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## Guidance on project management

*Lignes directrices sur la gestion de projets*

ICS 03.100.40

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## Foreword

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ISO 21500 was prepared by Project Committee ISO/PC 236, *Project Management*.

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## Introduction

This International Standard provides generic guidance on the concepts and processes of project management that are important for and have impact on the achievement of projects.

The target readership for this standard are:

- senior managers and project sponsors so that they may better understand the principles and practice of project management to facilitate providing appropriate support and guidance to their project managers and the project teams;
- project managers and project team members so that they may have a common base of comparison of their project standards and practices with those of others; and
- developers of national or organizational standards for use in developing project management standards, which are consistent at a core level with those of others.

This International Standard is not intended to:

- replace a national standard or be used as such; or
- be used in any way for certification or regulatory purposes.

## 1 Scope

This International Standard provides overarching guidance for project management.

This International Standard may be used by any type of organization, including public, private or community organizations, and to any type of project, irrespective of complexity, size, or duration.

This International Standard provides a high-level description of the concepts and processes that are considered to form sound practice in project management.

This International Standard places projects in the context of programmes and project portfolios. It does not provide detailed guidance on the management of programmes and project portfolios. Topics pertaining to general management disciplines are addressed only as they relate to project management.

## 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 2.1 activity

identified component of work within a schedule that is required to be undertaken to complete a project

### 2.2 application area

category of projects that have a common focus related to a product, customer, or sector

### 2.3 baseline

reference basis for comparison against which project performance is monitored and controlled

**2.4  
change request**

documentation that defines a proposed alteration to the project

**2.5  
configuration management**

application of procedures to control technical specifications and attributes

**2.6  
control**

comparison of actual performance with planned performance, analyzing variances, and taking appropriate corrective and preventive action as needed

**2.7  
corrective action**

direction for modifying the performance of work to bring performance in line with the plan

**2.8  
critical path**

sequence of activities that determine the earliest possible completion date for the project

**2.9  
group dynamics**

describes the way a collection of individuals interact to make decisions or organize to undertake tasks

**2.10  
lag**

attribute applied to a logical relationship to delay the start or finish of an activity

**2.11  
lead**

attribute applied to a logical relationship to advance the start or finish of an activity

**2.12  
learning curve**

representation that depicts an improvement in the performance of a skill or task due to repetition of the task by the same person or team

**2.13  
project life cycle**

defined set of phases from the start to the end of the project

**2.14  
project manager**

individual responsible and accountable for achieving the requirements of the project

**2.15  
risk register**

record of identified risks including results of analysis and planned responses

**2.16  
stakeholder**

person or organization that can affect, be affected by, or perceive themselves to be affected by any aspect of the project

**2.17  
tender**

document in the form of an offer or statement of bid to supply a product or service usually in response to an invitation or request

**2.18  
work breakdown structure dictionary**

document that describes each component in the work breakdown structure

**3 Project management concepts****3.1 Overview**

This clause describes key concepts specific to projects to provide the context within which projects are performed.

Figure 1 shows how project management concepts relate to each other. The organizational strategy identifies the opportunities. The opportunities are evaluated and captured in the business case or other similar document. Selected opportunities can result in projects that provide deliverables. These deliverables can be used to realise benefits. The benefits can be an input to organizational strategy.

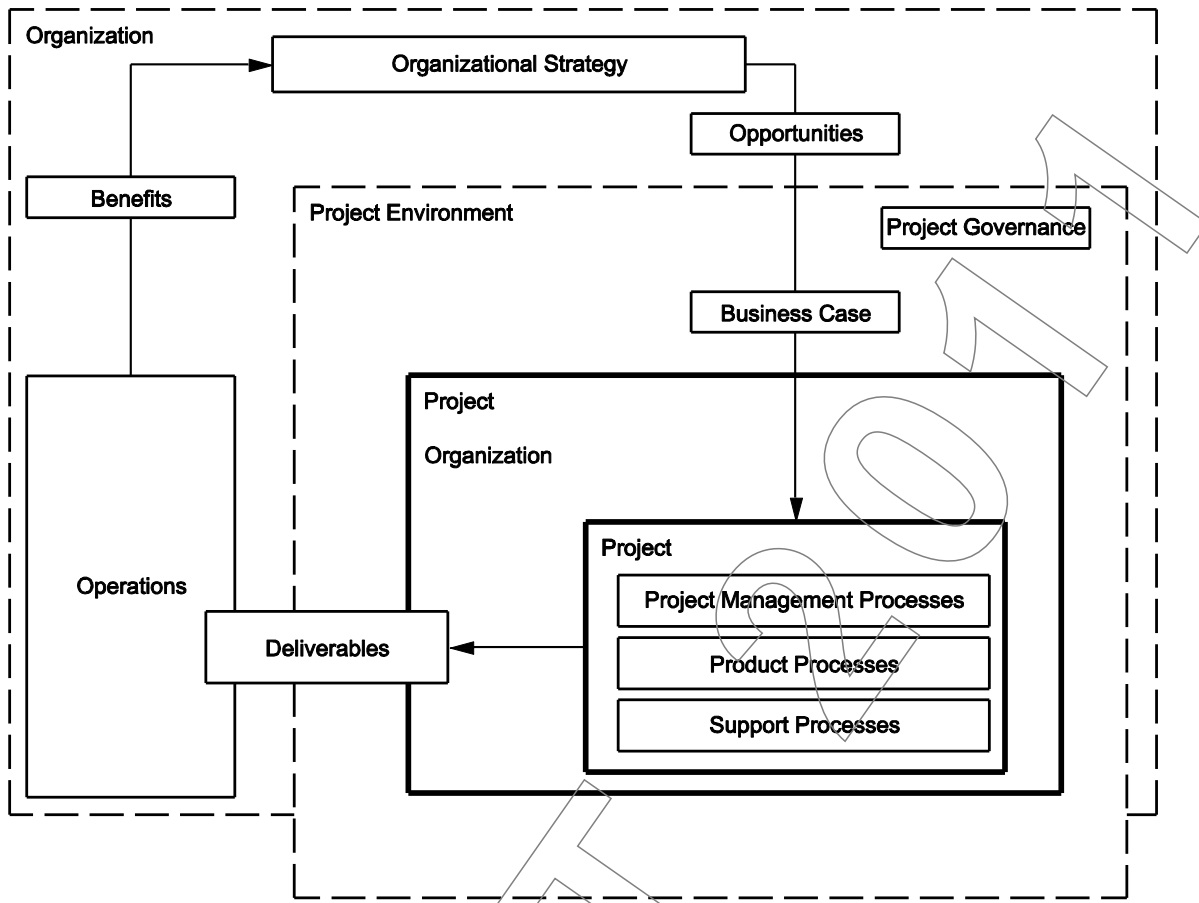


Figure 1 — Overview of project management concepts and their relationships

Figure Key:

- Boxes represent project management concepts introduced in the sections below
- Arrows represent a logical flow by which the concepts are connected
- Dotted lines represent organizational boundaries

### 3.2 Project

A project is a unique set of processes consisting of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective. Achievement of the project objective requires deliverables conforming to specific requirements, including multiple constraints such as time, cost and resources.

Although many projects may be similar, each project is unique as differences may occur in the deliverables provided by the project; the stakeholders influencing the project; the resources used; and the way processes are adapted to create the deliverables.

Every project has a definite start and end, and is usually divided into phases. The project starts and ends as defined in clause 4.3.1.

### 3.3 Project management

Project management is the application of methods, tools, techniques and competencies to a project. Project management includes the integration of the various phases of the project life cycle as described in clause 3.10. Project management is accomplished through processes.



The processes selected for use in a project should be aligned in a systemic view. Each phase of the project life cycle has deliverables. These deliverables are regularly reviewed during the project to meet the requirements of the sponsor, customer and other stakeholders.

### 3.4 Organizational strategy and projects

#### 3.4.1 Organizational strategy

Organizations establish strategy based on their mission, vision and policies. Projects are often the means to accomplish strategic goals. An example of a value creation framework is shown in Figure 2.

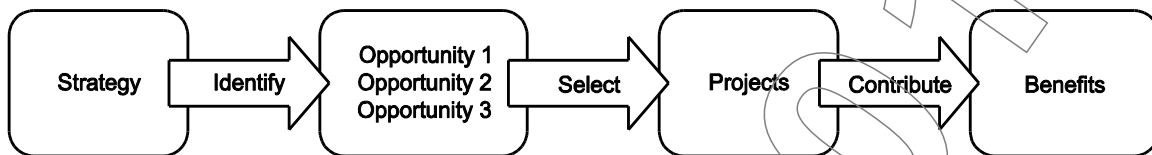


Figure 2 — An example of a value creation framework

Strategic goals may guide the development of opportunities. Opportunities selection includes consideration of various factors, such as how benefits can be realised and risks can be managed. The project goal is the measurable attribute of the selected opportunities. The project objective contributes to the project goal by creating the required deliverables. Project goals are achieved when the benefits are realised. Goals might not be achieved until a period of time after the objectives are achieved.

#### 3.4.2 Opportunity identification and project initiation

Based on the organization's current capabilities, it can develop a list of opportunities. These opportunities may be evaluated in order to support informed decision-making by responsible management to identify feasible projects that could transform some or all of these opportunities into realised benefits.

These opportunities may address, for example, a new market demand, a current organizational need, or a new legal requirement. The opportunities are often evaluated through a set of activities that provide formal authorisation to start a new project. It is common for the organization to identify or appoint a project sponsor to articulate project goals and benefits.

The goals and benefits may result in a justification for the investment in the project, for example in the form of a business case, and that may contribute to a prioritisation of all opportunities. The purpose of the justification is to obtain management commitment and approval for investment in the selected projects.

The evaluation process may include multiple criteria including financial investment appraisal techniques and qualitative criteria, for example strategic alignment, social impact and environment, and may differ from one project to another.

#### 3.4.3 Benefits realisation

Benefits realisation is the responsibility of the customer's organizational management, that may use the deliverables of the project to realise benefits in alignment with the organizational strategy. The project manager should consider the benefits and their realisation in so far as they influence decision-making throughout the project life cycle.

### 3.5 Project environment

#### 3.5.1 General

The project environment may impact project performance and success. The project team should consider the following:

- Factors outside the organizational boundary such as socio-economic, geographical, political, regulatory, technological and ecological.
- Factors within the organizational boundary such as strategy, technology, project management maturity and availability of resources, organizational culture and structure.

#### 3.5.2 Projects within the organizational boundary

A project usually exists within a larger organization encompassing other endeavours. In such cases there are relationships between the project and its environment, business planning and operations. Pre- and post-project activities may include activities such as preparing the business case, conducting feasibility studies and transition to operations. Projects may be organised within other related structures such as programmes and project portfolios. Figure 3 illustrates these relationships.

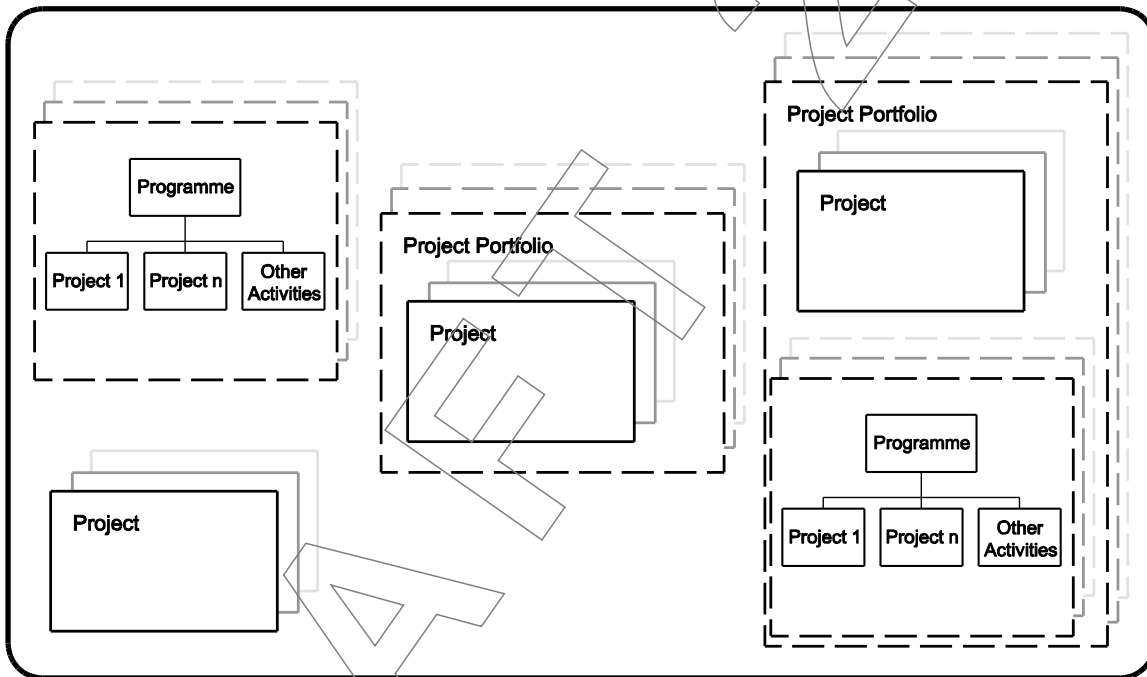


Figure 3 — Projects, programmes and project portfolios

##### 3.5.2.1 Project portfolio management

A project portfolio is a collection of projects and programmes and other work that are grouped together to facilitate the effective management of that work to meet strategic goals. Project portfolio management is the centralised management of one or more project portfolios, which includes identifying, prioritising, authorising, directing and controlling projects, programmes and other work to achieve specific strategic goals.

It may be appropriate to conduct the opportunity identification, selection, approval and management of projects through a project portfolio management system.

### 3.5.2.2 Programme management

A programme is a group of related projects and other activities aligned with an organizational strategy or with major goals. Programme management consists of centralised and coordinated activities to achieve the goals.

## 3.6 Project governance

Governance is the framework by which an organization is directed and controlled. Project governance is concerned with those areas of organizational governance that are specifically related to project activities.

Project governance includes aspects such as defining the management structure; the policies, processes and methodologies to be used; limits of authority for decision-making; stakeholder responsibilities and accountabilities; and interactions such as reporting and the escalation of issues or risks. The responsibility for maintaining the appropriate governance of a project is commonly assigned either to the project sponsor or to a project steering committee.

## 3.7 Projects and operations

Project management fits within the general framework of business and management, but is a management discipline that is differentiated from the management of an organization's operations by the temporary and unique nature of projects.

Organizations perform work to achieve specific goals. Generally this work may be categorised as either operations or projects. Operations and projects differ primarily in that operations are performed by relatively stable teams through ongoing and repetitive processes and are focused on sustaining the organization. Projects are performed by temporary teams, are non-repetitive and create original deliverables.

## 3.8 Stakeholders and Project Organization

The project stakeholders, including the project organization, should be described in sufficient detail to enable project success. The roles and responsibilities of stakeholders should be defined and communicated based on the organization and project goals. Typical project stakeholders are shown in Figure 4.

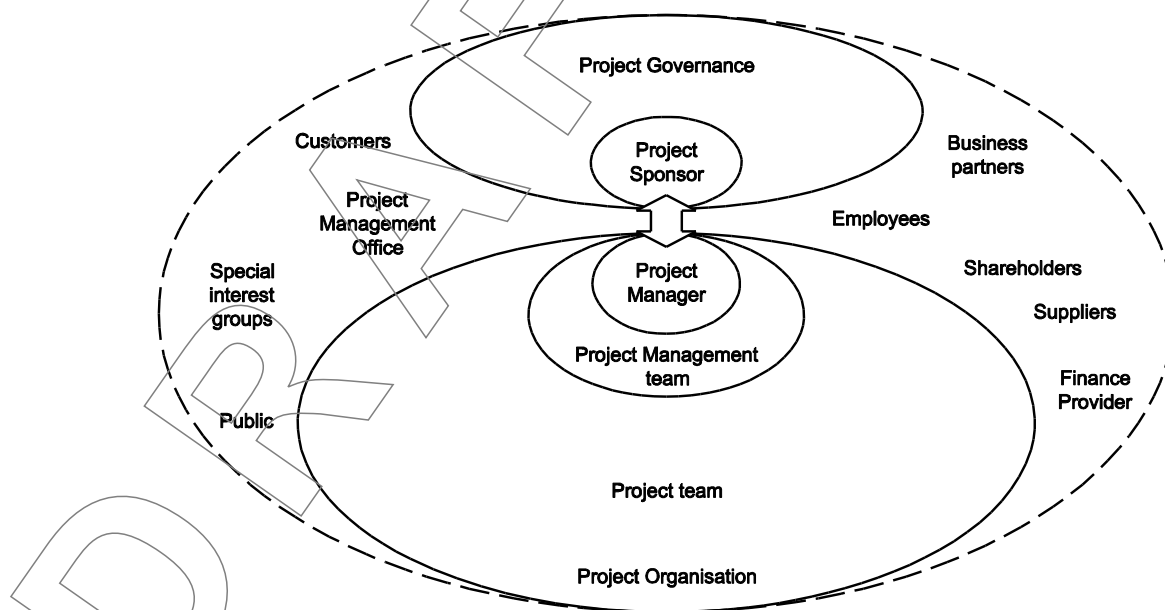


Figure 4 — Project Stakeholders

Stakeholder interfaces are managed within the project through the project management processes of clause 4.

The project organization is the temporary structure that includes project roles; responsibilities; and levels of authority and boundaries that need to be defined and communicated to all stakeholders of the project. The project organization may include the following:

- project manager - leads and manages project activities and completion of the project deliverables.
- project management team (optional) - supports the project manager in leading and managing the project activities and completion of the project deliverables.
- project team - contributes to the project success by performing specific project activities.

Project governance may involve the following:

- project sponsor - directs, justifies, authorises resources, facilitates and supports the project. Makes executive decisions and solves problems and conflicts that cannot be handled by the project manager.
- steering committee or board (optional) - contributes to the project by providing senior level guidance to the project.

Figure 4 also includes some additional stakeholders, for instance:

- customer or customer representative – contributes to the project by specifying project requirements and accepting the project deliverables.
- suppliers – contribute to the project by supplying resources to the project.
- project management office – may perform a wide variety of activities including governance, project management training, and project planning and monitoring.

### 3.9 Competencies of project personnel

People competent in project management principles and processes are required to successfully manage projects. Project personnel should be encouraged to develop and exhibit such competencies in order to achieve project objectives and goals.

Each project team requires competent individuals who are capable of applying their knowledge and experience in order to deliver the project deliverables. Any identified skills gap between the available and required competence levels of the project could introduce risk and should be addressed.

While detailed information regarding the breadth and depth of competencies is beyond the scope of this standard, project management competencies can be categorised into, but not limited to:

- technical competencies for delivering projects in a structured way, including the project management processes defined in this standard.
- behavioural competencies associated with personal relationships within the defined boundaries of the project.
- contextual competencies related to the management of the project within the organizational environment.

Competencies may be raised through professional development processes such as training, coaching and mentoring inside or outside an organization.

### 3.10 Project life cycle

Projects are usually organized into phases that are determined by governance and control needs. These phases follow a logical sequence, with a start and an end, and use inputs to produce deliverables. To ensure efficient management of the project during the entire project life cycle, a set of activities should be performed in each phase. Project phases divide the project into manageable sections, collectively known as the project life cycle.

The project life cycle spans the period from the start of the project to its planned end or its termination. The phases are divided by decision points, which can vary depending on the organizational environment. The decision points facilitate project governance. By the end of the last phase, the project should have provided all deliverables.

To manage a project throughout its life cycle, project management processes should be employed for the project as a whole, or for individual phases for each team or sub-project.

### 3.11 Project constraints

There are several types of constraints and it is important for a project manager to balance a particular constraint against the others, as constraints are often interdependent. The project deliverables should fulfil the requirements for the project and relate to any given constraints such as scope, quality, schedule and cost. Constraints are interrelated such that a change in one may affect one or more of the others. Hence, the constraints may have an impact on the decisions made within the project management processes.

Achievement of consensus among key project stakeholders on the constraints forms a strong foundation for project success.

There are many different constraints that may be imposed on a project. Some constraints could be:

- duration or target date for the project.
- budget of the project including all economic and financial means for acquisition.
- availability of project resources such as people, facilities, time, equipment, materials, tools and others required to carry out the project activities relating to the requirements of the project.
- factors related to safety of personnel.
- level of acceptable risk exposure.
- potential ecological impact of the project.
- laws, rules and other legislative requirements.

### 3.12 Relationship between concepts and processes

Project management is accomplished through processes utilising the concepts and competencies described above. A process is a set of interrelated actions and activities. Processes used in projects are generally categorised into three major types:

- project management processes, which are specific to project management, determine how the activities selected for the project are managed;
- product processes, which are not unique to project management, result in the specification and creation of a particular product, service, or result and vary depending on the particular project deliverable;
- support processes, which are not unique to project management, provide relevant and valuable support to product and project management processes in such disciplines as logistics, finance, accounting and safety.

This standard addresses only project management processes. However, it should be noted that product and support processes and project management processes often overlap and interact throughout a project.

## 4 Project management processes

### 4.1 Project management process application

This standard identifies the recommended project management processes to be used during a project as a whole, for individual phases or both. These project management processes are appropriate to projects in all organizations. Project management requires significant coordination and, as such, requires each process used to be appropriately aligned and connected with other processes to facilitate project success. Some processes may need to be iterated to fully define and meet stakeholder requirements and reach agreement on the project objectives.

Project managers, in conjunction with other project stakeholders, are advised to carefully consider the processes identified in clause 4.3 and apply them as a high-level guide to include those processes that are appropriate to the project and organizational needs.

The processes described in clause 4.3 need not be applied uniformly on all projects or all project phases. Therefore, the project manager should tailor the management processes for each project or project phase by determining what processes are appropriate and the degree of rigor to be applied for each process. This should be accomplished in collaboration with the project team and in accordance with the relevant organizational policies.

In order for a project to be successful, the project manager and project team should:

- select appropriate processes described in clause 4.3 that are required to meet the project objectives;
- use a defined approach to develop or adapt the product specifications and plans to meet the project objectives and requirements;
- comply with requirements to satisfy the project sponsor, customer and other stakeholders;
- define and manage the project scope within the constraints while considering the project risks and resource needs to produce the project deliverables;
- ensure proper support from each performing organization, including commitment from the customer, and project sponsor.

The project management processes in this standard are defined in terms of the purposes they serve, the relationships among the processes, the interactions within the processes, and the primary inputs and outputs associated with each process.

### 4.2 Process groups and subject groups

The project management processes may be viewed from two different perspectives: one for the management of the project described in clause 4.2.1 as process groups and one collecting the processes by subject described in clause 4.2.2 as subject groups. These two different groupings are shown in Table 1. The individual processes are described in some detail in clause 4.3. Each process is shown in the process group and subject group in which most of the activity takes place. For instance, when a process that normally takes place during planning is revisited or updated during implementing, the process is the same that was performed in planning, not an additional, new process.

Table 1 - Project management processes cross-referenced to Process and Subject Groups

Subject Groups	Process groups				
	Initiating	Planning	Implementing	Controlling	Closing
<b>Integration</b>	4.3.2 Develop Project Charter	4.3.3 Develop Project Plans	4.3.4 Direct Project Work	4.3.5 Control Project Work. 4.3.6 Control Changes	4.3.7 Close Project Phase or Project 4.3.8 Collect Lessons Learned
<b>Stakeholder</b>	4.3.9 Identify Stakeholders		4.3.10 Manage Stakeholders		
<b>Scope</b>		4.3.11 Define Scope 4.3.12 Create Work Breakdown Structure 4.3.13 Define Activities		4.3.14 Control Scope	
<b>Resource</b>	4.3.15 Establish Project Team	4.3.16 Estimate Resources 4.3.17 Define Project Organization	4.3.18 Develop Project Team	4.3.19 Control Resources 4.3.20 Manage Project Team	
<b>Time</b>		4.3.21 Sequence Activities 4.3.22 Estimate Activity Durations 4.3.23 Develop Schedule		4.3.24 Control Schedule	
<b>Cost</b>		4.3.25 Estimate Costs 4.3.26 Develop Budget		4.3.27 Control Costs	
<b>Risk</b>		4.3.28 Identify Risks 4.3.29 Assess Risks	4.3.30 Treat Risks	4.3.31 Control Risks	
<b>Quality</b>		4.3.32 Plan Quality	4.3.33 Perform Quality Assurance	4.3.34 Perform Quality Control	
<b>Procurement</b>		4.3.35 Plan Procurement	4.3.36 Select Suppliers	4.3.37 Administer Contracts	
<b>Communication</b>		4.3.38 Plan Communications	4.3.39 Distribute Information	4.3.40 Manage Communication	

NOTE: This table does not represent a chronological order

## **4.2.1 Process groups**

### **4.2.1.1 General**

Each process group consists of processes that are applicable to any project phase or project. These processes, further defined in terms of purpose, description and primary inputs and outputs in clause 4.3, are interdependent. They are also independent of application area or industry focus. Informative Annex A provides a depiction of the interactions of the individual processes in each process group mapped against the subject groups identified in clause 4.2.2.

Not all process interactions are shown in Annex A. The interactions shown represent one possible logical sequence of the processes. Process groups are not project life cycle phases.

### **4.2.1.2 Initiating process group**

The initiating processes are employed to start a project phase or project, to enable the purpose of the project phase or project to be defined, the objectives to be specified and the project manager to be authorised to proceed with the project work.

### **4.2.1.3 Planning process group**

The planning processes are employed for detailed project planning and for setting the baselines against which project implementation should proceed and project performance should be measured.

### **4.2.1.4 Implementing process group**

The implementing processes are employed to accomplish the project management activities to support the production of the project's deliverable(s) according to the project plans.

### **4.2.1.5 Controlling process group**

The controlling processes are employed to monitor, measure, and control the project's performance against the project plan so that preventive and corrective actions may be taken and change requests made when they are necessary to ensure the project objectives are achieved.

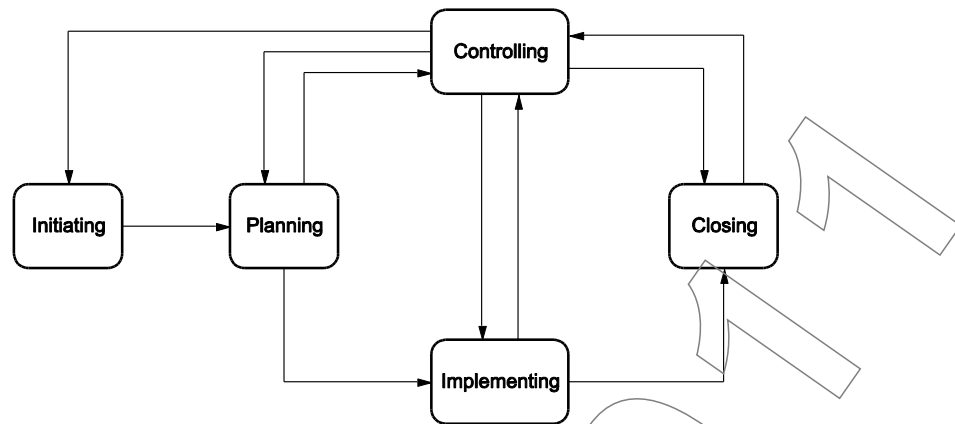
### **4.2.1.6 Closing process group**

The closing processes are employed to establish formally that the project phase or project is finished and to provide lessons learned to be considered and implemented as appropriate.

### **4.2.1.7 Project management process group interrelationships and interactions**

The management of a project starts with the initiating process group and finishes with the closing process group. The interdependency between process groups requires the controlling process group to interact with every other process group as shown in Figure 5. Process groups are seldom either discrete or one-time in their application.





**Figure 5 – Process groups interactions**

The process groups are normally repeated within each project phase to drive the project to completion effectively. However, just as not all of the processes may always be needed on all projects, not all of the interactions may apply to all project phases or all projects. In practice, processes are often undertaken concurrently, overlapping and interacting in ways that are not shown here.

Figure 6 elaborates on Figure 5 to show the interactions among the process groups within the boundaries of the project including the main inputs and outputs of processes within the process groups. With the exception of the controlling process group, linkages between the various process groups are through individual constituent processes within each process group. While linkage is shown in Figure 6 between the controlling process group and other process groups, the controlling process group may be considered self-standing because its processes are employed to control not only the overall project but also the individual process groups.

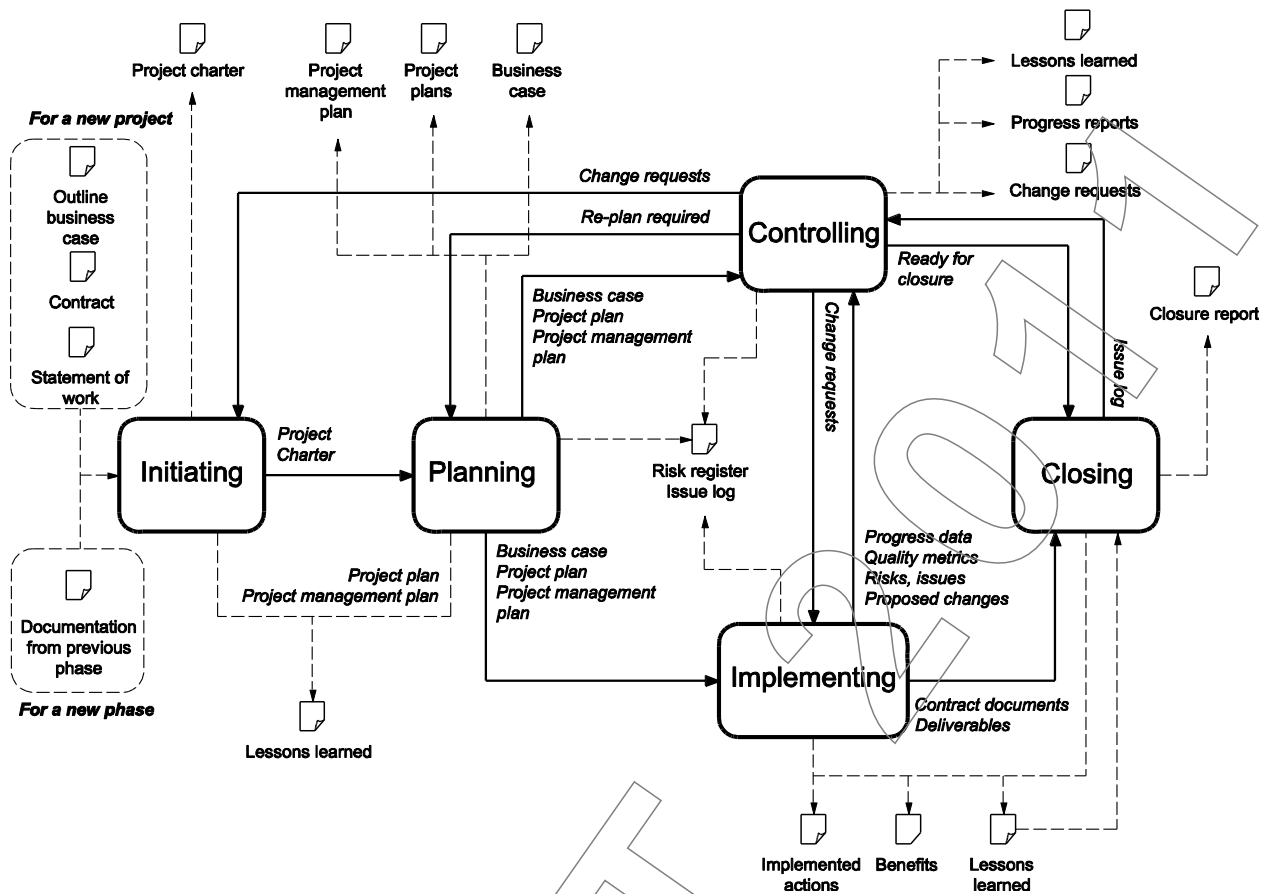



Figure 6 – Process groups' interactions showing main inputs and outputs

**Key:**  
 Key project information  
 --- Information passing between process areas

## 4.2.2 Subject groups

### 4.2.2.1 General

Each subject group consists of processes that are applicable to any project phase or project. These processes are defined in terms of purpose, description and primary inputs and outputs in clause 4.3 and are interdependent. They are independent of application area or industry focus.

Annex A provides a depiction of the interactions of the individual processes in each process group identified in clause 4.2.1 mapped against the subject groups.

### 4.2.2.2 Integration

The integration subject group includes those processes required to identify, define, combine, unify, coordinate, control and close the various activities and processes related to the project

### 4.2.2.3 Stakeholder

The stakeholder subject group includes the processes for identifying and engaging the project sponsor, customer and other stakeholders to understand their needs and requirements, manage their expectations and address their issues as they occur.

#### **4.2.2.4 Scope**

The scope subject group includes the processes required to ensure that the project includes all the work, and only the work and deliverables required and specified, in order to reach the project objectives, thus to complete the project successfully.

#### **4.2.2.5 Resource**

The resource subject group includes the processes required to ensure the project has adequate human resources, materials, facilities, infrastructure and other resources to achieve the project objectives.

#### **4.2.2.6 Time**

The time subject group includes the processes required to schedule the project activities, to monitor progress and to achieve scheduled completion of the project.

#### **4.2.2.7 Cost**

The cost subject group includes the processes required to establish the budget, to control costs and to complete the project within budget.

#### **4.2.2.8 Risk**

The risk subject group includes the processes required to maximise the probability of achieving the project objectives through proactive management of threats and opportunities.

#### **4.2.2.9 Quality**

The quality subject group includes both deliverable and project quality. It includes the processes required to ensure that the project deliverables; the project management processes and their outputs meet the stated requirements.

#### **4.2.2.10 Procurement**

The procurement subject group includes the processes required to purchase or acquire products, services or results in order to complete the project.

#### **4.2.2.11 Communication**

The communication subject group includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval, and ultimate disposition of project information.

### **4.3 Processes**

#### **4.3.1 General**

This clause describes each of the project management processes in terms of the purpose, description, primary inputs and primary outputs. Note that in Tables 2 through 40, only the most common primary inputs and outputs, are shown without an indication of their importance or sequence. Artefacts are updated by the process that originated them.

Some project-related processes may be accomplished external to the project's boundaries as shown in Figure 6, through an organization's policy, programme, portfolio, or other such means. Examples include conducting initial feasibility studies, business case development, project selection processes prior to the actual start of project work and lessons learned from previous projects. Although the inclusion or exclusion of these types of processes within

the project boundaries is at the discretion of the individual organizations, for the purposes of this International Standard the following assumptions are made:

- a project starts when the performing organization completes the appropriate organizational project selection processes and mandates a new project to be initiated;
- a project ends when the project deliverable(s) has (have) been accepted, or the project has been prematurely terminated, and all project documentation is delivered and all closure activities have been completed.

The processes are presented in this standard as separate elements with well-defined interfaces. In practice they overlap and interact in systemic ways that cannot be completely detailed in section 4. It is recognized that there is more than one way to manage a project, depending on factors such as the objectives that are required to be accomplished, risk, size, timeframe, the project team's experience, access to resources, amount of historical information, the organization's project management maturity, and industry and application area requirements.

**4.3.2 Develop project charter**

The purpose of **Develop project charter** is to formally authorise a project or a new project phase, identify the project manager and the appropriate project manager responsibilities and authorities, and document the business needs, objectives, expected results and the economic aspects of the project.

The business case should include not only the financial analysis of the cost and benefits of the project, but also how the project aligns with the strategies, goals and objectives of the business. The business case should be reassessed throughout the project as conditions change, and the results should be communicated to the project sponsor since the sponsor may affect the continuation or termination of the project or phase.

The project charter links the project to the strategic objectives of the organization and should identify any appropriate terms of reference, obligations, assumptions and constraints.

The primary inputs and outputs are listed in Table 2.

**Table 2 — Develop project charter: primary inputs and outputs**

Primary Inputs	Primary Outputs
— Project statement of work, contract, business case or previous phase documents	— Project charter

**4.3.3 Develop project plans**

The purpose of **Develop project plans** is to document: why the project is being undertaken; what is to be created by whom; how it will be created; what it will cost; and how the project is to be implemented, controlled and closed. Project plans normally consist of the business case, the project plan and the project management plan. These plans may be separate documents or may be combined into one document, but regardless of which option is chosen, the project plans should reflect the integration of scope, time, cost, and other items as appropriate.

The project management plan is a document or set of documents that defines how the project is undertaken, monitored and controlled. The project management plan may be applied to the entire project as a whole or to some aspect of the project through subsidiary plans, such as a risk management plan and quality management plan. Typically the project management plan defines the roles, responsibilities, organization and procedures for the management of risk, issues, change control, schedule, costs, communications, configuration management, quality, health, environment, safety and other items as needed.

The project plan contains baselines for carrying out the project, for example in terms of scope, quality, schedule, costs, resources and risks. All aspects of the project plan should be consistent and fully integrated. The project plan should include outputs of all relevant project planning processes and the actions necessary to define,

integrate and coordinate all appropriate efforts for implementing, controlling and closing the project. The project plan content will vary depending on the application area and complexity of the project. At the discretion of the performing organization, through coordination with the appropriate project stakeholders, the project plan may be either a detailed document or a summary level document referencing any appropriate subsidiary plans, such as scope plan, and schedule. If a summary level project plan is used, it should describe how the management of the individual subsidiary plans would be integrated and coordinated. The project plan should always be updated and communicated to appropriate stakeholders throughout the project. However, it may start as a high level plan. This process progressively reworks the plan from initial high level allocations of scope, budget, resource, schedule, and other items, into more detailed and tightly allocated packages of work which provide for the necessary level of management insight and control as is warranted by the project risk.

The primary inputs and outputs are listed in Table 3.

**Table 3 — Develop project plans: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project charter</li> <li>— Subsidiary plans</li> <li>— Lessons learned from previous projects</li> <li>— Business case</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Project plan</li> <li>— Project management plan</li> <li>— Subsidiary plans</li> </ul>

NOTE: In the remainder of this document “Project plans” is used to represent all plans in clause 4.3.3.

#### 4.3.4 Direct project work

The purpose of **Direct project work** is to manage the performance of the work as defined in the project plans to create the approved project deliverable(s). **Direct project work** is the management interface between the project sponsor, project manager and project team ensuring that the work undertaken by the team can be integrated into subsequent project work or the final project deliverables.

The project manager should direct the performance of the planned project activities and manage the various technical, administrative and organizational interfaces within the project.

The deliverables are the result of the integrated processes performed as defined in the project plans. Information on the status of the deliverables is collected as part of **Distribute information** (4.3.39).

The primary inputs and outputs are listed in Table 4.

**Table 4 — Direct project work: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Progress data</li> <li>— Issues log</li> <li>— Lessons learned</li> </ul>

**4.3.5 Control project work**

The purpose of **Control project work** is to assure that project activities are completed in an integrated manner in accordance with the project plans.

**Control project work**, which is to be performed throughout the project, is an aspect of project management including measuring performance, assessing measurements and trends that may affect process improvement and triggering process changes to improve performance. The continuous application of **Control project work** provides project stakeholders, including the project sponsor, project manager and project team with an accurate and current description of project performance.

The primary inputs and outputs are listed in Table 5.

**Table 5 — Control project work: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Progress data</li> <li>— Quality control measurements</li> <li>— Risk register</li> <li>— Issues log</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> <li>— Forecasts</li> <li>— Progress reports</li> <li>— Project handover reports</li> </ul>

**4.3.6 Control changes**

The purpose of **Control Changes** is to control all changes to the project and deliverables and to formalise acceptance or rejection of these changes before subsequent implementation.

Throughout the project it is necessary to record change requests in a change register, evaluate them in terms of benefit, scope, resources, time, cost, quality and risk, assess the impact and benefit and obtain approval prior to implementation. A proposed change may be modified or even cancelled in light of the impact assessment. Once the change has been approved, the decision should be communicated to all the relevant stakeholders for implementation, including updating of project documentation as appropriate. Changes to deliverables should be controlled, if required, through configuration management.

The primary inputs and outputs are listed in Table 6.

**Table 6 — Control changes: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Change requests</li> </ul>	<ul style="list-style-type: none"> <li>— Approved changes</li> <li>— Change register</li> </ul>

**4.3.7 Close project phase or project**

The purpose of **Close project phase or project** is to verify the desired completion of all project processes and activities in order to close a project phase or a project.

All processes and activities should be verified to ensure that the desired results of the project phase or project were obtained or delivered and all of the defined project management processes were completed appropriately. All project documents should be collected and archived according to the prevailing quality standards and all project personnel and resources should be released.

A project may need to be terminated prior to completion if the customer no longer requires the project deliverables, or if it becomes obvious that some or all of the goals and objectives cannot be met. Unless special grounds exist, terminating a project should comprise the same activities as closing a project, even though there may not be a deliverable to release to the customer. All the documentation for a terminated project should also be collected and archived according to the prevailing requirements.

The primary inputs and outputs are listed in Table 7.

**Table 7 — Close project phase or project: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Progress reports</li> <li>— Project handover reports</li> <li>— Project handover certificate</li> </ul>	<ul style="list-style-type: none"> <li>— Completed contracts</li> <li>— Project or phase closure report</li> <li>— Released resources</li> </ul>

#### 4.3.8 Collect lessons learned

The purpose of **Collect lessons learned** is to evaluate the project and collect experiences to benefit current and future projects.

The purpose of evaluating the project management effort is to let the project management team evaluate the management focuses, methods, tools and style and use the result for updating the plans for managing the project.

Throughout the project, the project team and key stakeholders identify lessons learned concerning the technical, managerial and process aspects of the project. The lessons learned should be captured, compiled, formalised, stored, disseminated and used throughout the project. Therefore, at some level lessons learned may be outputs to every project management process and may result in updated project plans.

The primary inputs and outputs are listed in Table 8.

**Table 8 — Collect lessons learned: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Progress reports</li> <li>— Approved changes</li> <li>— Lessons learned</li> <li>— Issues log</li> <li>— Risk register</li> </ul>	<ul style="list-style-type: none"> <li>— Lessons learned document</li> </ul>

#### 4.3.9 Identify stakeholders

The purpose of **Identify stakeholders** is to determine the individuals, groups or organizations impacted by or impacting the project and to document relevant information regarding their interest and involvement.

Stakeholders may be actively involved in the project and may be internal or external to the project, and may be at varying authority levels. For further information see clause 3.8.

The primary inputs and outputs are listed in Table 9.

**Table 9 — Identify stakeholders: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project charter</li> <li>— Project organization chart</li> </ul>	<ul style="list-style-type: none"> <li>— Stakeholder register</li> </ul>

#### 4.3.10 Manage stakeholders

The purpose of **Manage stakeholders** is to ensure appropriate attention is given to stakeholders. From this analysis prioritised stakeholder management and communication plans may be developed.

Manage stakeholders includes such activities as understanding their expectations, addressing concerns, and resolving issues.

Diplomacy and tact are essential when negotiating with contra stakeholders. When it is not possible for the project manager to resolve stakeholder issues it may be necessary to escalate the issue in accordance with the project organization to a higher authority, or elicit the assistance of external individuals.

To enable the project manager to take maximum advantage of the contribution to the project from the pro stakeholders and counter the effect of the contra stakeholders, a detailed analysis should be made of these stakeholders and the impact they might have on the project.

The primary inputs and outputs are listed in Table 10.

**Table 10 — Manage stakeholders: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Stakeholder register</li> <li>— Project plans</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> </ul>

#### 4.3.11 Define scope

The purpose of **Define scope** is to achieve clarity of the project scope including deliverables, requirements, and boundaries by defining the end state of the project.

The definition of project scope makes clear what the project will contribute to the strategic goals of the company or organization. A detailed project scope statement should be used as the basis for future project decisions, as well as for communicating the importance of the project and the benefits that will be obtained by carrying out the project successfully. A detailed scope statement, including project objectives and included in the scope plan, should be used as the basis for future project decisions, as well as for communicating the importance of the project and the benefits that will be obtained by carrying out the project successfully.

The primary inputs and outputs are listed in Table 11.

**Table 1 — Define scope: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project charter</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Scope statement</li> <li>— Requirements</li> </ul>



#### 4.3.12 Create work breakdown structure

The purpose of **Create work breakdown structure** is to produce a hierarchical decomposition framework for presenting the work that needs to be completed to accomplish the project objectives.

The work breakdown structure provides a framework for dividing and subdividing the project work into smaller and thus more manageable pieces of work. The work breakdown structure can be structured for example in project phases, major deliverables, discipline, and location. Each descending level of the work breakdown structure describes project work in an increasingly detailed level. It is possible to develop a framework for methodically assessing the project's products, organization, risk and cost accounting needs and establishing related hierarchical breakdown structures.

The primary inputs and outputs are listed in Table 12.

**Table 12 — Create work breakdown structure: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Requirements</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Work breakdown structure</li> <li>— Work breakdown structure dictionary</li> </ul>

#### 4.3.13 Define activities

The purpose of **Define activities** is to identify, define and document all the specific activities that need to be performed to accomplish the project objectives.

**Define activities** should include the processes necessary for identifying, defining and documenting the work that needs to be performed at a detailed level. The **Define activities** process starts at the work breakdown structure's lowest level. **Define activities** identifies, defines and documents the work through the use of smaller components called activities to provide a base for a range of project planning, implementing, controlling and closing work.

The primary inputs and outputs are listed in Table 13.

**Table 2 — Define activities: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Work breakdown structure</li> <li>— Work breakdown structure dictionary</li> <li>— Project plans</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Activity list</li> </ul>

#### 4.3.14 Control scope

The purpose of **Control scope** is to maximise positive and minimise negative project impacts created by scope changes.

**Control scope** should focus on determining the present project scope status, comparing the present scope status to the approved baseline scope to determine any variance, forecasting projected future scope at completion and implementing any appropriate change requests to avoid adverse scope impacts.

The **Control scope** process is also concerned with influencing the factors that create scope changes and controlling the impact of those changes on the project objectives. **Control scope** is used to ensure that all change requests are processed through **Control changes**; see clause 4.3.6. **Control scope** is also used to manage the actual changes, and is integrated with the other control processes. Uncontrolled changes are often referred to as project scope creep.

The primary inputs and outputs are listed in Table 14.

**Table 14 — Control scope: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Progress data</li> <li>— Scope statement</li> <li>— Work breakdown structure</li> <li>— Activity list</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> </ul>

**4.3.15 Establish project team**

The purpose of **Establish project team** is to obtain the human resources needed to complete the project.

The project manager should determine how and when project team members are to be acquired as well as how and when they will be released from the project. When human resources are not available within the organization consideration should be given to hiring additional resources or subcontracting work to another organization. The work location, commitment, roles and responsibilities, as well as reporting and communication requirements, should be established.

The project manager may or may not have absolute control over the selection of the project team members, but the project manager should be involved in their selection. The project manager, when possible, should take into consideration factors such a skills and expertise, different personalities, and group dynamics when establishing the project team. Because projects are typically performed in a changing environment, the **Establish project team** process is normally performed continuously throughout the project.

The primary inputs and outputs are listed in Table 15.

**Table 3 — Establish project team: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Resource requirements</li> <li>— Project organization chart</li> <li>— Resource availability</li> <li>— Project plans</li> <li>— Role descriptions</li> </ul>	<ul style="list-style-type: none"> <li>— Staff assignments</li> <li>— Staff contracts</li> </ul>

**4.3.16 Estimate resources**

The purpose of **Estimate resources** is to determine the human resources, equipment, materials and facilities needed for each activity in the activity list.

Using the available information **Estimate resources** should address the human resources together with their expected productivity rates based on their skills and expertise. The results should be recorded in quantity or size, attributes and origin, and indications when their engagement on the project starts and ends.

The primary inputs and outputs are listed in Table 16.

**Table 16 — Estimate resources: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Activity list</li> <li>— Project plans</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Resource requirements</li> <li>— Resource plan</li> </ul>

#### 4.3.17 Define project organization

The purpose of **Define project organization** is to secure all needed commitments from all the parties involved in a project. Roles, responsibilities and authorities that are relevant to the project should be defined for the project according to its nature and complexity and should consider the performing organization's existing policies.

The definition of the project organizational structure includes the identification of all project team members and other persons directly involved in the project work.

**Define project organization** includes the assignment of project responsibilities and authorities. These responsibilities and authorities may be defined at the project level, work packages level, or at the activity level. Those definitions usually include responsibilities to perform the approved work, responsibilities to manage the project progress and the resources allocated to the project.

The primary inputs and outputs are listed in Table 17.

**Table 17 — Define project organization: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Work breakdown structure</li> <li>— Resource requirements</li> <li>— Stakeholder register</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Role descriptions</li> <li>— Project organization chart</li> </ul>

#### 4.3.18 Develop project team

The purpose of **Develop project team** is to improve the capabilities and the interaction of project team members in a continuing manner to enhance their motivation and the team's performance on the project.

**Develop project team** depends on the existing competences of the project team. Ground rules of acceptable behaviour should be established early in the project to minimise misunderstandings and conflicts.

The primary inputs and outputs are listed in Table 18.

**Table 18 — Develop project team: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Staff assignments</li> <li>— Resource availability</li> <li>— Resource plan</li> <li>— Role descriptions</li> </ul>	<ul style="list-style-type: none"> <li>— Team performance</li> <li>— Team appraisals</li> </ul>

**4.3.19 Control resources**

The purpose of **Control resources** is to ensure that the resources required to undertake the project work are available and assigned in the manner required to meet the project requirements.

Conflicts in availability of certain resources may occur due to unavoidable circumstances such as equipment failure, weather, labour unrest, or technical problems. Such circumstances may require rescheduling of activities that may shift remaining resource requirements for current or subsequent activities. Procedures should be established to identify such shortages in a proactive manner to facilitate the reallocation of resources.

The primary inputs and outputs are listed in Table 19.

**Table 19 — Control resources: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Staff assignments</li> <li>— Resource availability</li> <li>— Progress data</li> <li>— Resource requirements</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

**4.3.20 Manage project team**

The purpose of **Manage project team** is to optimise team performance, provide feedback, resolve issues, encourage communication, and coordinate changes to achieve project success.

As a result of managing the project team, the resource requirements may be revised; in addition, issues should be raised and input provided for organizational personnel performance appraisals and project lessons learned.

The primary inputs and outputs are listed in Table 20.

**Table 20 — Manage project team: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Project organization chart</li> <li>— Role descriptions</li> <li>— Progress data</li> </ul>	<ul style="list-style-type: none"> <li>— Staff performance</li> <li>— Staff appraisals</li> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

#### 4.3.21 Sequence activities

The purpose of **Sequence activities** is to identify and document the logical relationships between project activities.

All activities within the project are linked with dependencies to produce a network diagram such that the critical path may be determined. Activities should be logically sequenced with proper precedence relationships and appropriate leads, lags, constraints, interdependencies and external dependencies to support development of a realistic and achievable project schedule.

The primary inputs and outputs are listed in Table 21.

**Table 21 — Sequence activities: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Activity list</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Activity sequence</li> </ul>

#### 4.3.22 Estimate activity durations

The purpose of **Estimate activity durations** is to estimate the number of work periods required to complete each activity in the project.

Activity durations are a function of such issues as quantity and type of resources available, relationship between activities, capacities, planning calendars, learning curves, and administrative processing. Administrative processing may affect such activities as approval cycles. Future activities, planning packages, may represent aggregates of effort that will be broken down into more detail as time progresses and more detailed information becomes available. Durations most frequently represent a trade-off between time constraints and resource availability. Periodic re-estimates that result in periodic reforecasting against the baseline is also a component of this process.

Activity duration estimates may need to be revisited once the activities are scheduled and the critical path is identified. If the critical path reveals a completion date of the project later than the required completion date, activities on the critical path may have to be adjusted.

The primary inputs and outputs are listed in Table 22.

**Table 22 — Estimate activity durations: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Activity list</li> <li>— Resource requirements</li> <li>— Historical data</li> <li>— Industry standards</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Activity duration estimates</li> </ul>

#### 4.3.23 Develop schedule

The purpose of **Develop schedule** is to calculate the start and finish times of the project activities and establish the overall project schedule baseline.

All elements of the work are scheduled in a logical sequence that identifies durations, milestones and interdependencies to produce a network.

The activity level provides sufficient resolution for management control throughout the project life cycle. The schedule provides a vehicle for evaluating actual progress in time against a predefined objective measurement of achievement.

The schedule is established at the activity level, which provides the basis for assigning resources and developing the time-phased budget. Schedule development should continue throughout the project as work progresses, as the project plans change, as anticipated risk events occur or disappear and as new risks are identified. Duration and resource estimates should be reviewed and revised if necessary to develop an approved project schedule that can serve as the baseline against which progress may be tracked.

The primary inputs and outputs are listed in Table 23.

**Table 23 — Develop schedule: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Activity sequence</li> <li>— Activity duration estimates</li> <li>— Schedule constraints</li> <li>— Risk register</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Schedule</li> </ul>

**4.3.24 Control schedule**

The purpose of **Control schedule** is to monitor schedule variances and to take appropriate actions.

**Control schedule** should focus on determining the current status of the project schedule, comparing it to the approved baseline schedule to determine any variance, forecasting projected future completion dates and implement any appropriate actions to avoid adverse schedule impacts. All changes to the baseline schedule should be managed through **Control changes**; see clause 4.3.6. Forecasts of schedules at completion should be routinely developed and updated based on past trends and current knowledge.

The primary inputs and outputs are listed in Table 24.

**Table 4 — Control schedule: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Schedule</li> <li>— Progress data</li> <li>— Project plans</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

**4.3.25 Estimate costs**

The purpose of **Estimate costs** is to obtain an approximation of the costs of all the resources needed to complete each project activity and the cost of the project as a whole.

Cost estimates can be expressed in terms of units of measure such as labour hours or number of equipment hours or in currency valuations. When expressed in currency, factors that take into account the time value of

money may be employed when the project performance is expected to span long periods of time. Learning curves may be employed when the project includes a number of repetitive and sequential activities. Projects dealing in more than one currency should identify the exchange rates used in costing the project plan.

Reserves or contingency estimates are used to deal with risks or uncertainties and should be added to the project cost estimates and clearly identified.

The primary inputs and outputs are listed in Table 25.

**Table 25 — Estimate costs: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Work breakdown structure</li> <li>— Project plans</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Cost estimates</li> <li>— Cost plan</li> </ul>

#### 4.3.26 Develop budget

The purpose of **Develop budget** is to distribute the project's budget to individual project activities or work packages.

The assignment of budgets to scheduled segments of work produces a plan against which actual performance can be compared. Maintaining realistic budgets, directly tied to an established scope of work, is essential for each organization responsible for performing project effort. The budgets are normally distributed in the same manner in which the project estimate was derived. Project cost estimating and project budgeting are closely linked. Cost estimating determines the total cost of the project, whereas budgeting identifies where and when costs will be expended and establishes a means whereby performance can be managed.

Objective measures of cost performance should be established in the budgeting process. Objective measurement tools allow for work to be measured in a clear and unequivocal manner. Setting the objective measures in advance of cost performance assessments enhances accountability and objectivity.

Contingency or reserve items not assigned to activities or other work scope may be created and employed for management control purposes or to cover identified risks. Such items and the associated risk should be clearly identified.

The primary inputs and outputs are listed in Table 26.

**Table 26 — Develop budget: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Work breakdown structure</li> <li>— Cost estimates</li> <li>— Schedule</li> <li>— Project plans</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Budget</li> </ul>

#### 4.3.27 Control costs

The purpose of **Control costs** is to monitor cost variances and to take appropriate actions.

The process of **Control costs** should focus on determining the present project cost status, comparing it to the baseline costs to determine any variance, forecasting projected costs at completion and implementing any appropriate preventive or corrective actions to avoid adverse cost impacts. All changes to the baseline costs should be managed through **Control changes**; see clause 4.3.6. Once work is started, performance data is accumulated including budgeted costs, actual costs and estimated cost at completion. In order to evaluate cost performance it is necessary to accumulate scheduling data, such as the progress of scheduled activities and the forecasted completion dates of current and future activities. Variances might arise from poor planning, unforeseen scope changes, technical problems, equipment failures or other exogenous factors such as supplier difficulties. Regardless of the cause, corrective actions require either a change in the cost baseline or the development of a short-term recovery plan.

The primary inputs and outputs are listed in Table 27.

**Table 27 — Control costs: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Progress data</li> <li>— Project plans</li> <li>— Budget</li> </ul>	<ul style="list-style-type: none"> <li>— Actual costs</li> <li>— Forecasted costs</li> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

**4.3.28 Identify risks**

The purpose of **Identify risks** is to determine potential risk events and their characteristics that, if they occur, may have a positive or negative impact on the project objectives.

**Identify risks** is an iterative process because new risks may become known or risks may change as the project progresses through its life cycle. Risks with a potential negative impact to the project are referred to as “threats”, and risks with a potential positive impact on the project are referred to as “opportunities”. All identified risks should be addressed according to the criteria described in **Treat risks**; see clause 4.3.30.

**Identify Risks** should involve multiple participants, typically the project customer, project sponsor, project manager, project team members, executive managers, users, risk management experts, other members of the steering committee and subject matter experts.

The primary inputs and outputs are listed in Table 28.

**Table 6 — Identify risks: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> </ul>	<ul style="list-style-type: none"> <li>— Risk register</li> </ul>

**4.3.29 Assess risks**

The purpose of **Assess risks** is to measure and prioritise the identified risks for further action, such as the preparation of risk response plans.

**Assess risks** includes estimating the probability of occurrence of each identified risk and the corresponding consequence on objectives, if the risk does occur. The risks are then prioritised in accordance with this assessment considering other factors such as the timeframe and key stakeholders’ risk tolerance.



Risk assessment is an ongoing process throughout the project through **Control risks**; see clause 4.3.31. Trends can indicate the need for more or less risk management action.

The primary inputs and outputs are listed in Table 29.

**Table 29 — Assess risks: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Risk register</li> <li>— Project plans</li> </ul>	<ul style="list-style-type: none"> <li>— Prioritised risks</li> </ul>

#### 4.3.30 Treat risks

The purpose of **Treat risks** is to develop options and determine actions to enhance opportunities and reduce threats to the project's objectives.

**Treat risks** addresses the risks by their impact by inserting resources and activities into the budget and schedule. Risk treatment should be appropriate to the risk, cost-effective in meeting the challenge, timely, realistic within the project context, understood by all parties involved and assigned to an appropriate person.

Risk treatment includes measures to mitigate the risk, to deflect the risk, or to develop contingency plans to be used if the risk occurs.

The primary inputs and outputs are listed in Table 30.

**Table 30 — Treat risks: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Risk register</li> <li>— Project plans</li> </ul>	<ul style="list-style-type: none"> <li>— Risk responses</li> <li>— Change requests</li> </ul>

#### 4.3.31 Control risks

The purpose of **Control risks** is to minimise disruption to the project by determining whether the risk responses are executed and whether they have the desired effect.

It is achieved by keeping track of the identified risks, identification and analysis of newly arising risks, monitoring trigger conditions for contingency plans and reviewing progress on risk responses, while evaluating their effectiveness.

Project risks should be periodically evaluated throughout the project life cycle, when a new risk arises or when a milestone is reached.

The primary inputs and outputs are listed in Table 31.

**Table 31 — Control risks: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Risk register</li> <li>— Progress data</li> <li>— Project plans</li> <li>— Risk responses</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

**4.3.32 Plan quality**

The purpose of **Plan quality** is to determine the quality requirements and standards that will be applicable to the project, the deliverable(s) of the project, and how the requirements and standards will be met based on the project objectives.

**Plan quality** includes:

- determining and agreeing with the project sponsor and other stakeholders on the objectives and relevant standards to be achieved;
- establishing the tools, procedures, techniques and resources necessary to achieve the relevant standards;
- determining methodologies, techniques and resources required to implement the planned systematic quality activities;
- developing the quality plan which includes type of reviews, responsibilities and participants in a timetable in accordance with the project overall schedule; and
- consolidating all quality information in the quality plan, which is included in the project plans.

Due to the temporary nature of projects and their limited life and time constraints, most projects do not have the ability to develop quality standards. Development and organizational acceptance of quality standards and product quality parameters are normally outside of the project boundaries. This acceptance is normally the responsibility of the performing organization and serves as input to **Plan quality**. The term “quality plan” refers to a set of documents that gives evidence that the specified quality systems and procedures for the product and project are actually being implemented and that the specified quality standards for the project will be met. The quality plan should refer to or include the quality policy as established by senior management.

The primary inputs and outputs are listed in Table 32.

**Table 32 — Plan quality: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Quality requirements</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Quality plan</li> <li>— Quality management plan</li> </ul>

**4.3.33 Perform quality assurance**

The purpose of **Perform quality assurance** is to ensure that the product and project planning includes all processes, tools, procedures, techniques and resources necessary to meet project quality requirements.

**Perform quality assurance** includes:

- assuring that objectives and relevant standards to be achieved are communicated, understood, accepted and adhered to by the appropriate project organization members;
- executing the quality plan as the project progresses; and
- assuring that the established tools, procedures, techniques and resources are being used.

Quality assurance audit activities are often performed outside the project boundaries by other parts of the performing organization. Quality assurance activities ensure that project quality process performance and product quality conform to project quality requirements and standards. Quality audits determine the performance of the quality process and quality control, and the need for recommended action or change requests.

The primary inputs and outputs are listed in Table 33.

**Table 33 — Perform quality assurance: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Quality plan</li> <li>— Quality management plan</li> </ul>	<ul style="list-style-type: none"> <li>— Change requests</li> </ul>

#### 4.3.34 Perform quality control

The purpose of **Perform quality control** is to determine whether the established project objectives, quality requirements and standards are being met; and to identify causes of and ways to eliminate unsatisfactory performance.

**Perform quality control** should be applied during the whole project life cycle and includes:

- monitoring that the quality of the specific deliverables and processes is being met and detecting defects by using the established tools, procedures and techniques
- analyzing possible causes of defects
- determining the preventive actions and change requests
- communicating the corrective actions and change requests to the appropriate project organization members.

Quality control is often performed outside the project boundaries by other parts of the performing organization or the customer. Quality control activities identify causes of poor process performance or product quality and may result in recommended actions or change requests when necessary to eliminate non-conforming performance.

The primary inputs and outputs are listed in Table 34.

**Table 34 — Perform quality control: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Progress data</li> <li>— Deliverables</li> <li>— Quality plan</li> <li>— Quality management plan</li> </ul>	<ul style="list-style-type: none"> <li>— Quality control measurements</li> <li>— Verified deliverables</li> <li>— Inspection reports</li> <li>— Change requests</li> </ul>

#### 4.3.35 Plan procurement

The purpose of **Plan procurement** is to ensure that the procurement strategy and overall process are properly planned and documented before procurement is initiated.

**Plan procurement** is used to facilitate procurement decision-making, to specify procurement approaches, and to develop procurement specifications and requirements.

The primary inputs and outputs are listed in Table 35.

**Table 35 — Plan procurement: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— In-house capacity and capability</li> <li>— Existing contracts</li> <li>— Resource requirements</li> <li>— Risk register</li> </ul>	<ul style="list-style-type: none"> <li>— Procurement plan</li> <li>— Preferred suppliers list</li> <li>— Make-or-buy decision list</li> </ul>

#### 4.3.36 Select suppliers

The purpose of **Select suppliers** is to ensure that information is obtained from suppliers to enable consistent evaluation of proposals against stated requirements, to review and examine all the submitted information and to select the supplier or suppliers.

The request for information, proposal, or quotation, each of which serve different purposes, should be unambiguous to ensure that the information obtained in response to the specific type of request meets the needs of the customer and complies with applicable local legal and regulatory requirements. The request should include a full description of the documents to be provided, such as scope, format, quality and quantity of these documents, as well as their purpose and the date by which they have to be submitted. When proposals are requested, the submitted documentation should provide sufficient information to enable the selection of a supplier.

An evaluation of each supplier's tender should be undertaken in accordance with the chosen evaluation criteria. The final selection should be made on what is considered to be the most appropriate and beneficial tender with reference to the evaluation criteria. There may be a period of negotiation between selecting a preferred supplier and agreeing on the final contract conditions.

The primary inputs and outputs are listed in Table 36.

**Table 36 — Select suppliers: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Procurement plan</li> <li>— Preferred suppliers list</li> <li>— Supplier's tenders</li> <li>— Make-or-buy decision list</li> </ul>	<ul style="list-style-type: none"> <li>— Request for information, proposal, or quotation</li> <li>— Contracts or purchase orders</li> <li>— Selected suppliers list</li> </ul>

#### 4.3.37 Administer contracts

The purpose of **Administer contracts** is to manage the relationship between the buyer and the supplier(s).

This includes monitoring and reviewing the supplier's performance, ensuring the receipt of regular progress reports and taking appropriate action to ensure compliance with all the project requirements including contract types, quality, performance, timeliness and safety.

**Administer contracts** starts with issuing of the agreed contract documentation and ends with contract closure.

The primary inputs and outputs are listed in Table 37.

**Table 37 — Administer contracts: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Contracts or purchase orders</li> <li>— Project plans</li> <li>— Approved changes</li> <li>— Inspection reports</li> </ul>	<ul style="list-style-type: none"> <li>— Contract certificates</li> <li>— Change requests</li> <li>— Corrective actions</li> </ul>

#### 4.3.38 Plan communications

The purpose of **Plan communications** is to determine the information and communication needs of the project stakeholders.

Although all projects have the need to communicate project information, the informational needs and methods of distribution vary widely. Factors for project success include identification of the information needs of the stakeholders and any mandated information needs, for example, government or regulatory, and determining a suitable means of meeting those needs. Additionally, environmental factors such as geographically dispersed personnel multiple cultures, and organizational influences may significantly affect a project's communication requirements.

**Plan communications** should be conducted early in the planning of the project following a stakeholder identification and analysis, but should be regularly reviewed and revised as needed to ensure continued effectiveness throughout the project. The communications plan defines the agreed-upon information expectations and should be easily accessible by the appropriate stakeholders throughout the project.

The primary inputs and outputs are listed in Table 38.

**Table 38 — Plan communications: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Project plans</li> <li>— Stakeholder register</li> <li>— Role descriptions</li> <li>— Approved changes</li> </ul>	<ul style="list-style-type: none"> <li>— Communication plan</li> </ul>

#### 4.3.39 Distribute information

The purpose of **Distribute information** is to make required information available to project stakeholders as defined by the communication plan and responding to unexpected, ad-hoc requests for information. **Distribute information** is also used to collect the information necessary for a successful project, and thereby providing input for the risk processes.

Organizational policies, procedures and other information may be affected by, amended or produced as a result of this process.

The primary inputs and outputs are listed in Table 39.

**Table 39 — Distribute information: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Communication plan</li> <li>— Progress reports</li> <li>— Forecasts</li> <li>— Unexpected requests</li> </ul>	<ul style="list-style-type: none"> <li>— Distributed information</li> </ul>

**4.3.40 Manage communication**

The purpose of **Manage communication** is to ensure that the communication needs of the project stakeholders are satisfied and to resolve communication issues if and when they arise including updating the communication plan as additional needs are defined.

Success or failure of a project can depend on how well the various project team members and stakeholders communicate with each other. **Manage communication** should focus on increasing the understanding and teamwork among the various stakeholders through good communications; providing timely, accurate and unbiased information; and resolving communications issues to ensure that the project is not adversely affected by unknown or unresolved stakeholder issues or misunderstandings.

The primary inputs and outputs are listed in Table 40.

**Table 40 — Manage communication: primary inputs and outputs**

Primary Inputs	Primary Outputs
<ul style="list-style-type: none"> <li>— Communication plan</li> <li>— Distributed information</li> </ul>	<ul style="list-style-type: none"> <li>— Accurate and timely information</li> <li>— Corrective actions</li> </ul>

D R A F T

## Annex A (informative)

### Process group processes mapped to subject groups

NOTE: Annex A provides a depiction of the interactions of the individual processes in each process group identified in clause 4.2.1 mapped against the subject groups identified in clause 4.2.2. Not all process interactions are depicted in Annex A. The interactions depicted represent only one possible logical view of the processes.

Not all process interactions are shown in the figures. The arrows represent *one* logical sequence of processes and it is up to the organization, project manager, and/or project team to decide what processes are required and in what sequence the project will run. A recursion is possible from *any* process.

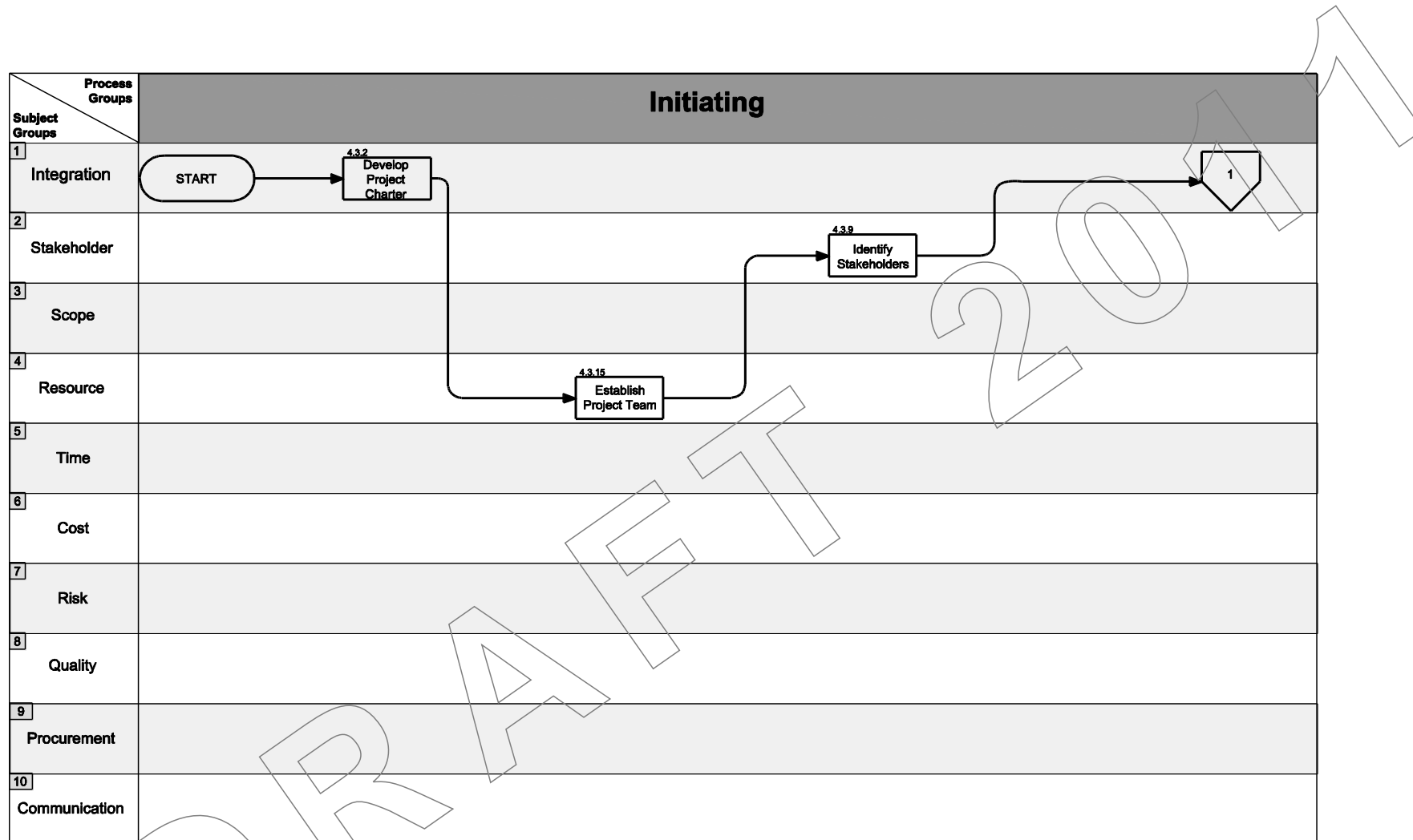


Figure A-1 Initiating process group processes

Document type: International Standard  
 Document subtype:  
 Document stage: (30) Committee  
 Document language: E



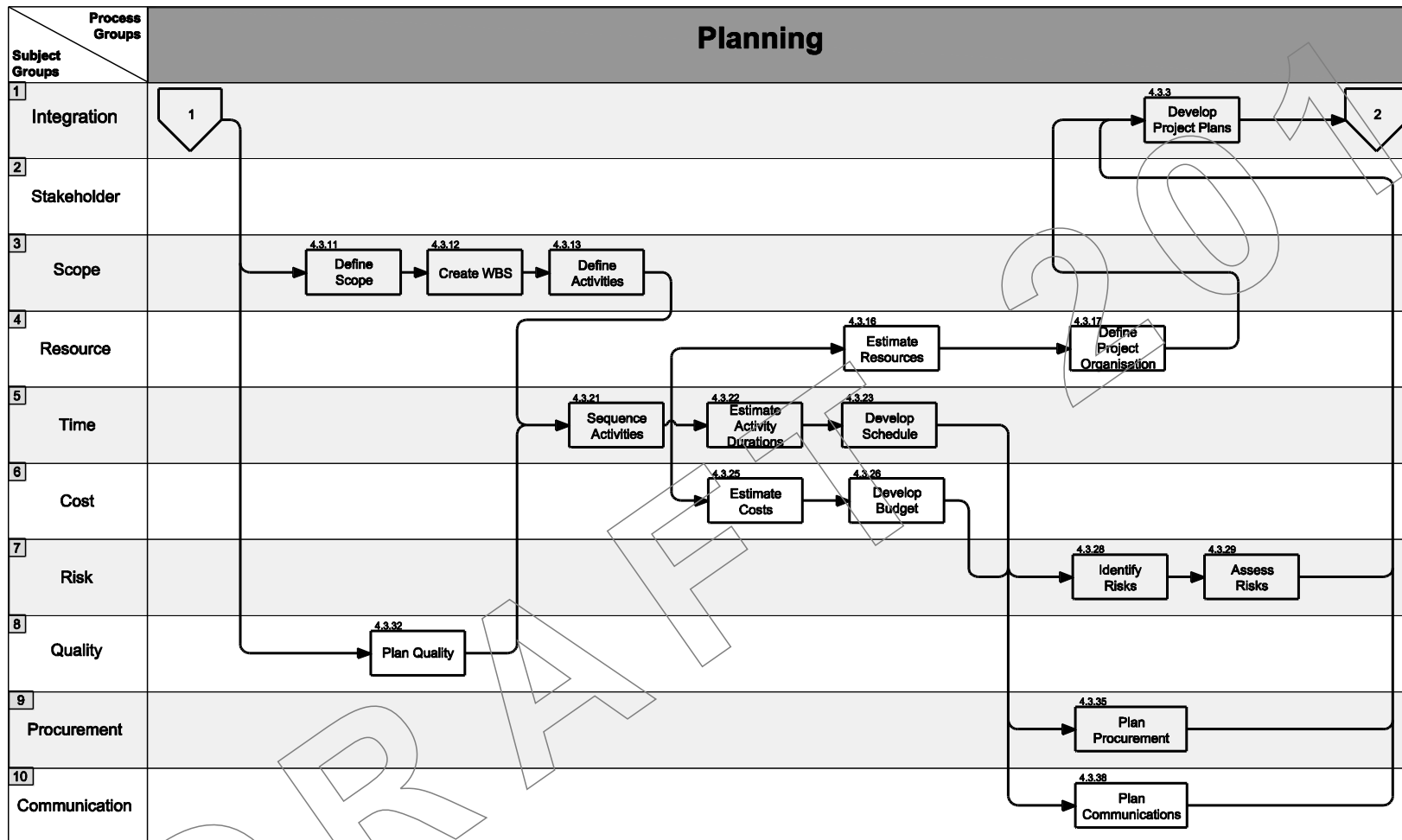


Figure A-2 Planning process group processes

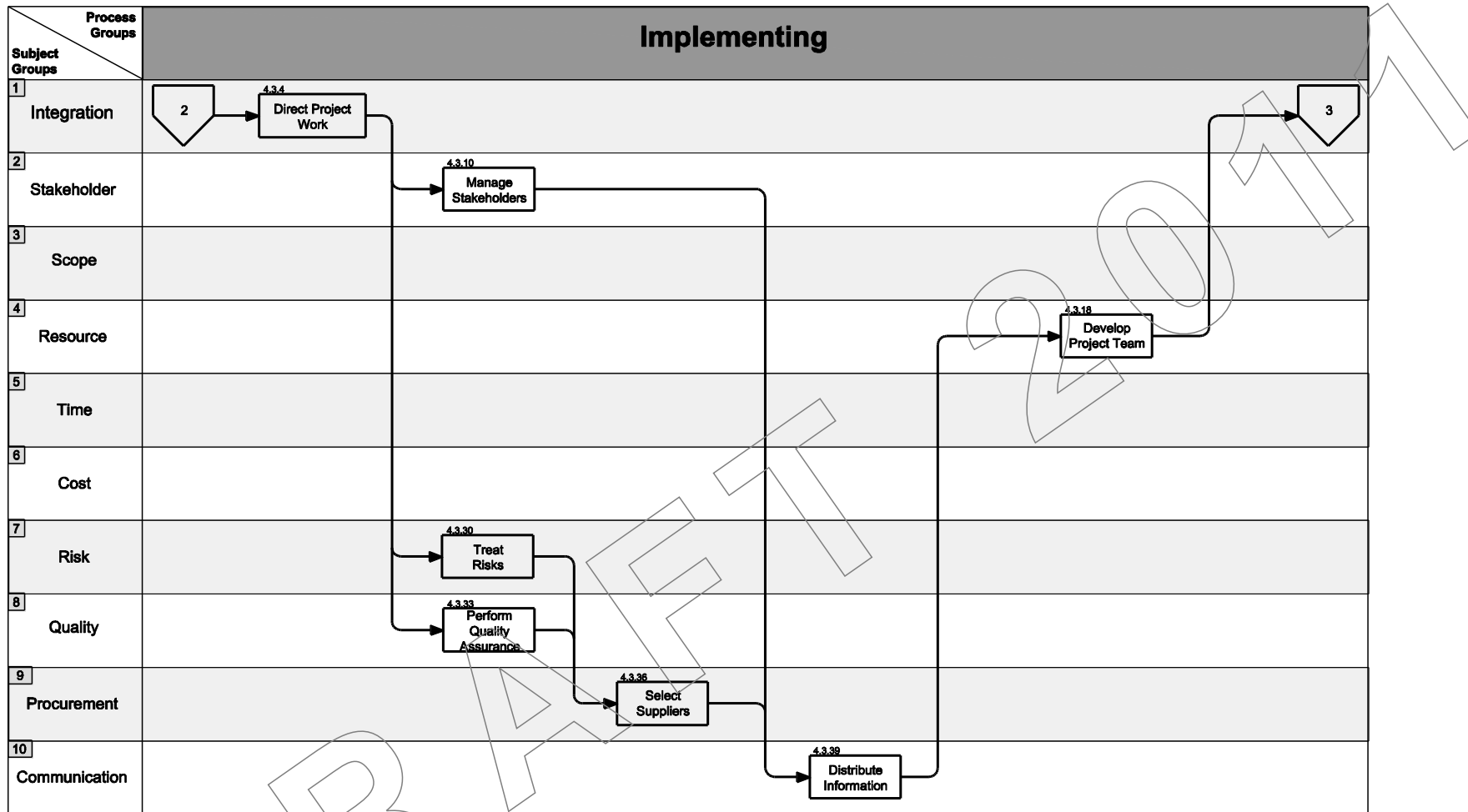


Figure A-3 Implementing process group processes

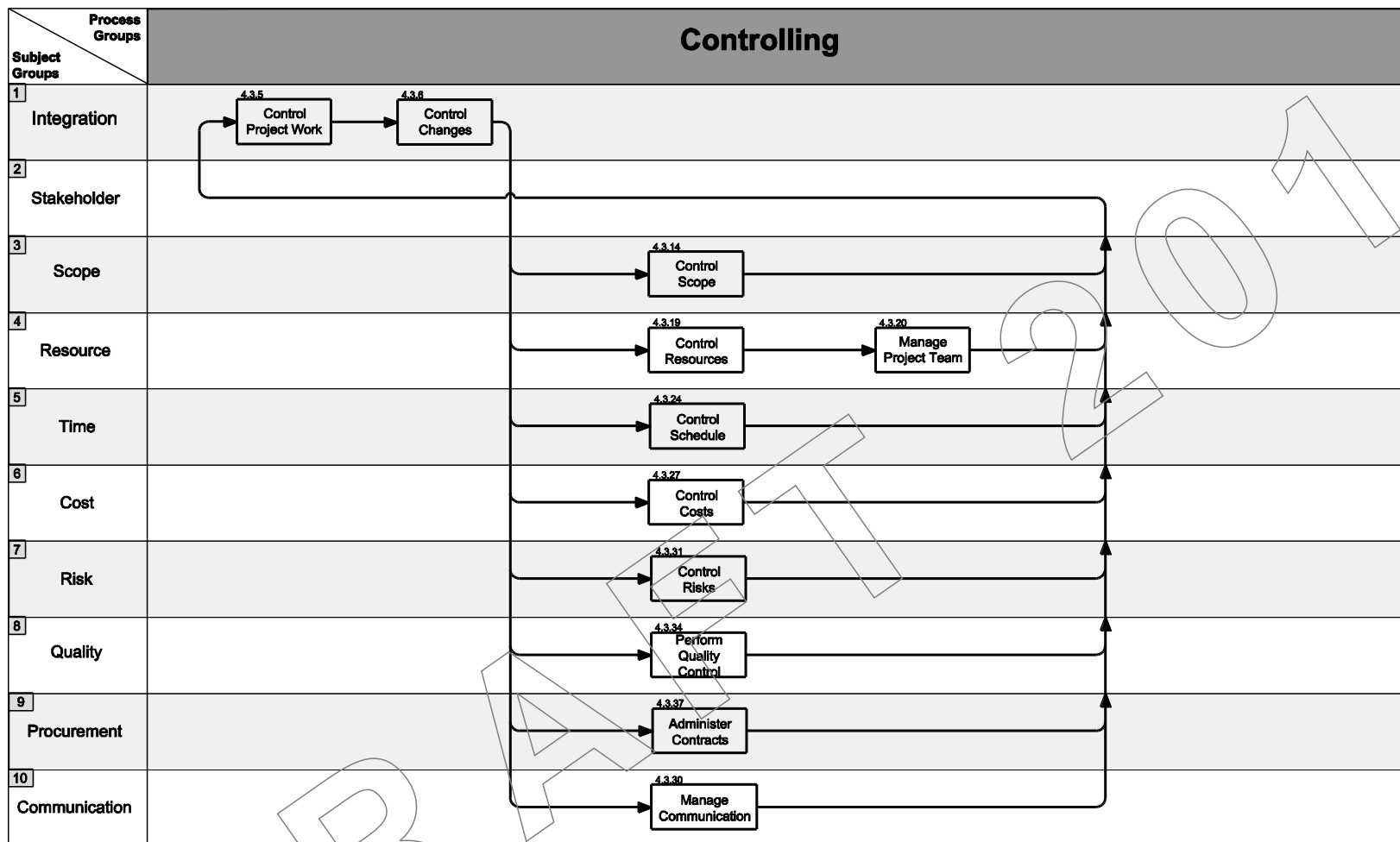


Figure A-4 Controlling process group processes

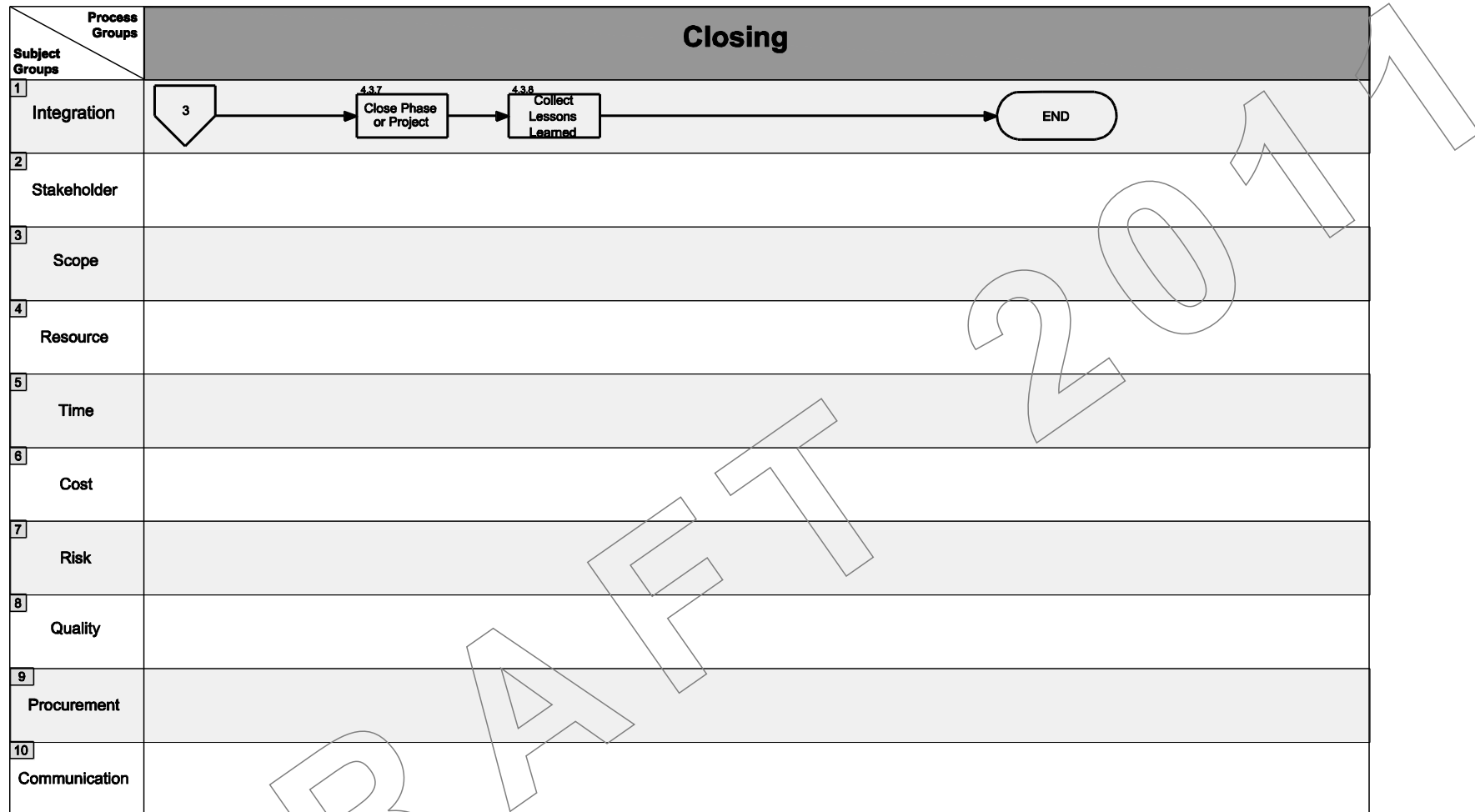


Figure A-5 Closing process group processes