accelerated depreciation provides for a relatively higher depreciation of an asset in the first year with gradually decreasing depreciation in the years that follow.
- There are two important types:
  - Sum of the years' digits (SYD)
  - Double declining balance (DDB)

QUESTIONS?