PROJECT INTEGRATION MANAGEMENT

INTRODUCTION

MAJOR PROJECT DOCUMENTS

Before we begin Integration, let's summarize the project's major documents generated by the project

- **Project Charter** – formally authorizes a project or a phase and documents initial requirements that satisfy the stakeholder's needs and expectations. (Never changes)

- **Project Management Plan** – documents the actions necessary to define, prepare, integrate, and coordinate all subsidiary management plans (changes a lot)

INTRODUCTION

MAJOR PROJECT DOCUMENTS

Other Project Documents (or Systems) Used by the Project

These systems could include tools, techniques, methodologies, resources (i.e. templates), procedures, documentations, tracking systems, approval levels, etc.

Project Management Information System (PMIS)

- An information system, consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes.

- It is used by project management team to support all aspects of the project from initiating through closing, and can include both manual and automated systems.

INTRODUCTION

MAJOR PROJECT DOCUMENTS

Configuration Management System

It is a sub-system of the overall PMIS. It is a collection of formal documented procedures used to apply technical and administrative direction and surveillance to:

- identify and document the functional and physical characteristics of a product, result, service, or component;
- control any changes to such characteristics;
- record & report each changes and its implementation status; and
- support the audit of the products, results, or components to verify conformance to requirements
- it includes the documentation, tracking systems, and defined approval levels necessary for authorizing and controlling changes.

Change Control System - is a collection of formal documented procedures that define how deliverables and documentation are controlled, changed and approved In most application areas CCS is a subset of the configuration management system.

INTRODUCTION

WHAT DOES THE INTEGRATION KNOWLEDGE AREA DO?

- It's about the entire project - processes & activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups
  - Projects start and close here.
  - Project plan is made here.
  - Product, service or result is made here.

Coordinate all knowledge area processes

INTRODUCTION

PROJECT INTEGRATION MANAGEMENT

The integrative nature of projects and project management can be understood by thinking of other types of activities performed while completing a project. Examples of some activities performed by the PM team are:

- Analyze and understand the scope. This includes the project and product requirements, criteria, assumptions, constraints, and other influences related to a project, and how each will be managed or addressed within the project.
- Understand how to take the identified information and then transform it into a project management plan using a structured approach as described in PMBOK Guide.
- Perform activities to produce project deliverables.
- Measure and monitor all aspects of the project's progress and take appropriate action to meet project objectives.

INTRODUCTION
INTEGRATION PROCESSES

INTEGRATION PROCESS DEFINITIONS

4.1 Develop Project Charter

- that formally authorizes a project or a project phase.

4.2 Develop Project Management Plan

- the process of documenting the actions necessary to define, prepare, integrate, and coordinate all subsidiary plan.

4.3 Direct & Manage Project Work

- the process of performing the work defined in the project management plan to achieve the project's objectives.

INTRODUCTION
INTEGRATION PROCESSES

4.4 Monitor & Control Project Work

- The process of tracking, reviewing, and regulating the progress to meet the performance objectives defined in the project management plan.

4.5 Perform Integrated Change Control

- Review **all** change requests, approve changes, and manage changes to the deliverables, organizational process assets, project documents, and the project management plan.

4.6 Close Project or Phase

- Finalize **all** activities across all Project Management Process Groups to formally complete the project or phase.

INTEGRATION PROCESSES

PROCESSES BY PROCESS GROUP

Initiating	Planning	Executing	Monitoring and controlling	Closing
4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project work	4.6 Close Project or Phase
			4.5 Perform Integrated Change Control	

DEVELOP PROJECT CHARTER

What should a project charter address?

- Project purpose or justification,
- Measurable project objectives and related success criteria,
- High-level requirements,
- High-level project description,
- High-level risks,
- Summary milestone schedule,
- Summary budget,
- Project approval requirements,
- Assigned project manager, responsibility, and authority level, and
- Name and authority of the sponsor or other person(s) authorizing the project charter.

Formally authorizes a project (never changes)

DEVELOP PROJECT CHARTER

Inputs

- Project statement of work
- Business Case
- Agreements
- Enterprise environmental factors
- Organizational process assets

Outputs

- Project Charter

DEVELOP PROJECT CHARTER INPUTS

Contract (when applicable)

- A contract from the customer's acquiring organization is an input if the project is being done for an external customer.

Project Statement of Work

- Narrative description of products or services to be supplied by the project
- For internal projects, the project initiator or sponsor provides the statement of work based on business needs, products or service requirements.
- For external projects, the SOW can be received from the customer as part of a bid document, for example, request for proposal, request for information, request for bid, or as part of a contract.

DEVELOP PROJECT CHARTER INPUTS

The SOW references:

- Business need - an organization's business need can be based on needed training, market demand, technological advance, legal requirement, or governmental standard

- Product scope description – documents the product requirements and characteristics of the product or service that the project will be undertaken to create

- Strategic plan -all projects should support the organization's strategic goals. The strategic plan of the performing organization should be considered as a factor when making project selection decisions.

DEVELOP PROJECT CHARTER - INPUTS

Business Case:

- Business case or similar document provides the necessary information from a business standpoint to determine whether or not the project is worth the required investment.
- Typically the business need and the cost-benefit analysis are contained in the business case to justify the project.
- For external project, the requesting organization or customer may write the business case.
- Business case is created as a result of one or more of the following:
  - Market demand
  - Organizational need
  - Customer request
  - Technological advance
  - Legal requirement
  - Ecological impacts
  - Social need

DEVELOP PROJECT CHARTER INPUTS

Enterprise Environmental Factors

- Governmental or industry standards
- Organization Infrastructure, and
- Marketplace conditions

These are examples and not specific to Project Charter – an input to all knowledge areas

DEVELOP PROJECT CHARTER INPUTS

Not specific to project Charter – an input to all knowledge areas

Organizational Process Assets

- Organizational standard processes, policies, and standardized process definitions for use in the organization;
- Templates (e.g. project charter template); and
- Historical information and lessons learned knowledge base.

DEVELOP PROJECT CHARTER
TOOLS & TECHNIQUES

Expert Judgement

It is available from many sources, including:

- Other units within the organization,
- Consultants,
- Stakeholders, including customers or sponsors,
- Professional and technical associations,
- Industry groups,
- Subject matter experts, and
- Project management office (PMO)

DEVELOP PROJECT CHARTER
TOOLS & TECHNIQUES

Project Selection Methods

- Mostly financial considerations are used.
- Project selection is generally the responsibility of Portfolio Managers, Steering Committees. In smaller companies, Presidents and Vice- Presidents

These methods generally fall into one of two broad categories:

- Benefit measurement methods that are comparative approaches, scoring models, benefit contribution, or economic models.
- Mathematical models that use linear, nonlinear, dynamic, integer, or multi-objective programming algorithms

DEVELOP PROJECT CHARTER
TOOLS & TECHNIQUES

Weighted Scoring Model (benefit measurement method)

A systematic process for selecting projects based on criteria (example on next slide)

- First, decide on a list of criteria used for project selection
- Assign weights (percentages) to each so that they add up to 100%
- Assign scores to each for each project
- Multiply scores by weights to get total weighted scores for each project
- Highest weighted score wins

Note: Also used for selecting contractors/sellers (Procurement)

DEVELOP PROJECT CHARTER

Weighted Scoring Model – Example

Criteria	Weight	Project A		Project B		Project C	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Supports key business objectives	25%	90	22.5	90	22.5	50	12.5
Has strong internal sponsor	15%	70	10.5	90	13.5	60	9.0
Has strong market demand	15%	50	7.5	70	10.5	70	10.5
Support key technologies	10%	50	5.0	75	7.5	45	4.5
Can be implemented in one year or less	5%	20	1.0	20	1.0	60	3.0
Provides positive NPV	20%	50	10.0	70	14.0	50	10.0
Has low risk in meeting objectives	10%	20	2.0	50	5.0	25	2.5
Weighted Scores	100%		58.5		74.0		52.0

Pick Project B

DEVELOP PROJECT CHARTER

Other Benefit Measurement Methods:

Cash Flow Techniques

a) Payback Period

- Length of time it will take to get back the initial investment
- Time value of money is ignored here, i.e. no interest, so this is the least precise of the cash flow techniques

Example:
Initial Investment (P) = $200,000
Cash Inflow (C) =$25,000 / quarter for 3 years
n = # of periods
Payback period (n) = P/C= *$ 200,000 I* $25,000
= 8 quarters or two years

DEVELOP PROJECT CHARTER

b) Discounted Cash Flow (or Net Present Value method)

Calculates the present worth of future money (called net present value)

Example -Which project is worth more?

Project X expects to make **$250K 1 year from now**

Project Y expects to make **$300K 2 years from now**

i= **12% (or 0.12)**

Given this formula, calculate present value & pick one.

$PV = FV/ (1 +i)^n$ or $FV = PV(1 +i)^n$

Where FV is future value, PV is present value, n is number of periods, i is interest rate

Project X, $PV=250/1.12= 223.2$; Project Y, $PV=300/ (1.12)^2 = 239.2$

Project Y is worth more.

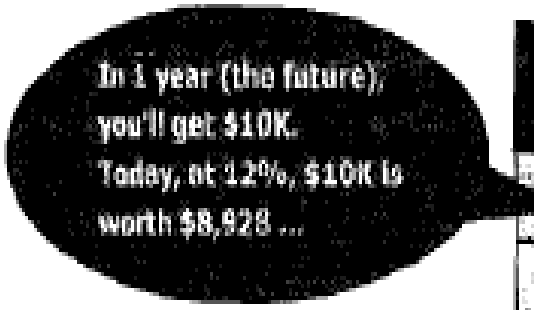
DEVELOP PROJECT CHARTER

Net Present Value

Calculates the expected net value of a project in today's money

To do this, discount all anticipated cash inflows and outflows to the present day

If Interest (i) = 12% & Initial Investment (P) = $20,000, what's the NPV of this? NPV=Total of all PVs-P



YEAR	$ INFLOW - end of each year	PV = FV / (1 + i)^n
1	$10,000	$10,000 / 1.12^1 -> $8,928
2	$10,000	$10,000 / 1.12^2 -> $7,971
3	$15,000	$15,000 / 1.12^3 -> $10,676
Total	$35,000	$27,575

NPV = $27,575 - $20,000 = $7,575

- Pick the project with the highest NPV

DEVELOP PROJECT CHARTER

Accounting Terms

***Sunk Cost* (Incurred Cost):**

In project selection method, when comparing projects for continuity, costs already incurred should be considered as sunk costs and should not be taken in to account in any calculation

Opportunity Cost:

- The cost of the opportunity that you picked
- What did you give up (your cost) for the project you selected?
- The amount you would have made if you picked the project with the next best NPV (expected value in today's money)
- Opportunity cost is always the second best alternative (doesn't take the third or subsequent projects into account)

DEVELOP PROJECT CHARTER

Internal Rate of Return (IRR)

- IRR is the interest rate when NPV equals zero (0)
- Net present value of all cash inflows (revenue) and outflows (investments) are the same
- Choose projects with highest IRR

DEVELOP PROJECT CHARTER
TOOLS & TECHNIQUES

Expert Judgment

- Expert judgment is often used to assess inputs used to make the Project Charter Available from many sources, including:
- Other departments in your organization
- Consultants
- Stakeholders
- Professional or technical associations and industry groups, i.e. PMI

DEVELOP PROJECT CHARTER
TOOLS & TECHNIQUES

Facilitated Techniques

These techniques are not only applicable to the "Develop Project Charter" process, it is broadly used within project management processes where key facilitators hold brainstorming session, use problem solving techniques, and hold meetings with management to help project team or individuals accomplish project activities

DEVELOP PROJECT CHARTER - OUTPUTS

OUTPUT

Project Charter

INTEGRATION PROCESSES

PROCESSES BY PROCESS GROUP

Initiating	Planning	Executing	Monitoring and controlling	Closing
4.1 Develop Project Charter	**4.2 Develop Project Management Plan**	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project work	**4.6 Close Project or Phase**
			4.5 Perform Integrated Change Control	

DEVELOP PROJECT MANAGEMENT PLAN

What's in a Project Management Plan?

- Documents/defines 'how' a project is executed, monitored and controlled
- Generally includes subsidiary management plans & other planning documents
- May be summary or detailed plan (changes often)
- Formally approved
- Updates are approved through the Integrated Change Control process and implemented in the Direct and Manage Project Work process

DEVELOP PROJECT MANAGEMENT PLAN

Specifically the plan includes:

- Which processes have been selected
- Level of implementation of each of the processes (how thorough each should be)
- Which inputs, tools & techniques and outputs are to be used for each process
- How processes will be used, their dependencies & interactions
- How work will be executed
- How changes will be monitored & controlled
- How configuration management will be performed
- How baseline integrity will be maintained (i.e. approved budget or schedule)
- Stakeholder communication needs & techniques to be used
- Project life cycle (if needed for phases)
- Key management reviews

DEVELOP PROJECT MANAGEMENT PLAN

Subsidiary management plans (if required), such as:

- Scope
- Schedule
- Cost
- Quality
- Process Improvement (in Quality)
- Staffing
- Communication
- Risk
- Procurement

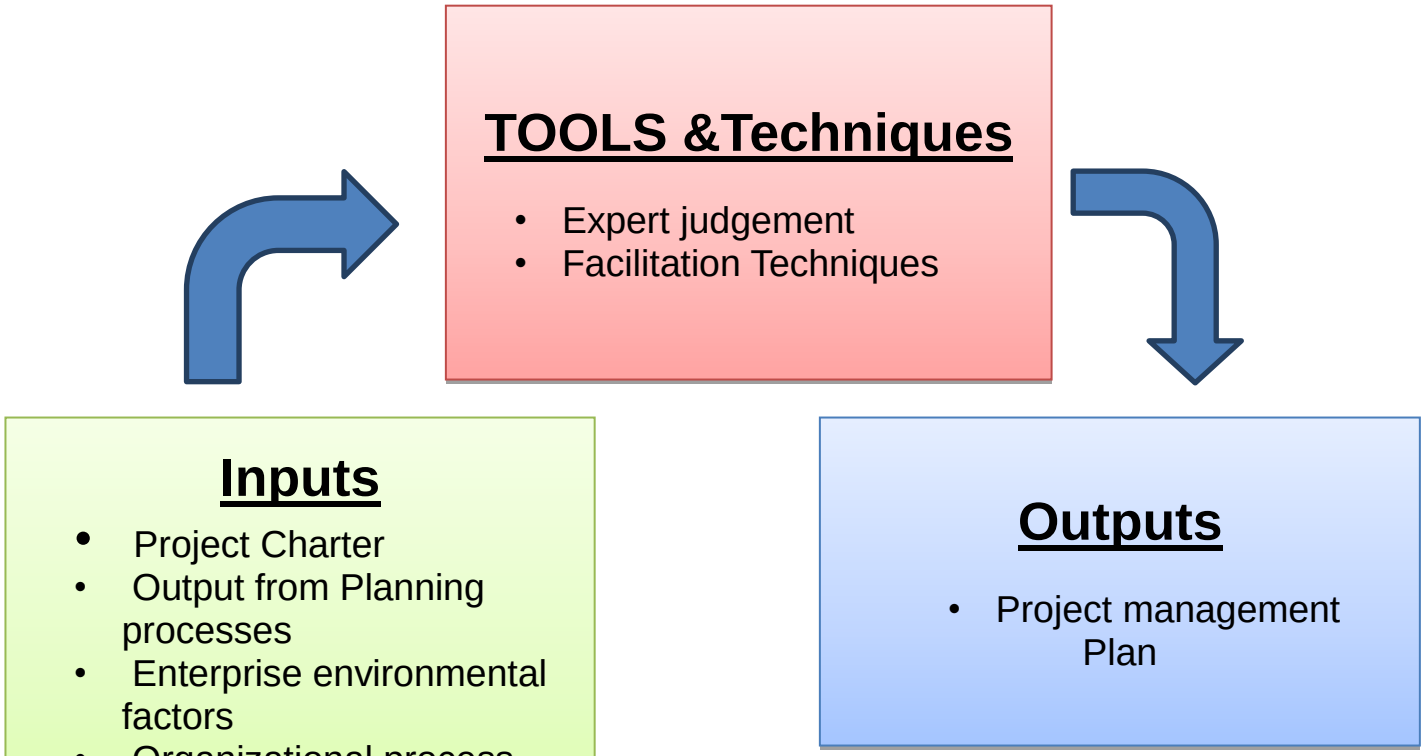
DEVELOP PROJECT MANAGEMENT PLAN

Other components, such as:

- Milestone list
- Resource calendar
- Schedule baseline
- Quality baseline
- Risk register

All these give explicit details of 'how' to produce the requirement(s)

DEVELOP PROJECT MANAGEMENT PLAN



DEVELOP PROJECT MANAGEMENT PLAN

INPUTS

- Project Charter
- Output from Planning Processes
- Enterprise Environmental Factors
- Organizational Process Assets

DEVELOP PROJECT MANAGEMENT PLAN

TOOLS & TECHNIQUES

Expert Judgment

Facilitation Techniques

DEVELOP PROJECT MANAGEMENT PLAN

OUTPUT

Project Management Plan

INTEGRATION PROCESSES

PROCESSES BY PROCESS GROUP

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DIRECT AND MANAGE PROJECT WORK

WHAT HAPPENS DURING PROJECT EXECUTION?

- PM and the project team to perform multiple actions to execute the project management plan to accomplish the work defined in the project scope statement.
- Some actions create the project's product, service or result while other actions manage the whole of the project in an integrated manner
- **Some actions include:**
  - Perform activities to accomplish project objectives
  - Expend effort and spend funds to accomplish project objectives
  - Staff, train & manage project team members
  - Obtain quotations, bids, offers, or proposals as appropriate

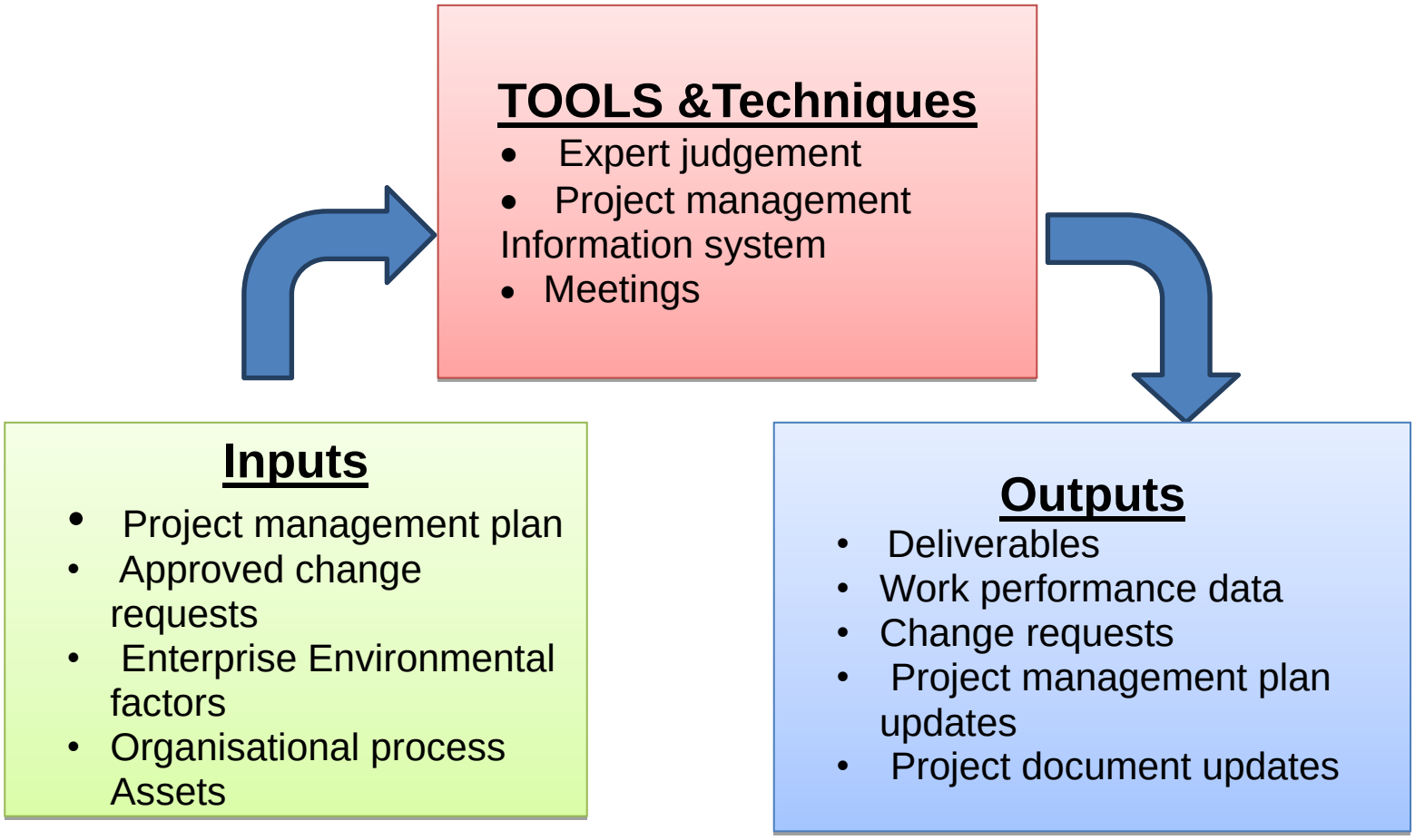
  Select sellers

……continued

DIRECT AND MANAGE PROJECT WORK

- Obtain, manage & use resources including materials, tools, equipment and facilities
- Implement the planned methods and standards
- Create, control, verify & validate project deliverables
- Manage risks & implement risk response activities
- Manage sellers
- Adapt approved changes into project scope, plans & environment
- Establish & manage project communication channels both external & internal to the project team
- Collect project data and report cost, schedule, technical & quality
- Progress and status information to facilitate forecasting
- Collect & document lessons learned, and implement approved process improvement activities

DIRECT AND MANAGE PROJECT WORK



DIRECT AND MANAGE PROJECT WORK

INPUTS

- **Project Management Plan**
- **Enterprise Environmental factors:** The enterprise environmental factors that can influence the direct and manage project execution process include:
  - Organizational, company or customer culture/structure,
  - Infrastructure (existing facilities and capital equipment)
  - Personnel administration (hiring and firing guidelines),
  - Stakeholder risk tolerances,
  - Project management information system
- **Organizational Process assets**: standardized guidelines and work instructions, communication requirements defining allowed communication media, record retention, and security requirements, project files from prior projects (e.g. scope, cost, schedule, etc), issue and defect management database containing historical issues and defect status, its control, resolutions and actions.

DIRECT AND MANAGE PROJECT WORK INPUTS

- **Approved Change Request**

  They are documented, authorized changes to expand or contract project scope. They can also modify policies, project management plans, procedures, costs or budgets, or revise schedules. They are scheduled for implementation by the project team.

DIRECT AND MANAGE PROJECT WORK-T&T

TOOLS & TECHNIQUES

- **Expert Judgment**
- **Project Management Information System (PMIS)**

Project management information system is part of environmental factors which provides access to tools, such as scheduling tools, a work authorization system, and information collection and distribution system.

DIRECT AND MANAGE PROJECT WORK

OUTPUTS

- **Deliverables**
  Any unique & verifiable product, result or capability to perform a service that is identified in the project management planning documentation, and must be produced and provided to complete the project

- **Change Request**
  When issues are found while project work is being performed, change requests are issued which may modify project policies and procedures, project scope, project cost or budget, project schedule or quality. Other change requests cover needed preventive or corrective actions to forestall negative impacts later in the project. Request for a change can be direct or indirect, externally or internally initiated, can be optional or legally/contractually mandated.

DIRECT AND MANAGE PROJECT WORK

OUTPUTS

Work Performance Data

Information on status of project activities being performed to accomplish the project work. Includes:

- Schedule progress showing status information
- Deliverables that have been completed and those not completed
- Schedule activities that have started and those that have been finished
- Extent to which quality standards are being met
- Costs authorized and incurred
- Estimates to complete the schedule activities that have started
- Percent physically complete of the in-progress schedule activities
- Documented lessons learned posted to the lessons learned knowledge base
- Resource utilization detail

DIRECT AND MANAGE PROJECT WORK

OUTPUTS

Project Management plan updates

Elements of the project management plan that may be updated include: Requirements (Scope) management plan, Schedule management plan, cost management plan, human resource management plan, quality management plan, communications management plan, risk management plan, procurements management plan, project baselines

Project Document updates

Project documents that may be updated include but are not limited to:

- Requirements documents
- Projects log (issues, assumptions)
- Risk register and
- Stakeholder register

INTEGRATION PROCESSES

PROCESSES BY PROCESS GROUP

Initiating	Planning	Executing	Monitoring and controlling	Closing
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MONITOR AND CONTROL PROJECT WORK

WHAT HAPPENS DURING MONITOR & CONTROL PROJECT WORK?

- Monitor project processes associated with initiating, planning, executing & closing.
  Corrective or preventive actions are taken to control the project performance.
  Monitoring is an aspect of project management performed throughout the project.

- **This process is concerned with:**
  - Comparing actual project performance against the project management plan
  - Assessing performance to determine whether any corrective or preventive actions are indicated, then recommending those actions as necessary
  - Analyzing, tracking, and monitoring project risks to make sure the risks are identified, their status is reported, and that appropriate risk response plans are being executed
  - Maintaining an accurate, timely information base concerning the project's product (s) and their associated documentation through project completion
  - Providing information to support status reporting, progress measurement, and forecasting
  - Providing forecasts to update current cost and current schedule information
  - Monitoring implementation of approved changes when and as they occur

MONITOR AND CONTROL PROJECT WORK

Inputs

- Project management plan
- Schedule Forecasts
- Cost Forecasts
- Validated Changes
- Work Performance Information
- Enterprise environmental factors
- Organizational process assets

Outputs

- Change Requests
- Work Performance Reports
- Project Management Plan updates
- Project documents updates

MONITOR AND CONTROL PROJECT WORK

INPUTS

- Project Management Plan
- Schedule Forecasts
- Cost Forecasts
- Validated Changes
- Work Performance Information
- Enterprise environmental factors
- Organizational process assets

MONITOR AND CONTROL PROJECT WORK

TOOLS & TECHNIQUES

- **Expert Judgments**
- **Analytical Techniques**
- **PMIS**
- **Meetings**

MONITOR AND CONTROL PROJECT WORK
OUTPUTS

Change requests

- **Recommended Corrective Actions**
  Corrective actions are recommended to bring expected future project performance into conformance with the project management plan
- **Recommended Preventive Actions**
  Preventive actions are recommended to reduce the probability of negative consequences associated with project risk
- **Recommended Defect Repair**
  Some defects, which are found during the quality inspection and audit process, are recommended for correction

Project Management plan updates

Project Document updates

INTEGRATION PROCESSES

PROCESSES BY PROCESS GROUP

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			4.5 Perform Integrated Change Control	

PERFORM INTEGRATION CHANGE CONTROL

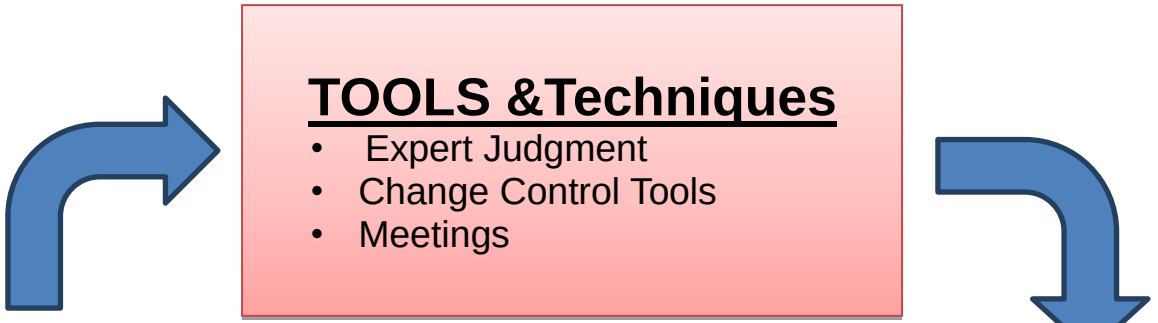
WHAT HAPPENS DURING PERFORM INTEGRATED CHANGE CONTROL?

- During the entire project, this process ensures that the project management plan, project scope statement, and other deliverables must be maintained by carefully and continuously managing changes, either by rejecting changes or by approving changes so that those approved changes are incorporated into a revised baseline.
- ICC process includes the following:
  - Identify if a change needs to occur or has occurred
  - Influence the factors that circumvent ICC so that only approved changes are implemented
  - Review, approve & then manage change requests
  - Review and approve all recommended corrective and preventative actions
  - Control & update scope, cost, budget, schedule & quality requirements, based on approved changes, by coordinating across entire project, i.e. a schedule change may affect risk

PERFORM INTEGRATION CHANGE CONTROL

- Document impact of requested changes
- Validate defect repairs
- Control project quality (in a coordinated fashion)
- Some configuration management activities included here are:
  - Configuration Identification -product details (to the level needed) are defined, verified & labeled; changes are managed & accountability is maintained
  - Configuration Status Accounting -capturing, storing & accessing configuration information
  - Configuration Verification & Auditing -compare performance & functional requirements defined in the configuration documentation with reality
- Large organizations have **Change Control Boards** (CCB) to authorize changes (their roles & responsibilities should be clearly documented here)

PERFORM INTEGRATED CHANGE CONTROL



TOOLS &Techniques

- Expert Judgment
- Change Control Tools
- Meetings

Inputs

- Project management plan
- Work performance reports
- Change requests
- Enterprise environmental factors
- Organizational process assets

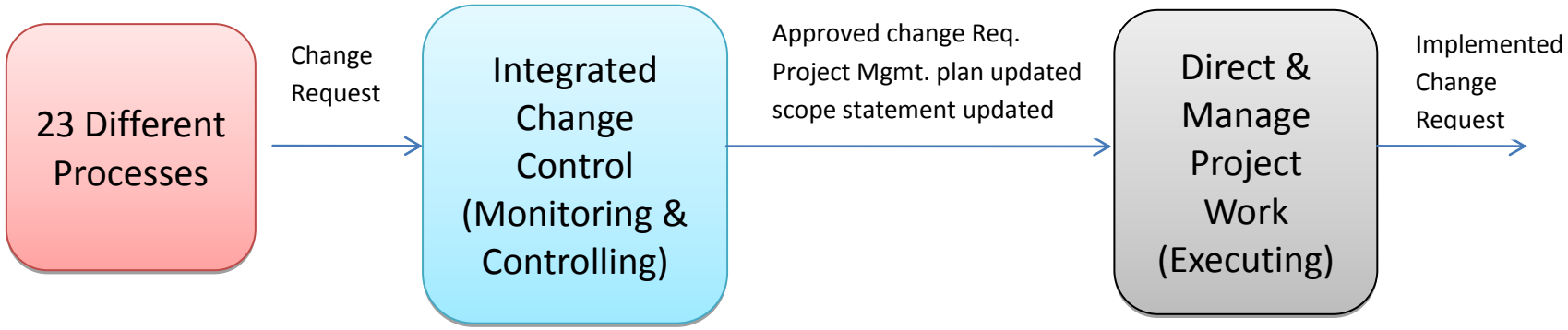
Outputs

- Approved Change Requests
- Change Log
- Project management plan updates
- Project document updates

PERFORM INTEGRATED CHANGE CONTROL

INPUTS

- Project Management Plan
- Work Performance Reports
- Change Requests
- Enterprise Environmental Factors
- Organizational process assets



PERFORM INTEGRATED CHANGE CONTROL

TOOLS & TECHNIQUES

- **Expert Judgment**
- **Change Control Tools**
- **Meetings**

PERFORM INTEGRATED CHANGE CONTROL

OUTPUTS

Approved Change Requests

Change Log

Project management plan updates

Project document updates

CLOSE PROJECT OR PHASE

PROCESSES BY PROCESS GROUP

Initiating	Planning	Executing	Monitoring and controlling	Closing
4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project work	**4.6 Close Project or Phase**
4.2 Develop Preliminary Project Scope Statement			4.5 Perform Integrated Change Control	

CLOSE PROJECT OR PHASE

WHAT HAPPENS DURING PROJECT CLOSURE?

- Finalize all activities completed across all process groups to formally close the project or project phase
- Transfer completed or cancelled project as appropriate
- Establish procedures to coordinate activities needed to verify and document the project deliverables, to coordinate and interact to formalize acceptance of those deliverables by the customer or sponsor
- Investigate and document the reasons for actions taken if a project is terminated before completion

INTEGRATION PROCESSES

PROCEDURES TO PERFORM CLOSURE ACTIVITIES

Administrative Closure Procedures

- integrated activities needed to collect project records
- analyze project success or failure
- gather lessons learned
- archive project information for future use by organization

Contract Closure Procedures (from Procurement)

- closing all contracts
- product verification (confirm if all work is completed correctly and satisfactorily)
- Administrative closure (update & archive contract records)

CLOSE PROJECT OR PHASE

Inputs

- Project management plan
- Accepted deliverables
- Organizational process assets

Outputs

- Final product, service or result transition
- Organizational process assets (updates)

CLOSE PROJECT OR PHASE

INPUTS

Project Management Plan

Accepted Deliverables

Organizational Process Assets e.g. formal sign off forms

CLOSE PROJECT OR PHASE

TOOLS & TECHNIQUES

Expert Judgment

Analytical Techniques

Meetings

CLOSE PROJECT OR PHASE

OUTPUTS

- **Final Product, Service, or Result Transition**
  Formal acceptance/handover of the final product, service or result. Receipt of formal statement that contract terms have been met

- **Organizational Process Assets (updates)**