C. Component: Information Flows and Items (see also Section 3.6)

Governance Practice	Inputs		Outputs	
	From	Description	Description	To
EDM05.01 Evaluate stakeholder engagement and reporting requirements.	EDM02.04	Actions to improve value delivery	Reporting and communications principles	MEA01.01
	EDM03.03	Risk management issues for the board	Evaluation of enterprise reporting requirements	MEA01.01
	EDM04.03	Feedback on allocation and effectiveness of resources and capabilities		
EDM05.02 Direct stakeholder engagement, communication and reporting.	APO12.04	Risk analysis and risk profile reports for stakeholders	Rules for validating and approving mandatory reports	MEA01.01; MEA03.04
			Escalation guidelines	MEA01.05
EDM05.03 Monitor stakeholder engagement.	MEA04.08	• Assurance review results • Assurance review report	Assessment of reporting effectiveness	MEA01.01; MEA03.04

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this component	

D. Component: People, Skills and Competencies

Skill	Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
Relationship management	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	E. Manage—E.4. Relationship Management

E. Component: Policies and Procedures

Relevant Policy	Policy Description	Related Guidance	Detailed Reference
Transparency policy	Addresses the importance of frequent, open communication with all stakeholders to ensure that they understand the strategic importance of I&T to enterprise success. Ensures that transparency supports appropriate risk mitigation, linking transparency and effective risk management to I&T value and enterprise growth.		

F. Component: Culture, Ethics and Behavior

Key Culture Elements	Related Guidance	Detailed Reference
Create a culture in which open and structured communication is provided to key stakeholders, in line with their requirements.		

G. Component: Services, Infrastructure and Applications

• Communication tools and channels
• IT dashboarding
• Stakeholder survey tools

Page intentionally left blank

4.2 Align, Plan and Organize (APO)

01   Managed I&T Management Framework

02   Managed Strategy

03   Managed Enterprise Architecture

04   Managed Innovation

05   Managed Portfolio

06   Managed Budget and Costs

07   Managed Human Resources

08   Managed Relationships

09   Managed Service Agreements

10   Managed Vendors

11   Managed Quality

12   Managed Risk

13   Managed Security

14   Managed Data

Page intentionally left blank

Align, Plan and Organize

Domain: Align, Plan and Organize Management Objective: APO01 — Managed I&T Management Framework	Focus Area: COBIT Core Model

Description
Design the management system for enterprise I&T based on enterprise goals and other design factors. Based on this design, implement all required components of the management system.

Purpose
Implement a consistent management approach for enterprise governance requirements to be met, covering governance components such as management processes; organizational structures; roles and responsibilities; reliable and repeatable activities; information items; policies and procedures; skills and competencies; culture and behavior; and services, infrastructure and applications.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG03 Compliance with external laws and regulations • EG08 Optimization of internal business process functionality • EG11 Compliance with internal policies • EG12 Managed digital transformation programs	• AG03 Realized benefits from I&T-enabled investments and services portfolio • AG11 I&T compliance with internal policies

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals
EG03 a. Cost of regulatory noncompliance, including settlements and fines b. Number of regulatory noncompliance issues causing public comment or negative publicity c. Number of noncompliance matters noted by regulators d. Number of regulatory noncompliance issues relating to contractual agreements with business partners	AG03 a. Percent of I&T-enabled investments for which claimed benefits in the business case are met or exceeded b. Percent of I&T services for which expected benefits (as stated in service level agreements) are realized
EG08 a. Satisfaction levels of board and executive management with business process capabilities b. Satisfaction levels of customers with service delivery capabilities c. Satisfaction levels of suppliers with supply chain capabilities	AG11 a. Number of incidents related to noncompliance with I&T-related policies. b. Number of exceptions to internal policies c. Frequency of policy review and update
EG11 a. Number of incidents related to noncompliance to policy b. Percent of stakeholders who understand policies c. Percent of policies supported by effective standards and working practices	
EG12 a. Number of programs on time and within budget b. Percent of stakeholders satisfied with program delivery c. Percent of business transformation programs stopped d. Percent of business transformation programs with regular reported status updates	

Align, Plan and Organize

Align, Plan and Organize

A. Component: Process		
Management Practice	**Example Metrics**	
APO01.01 Design the management system for enterprise I&T. Design a management system tailored to the needs of the enterprise. Management needs of the enterprise are defined through the use of the goals cascade and by application of design factors. Ensure the governance components are integrated and aligned with the enterprise's governance and management philosophy and operating style.	a. Number of formal sign-offs by applicable governance structures of the priority objectives for the I&T management system b. Percent of governance components integrated and aligned with the enterprise's governance and management philosophy and operating style	
Activities		**Capability Level**
1. Obtain an understanding of the enterprise vision, direction and strategy as well as the current enterprise context and challenges.		2
2. Consider the enterprise's internal environment, including management culture and philosophy, risk tolerance, security and privacy policy, ethical values, code of conduct, accountability, and requirements for management integrity.		
3. Apply the COBIT goals cascade and design factors to the enterprise strategy and context to decide on priorities for the management system and, thus, for implementation of management objective priorities.		
4. Validate selected priorities for implementation of management objectives with industry-specific good practices or requirements (e.g., industry-specific regulations) and with appropriate governance structures.		3
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**	
COSO Enterprise Risk Management, June 2017	7. Strategy and Objective-Setting—Principle 9	
ISO/IEC 27001:2013/Cor.2:2015(E)	International standard for establishing, implementing and maintaining a management system (all chapters)	
ITIL V3, 2011	Service Strategy, 2.3 Governance and management systems	
Management Practice	**Example Metrics**	
APO01.02 Communicate management objectives, direction and decisions made. Communicate awareness and promote understanding of alignment and I&T objectives to stakeholders throughout the enterprise. Communicate at regular intervals on important I&T-related decisions and their impact for the organization.	a. Frequency of communication on management objectives and direction for I&T b. Assigned responsibility for sending out regular communications	
Activities		**Capability Level**
1. Provide sufficient and skilled resources to support the communication process.		2
2. Define ground rules for communication by identifying communication needs and implementing plans based on those needs, considering top-down, bottom-up and horizontal communication.		3
3. Continuously communicate I&T objectives and direction. Ensure that communication is supported by executive management in actions and words, using all available channels.		
4. Ensure the information communicated encompasses a clearly articulated mission, service objectives, internal controls, quality, code of ethics/conduct, policies and procedures, roles and responsibilities, etc. Communicate the information at the appropriate level of detail for respective audiences within the enterprise.		
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**	
No related guidance for this component		

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO01.03 Implement management processes (to support the achievement of governance and management objectives). Define target process capability levels and implementation priority based on the management system design.	a. Number of priority processes to be implemented or improved to meet the target capability level b. Number of metrics defined for follow-up of successful process implementation

Activities	Capability Level
1. Develop the I&T governance target process model specific to the organization, based on the selection of priority management objectives (output of goals cascade and design factors exercise).	2
2. Analyze the gap between the target process model for the organization and current practices and activities.	3
3. Draft a road map for implementation of missing process practices and activities. Use practice metrics to follow up on successful implementation.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	**Example Metrics**
APO01.04 Define and implement the organizational structures. Put in place the required internal and extended organizational structures (e.g., committees) per the management system design, enabling effective and efficient decision making. Ensure that required technology and information knowledge is included in the composition of management structures.	a. Level of executive satisfaction with management decision making b. Number of decisions that could not be resolved within management structures and were escalated to governance structures

Activities	Capability Level
1. Identify decisions required for the achievement of enterprise outcomes and the I&T strategy and for the management and execution of I&T services.	2
2. Involve stakeholders who are critical to decision making (accountable, responsible, consulted or informed).	
3. Define the scope, focus, mandate and responsibilities of each function within the I&T-related organization, in line with governance direction.	
4. Define the scope of internal and external functions, internal and external roles, and capabilities and decision rights required to cover all practices, including those performed by third parties.	3
5. Align the I&T-related organization with enterprise architecture organizational models.	
6. Establish an I&T steering committee (or equivalent) composed of executive, business and I&T management to track status of projects, resolve resource conflicts, and monitor service levels and service improvements.	
7. Provide guidelines for each management structure (including mandate, objectives, meeting attendees, timing, tracking, supervision and oversight) as well as required inputs for and expected outcomes of meetings.	
8. Regularly verify the adequacy and effectiveness of the organizational structures.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO01.05 Establish roles and responsibilities. Define and communicate roles and responsibilities for enterprise I&T, including authority levels, responsibilities and accountability.	a. Number of I&T-related roles assigned to individuals b. Number of completed role descriptions

Activities	Capability Level
1. Establish, agree on and communicate I&T-related roles and responsibilities for all personnel in the enterprise, in alignment with business needs and objectives. Clearly delineate responsibilities and accountabilities, especially for decision making and approvals.	2
2. Consider requirements from enterprise and I&T service continuity when defining roles, including staff back-up and cross-training requirements.	
3. Provide input to the I&T service continuity process by maintaining up-to-date contact information and role descriptions in the enterprise.	
4. Include specific requirements in role and responsibility descriptions regarding adherence to management policies and procedures, the code of ethics, and professional practices.	
5. Ensure that accountability is defined through roles and responsibilities.	
6. Structure roles and responsibilities to reduce the possibility for a single role to compromise a critical process.	
7. Implement adequate supervisory practices to ensure that roles and responsibilities are properly exercised, to assess whether all personnel have sufficient authority and resources to execute their roles and responsibilities, and generally to review performance. The level of supervision should be aligned with the sensitivity of the position and extent of assigned responsibilities.	3

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	**Example Metrics**
APO01.06 Optimize the placement of the IT function. Position the IT capabilities in the overall organizational structure to reflect the strategic importance and operational dependency of IT within the enterprise. The reporting line of the CIO and representation of IT within senior management should be commensurate with the importance of I&T within the enterprise.	a. Number of key stakeholders that have signed off on the placement of the IT function b. Percent of stakeholders with a favorable opinion of the placement of the IT function

Activities	Capability Level
1. Understand context for the placement of the IT function, including assessment of enterprise strategy and operating model (centralized, federated, decentralized, hybrid), importance of I&T, and sourcing situation and options.	3
2. Identify, evaluate and prioritize options for organizational placement, sourcing and operating models.	
3. Define placement of the IT function and obtain agreement.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ISO/IEC 27002:2013/Cor.2:2015(E)	8.2 Information classification

Management Practice	**Example Metrics**
APO01.07 Define information (data) and system ownership. Define and maintain responsibilities for ownership of information (data) and information systems. Ensure that owners classify information and systems and protect them in line with their classification.	a. Percent of data assets with clearly defined owners b. Percent of information systems with clearly defined owners c. Percent of information items classified according to the agreed classification levels

Activities	Capability Level
1. Provide guidelines to ensure appropriate and consistent enterprisewide classification of information items.	3
2. Create and maintain an inventory of information (systems and data) that includes a listing of owners, custodians and classifications. Include systems that are outsourced and those for which ownership should stay within the enterprise.	
3. Assess and distinguish between critical (high value) and noncritical data, information and systems. Ensure appropriate protection for each category.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO01.08 Define target skills and competencies. Define the required skills and competencies to achieve relevant management objectives.	a. Number of staff who have attended training or awareness sessions for selected skills, competencies, desired behaviors b. Percent of staff with required skills and competencies aligned to selected management objectives

Activities	Capability Level
1. Identify the required skills and competencies to achieve selected management objectives.	2
2. Analyze the gap between target skills and capabilities for the enterprise and current skills of the workforce. Refer to APO07—Managed Human Resources for skills development and management practices.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	**Example Metrics**
APO01.09 Define and communicate policies and procedures. Put in place procedures to maintain compliance with and performance measurement of policies and other components of the control framework. Enforce the consequences of noncompliance or inadequate performance. Track trends and performance and consider these in the future design and improvement of the control framework.	a. Percent of active policies and procedures that are documented and up to date b. Number of staff aware and able to demonstrate competency with respect to policies and procedures

Activities	Capability Level
1. Create a set of policies to drive IT control expectations on relevant key topics such as quality, security, privacy, internal controls, usage of I&T assets, ethics and intellectual property (IP) rights.	3
2. Roll out and enforce I&T policies uniformly for all relevant staff so they are built into, and become integral parts of, enterprise operations.	
3. Evaluate and update the policies at least yearly to accommodate changing operating or business environments.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	**Example Metrics**
APO01.10 Define and implement infrastructure, services and applications to support the governance and management system. Define and implement infrastructure, services and applications to support the governance and management system (e.g., architecture repositories, risk management system, project management tools, cost-tracking tools and incident monitoring tools).	a. Number of tools selected to support priority processes b. Adequacy/coverage by the tools of key I&T processes c. Satisfaction of recipients with the accuracy, completeness and timeliness of information d. Percent of stakeholder satisfaction with tools selected to support their needs

Activities	Capability Level
1. Identify priority management objectives that may be achieved by automating services, applications or infrastructure.	2
2. Select and implement the most appropriate tools and communicate to stakeholders.	
3. Provide training on selected tools, as required.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

Align, Plan and Organize

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO01.11 Manage continual improvement of the I&T management system. Continually improve processes and other management system components to ensure that they can deliver against governance and management objectives. Consider COBIT implementation guidance, emerging standards, compliance requirements, automation opportunities and the feedback of stakeholders.	a. Date of last updates to the framework and components b. Number of I&T-related loss exposures due to inadequacies in the design of the control environment

Activities	Capability Level
1. Regularly assess performance of framework components and take appropriate action.	4
2. Identify business-critical processes based on performance and conformance drivers and related risk. Assess capability and identify improvement targets. Analyze gaps in capability and control. Identify options for improving or redesigning the process.	
3. Prioritize initiatives for improvement based on potential benefits and costs. Implement agreed improvements, operate as normal business practice, and set performance goals and metrics to enable monitoring of improvements.	5
4. Consider ways to improve efficiency and effectiveness (e.g., through training, documentation, standardization and/or process automation).	
5. Apply quality management practices to update the process.	
6. Retire outdated governance components (processes, information items, policies, etc.).	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ITIL V3, 2011	Continual Service Improvement, 4.1 The 7-Step Improvement Process

B. Component: Organizational Structures

Key Management Practice	Executive Committee	Chief Risk Officer	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	I&T Governance Board	Architecture Board	Enterprise Risk Committee	Chief Information Security Officer	Business Process Owners	Data Management Function	Head Human Resources	Relationship Manager	Head Architect	Head Development	Head IT Operations	Head IT Administration	Service Manager	Information Security Manager	Business Continuity Manager	Privacy Officer
APO01.01 Design the management system for enterprise I&T.	A		R	R	R	R															
APO01.02 Communicate management objectives, direction and decisions made.	A	R	R	R	R	R				R			R								
APO01.03 Implement management processes (to support the achievement of governance and management objectives).	A	R	R	R	R	R				R											
APO01.04 Define and implement the organizational structures.	A		R	R	R	R							R								
APO01.05 Establish roles and responsibilities.	A		R	R	R	R															
APO01.06 Optimize the placement of the IT function.	A		R	R	R	R	R														
APO01.07 Define information (data) and system ownership.	A		R	R	R	R	R			R	R		R								
APO01.08 Define target skills and competencies.	A		R	R	R	R								R	R	R	R				
APO01.09 Define and communicate policies and procedures.	A		R	R	R	R	R	R		R	R	R		R	R	R	R	R	R	R	R
APO01.10 Define and implement infrastructure, services and applications to support the governance and management system.	A		R	R	R	R					R			R	R	R	R	R	R	R	R
APO01.11 Manage continual improvement of the I&T management system.	A		R	R	R	R				R	R			R	R	R	R	R	R	R	R

B. Component: Organizational Structures *(cont.)*	
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**
COSO Enterprise Risk Management, June 2017	6. Governance and Culture—Principle 2
ISO/IEC 27001:2013/Cor.2:2015(E)	5.3 Organizational roles, responsibilities and authorities

C. Component: Information Flows and Items (see also Section 3.6)				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO01.01 Design the management system for enterprise I&T.	APO02.05	Strategic road map	Priority governance and management objectives	All APO; All BAI; All DSS; All MEA
	APO12.01	Emerging risk issues and factors	Management system design	All APO; All BAI; All DSS; All MEA
	APO12.02	Risk analysis results		
	EDM01.01	• Enterprise governance guiding principles • Decision-making model		
APO01.02 Communicate management objectives, direction and decisions made.	APO12.06	Risk impact communication	Communication ground rules	All APO; All BAI; All DSS; All MEA
	DSS04.01	Policy and objectives for business continuity	Communication on I&T objectives	All APO; All BAI; All DSS; All MEA
	DSS05.01	Malicious software prevention policy		
	DSS05.02	Connectivity security policy		
	DSS05.03	Security policies for endpoint devices		
	EDM01.02	Enterprise governance communication		
	EDM04.02	Principles for safeguarding resources		
APO01.03 Implement management processes (to support the achievement of governance and management objectives).	APO02.04	Gaps and changes required to realize target capability	Target model gap analysis	All APO; All BAI; All DSS; All MEA
	EDM01.01	Enterprise governance guiding principles	Process capability levels	APO01.11
APO01.04 Define and implement the organizational structures.	APO03.02	Process architecture model	Enterprise operational guidelines	APO03.02
	EDM01.01	Enterprise governance guiding principles	Definition of organizational structure and functions	APO03.02

Align, Plan and Organize

C. Component: Information Flows and Items (see also Section 3.6) *(cont.)*				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO01.05 Establish roles and responsibilities.	APO07.03	• Skills and competencies matrix • Skill development plans	Definition of supervisory practices	APO07.01
	APO11.01	Quality management system (QMS) roles, responsibilities and decision rights	Definition of I&T-related roles and responsibilities	DSS05.04
	APO13.01	Information security management system (ISMS) scope statement		
	DSS06.03	• Allocated roles and responsibilities • Allocated levels of authority		
	EDM01.01	Authority levels		
	EDM04.02	Assigned responsibilities for resource management		
APO01.06 Optimize the placement of the IT function.	Outside COBIT	• Enterprise strategy • Enterprise operating model	Defined operational placement of IT function	APO03.02
			Evaluation of options for IT organization	APO03.02
APO01.07 Define information (data) and system ownership.			Data classification guidelines	APO03.02; APO14.01; BAI02.01; DSS05.02; DSS06.01
			Data security and control guidelines	APO14.04; APO14.10; BAI02.01
			Data integrity procedures	APO14.04; BAI02.01; DSS06.01
APO01.08 Define target skills and competencies.			Target skills and competencies matrix	APO07.03
APO01.09 Define and communicate policies and procedures.	DSS01.04	Environmental policies	Noncompliance remedial actions	MEA01.05
	MEA03.02	Updated policies, principles, procedures and standards		
APO01.10 Define and implement infrastructure, services and applications to support the governance and management system.	APO09.01	Identified gaps in I&T services to the business	Plan of right-size I&T landscape including missing I&T capabilities, services and applications	APO02.02; APO02.03
	Outside COBIT	I&T landscape assessment including services, applications and infrastructure		

C. Component: Information Flows and Items (see also Section 3.6) *(cont.)*				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO01.11 Manage continual improvement of the I&T management system.	APO01.03	Process capability levels	Process improvement opportunities	All APO; All BAI; All DSS; All MEA
	EDM01.03	Feedback on governance effectiveness and performance	Performance goals and metrics for process improvement tracking	MEA01.02
	MEA03.02	Updated policies, principles, procedures and standards	Process capability assessments	MEA01.03
Related Guidance (Standards, Frameworks, Compliance Requirements)		**Detailed Reference**		
No related guidance for this component				

D. Component: People, Skills and Competencies		
Skill	**Related Guidance (Standards, Frameworks, Compliance Requirements)**	**Detailed Reference**
IT governance	Skills Framework for the Information Age V6, 2015	GOVN
IT management	Skills Framework for the Information Age V6, 2015	ITMG

E. Component: Policies and Procedures			
Relevant Policy	**Policy Description**	**Related Guidance**	**Detailed Reference**
I&T management framework	Establishes management system for enterprise I&T based on enterprise goals and other design factors. Considers detailed policies and principles for I&T management across all components.		

F. Component: Culture, Ethics and Behavior		
Key Culture Elements	**Related Guidance**	**Detailed Reference**
Set an internal culture of alignment between business and IT, establishing the necessary management objectives, structures, processes, and roles and responsibilities that enable decision making and value creation in the most effective and efficient manner.		

G. Component: Services, Infrastructure and Applications
• COBIT and related products/tools • Equivalent frameworks and standards

Align, Plan and Organize

Page intentionally left blank

Domain: Align, Plan and Organize Management Objective: APO02 — Managed Strategy		Focus Area: COBIT Core Model

Description

Provide a holistic view of the current business and I&T environment, the future direction, and the initiatives required to migrate to the desired future environment. Ensure that the desired level of digitization is integral to the future direction and the I&T strategy. Assess the organization's current digital maturity and develop a road map to close the gaps. With the business, rethink internal operations as well as customer-facing activities. Ensure focus on the transformation journey across the organization. Leverage enterprise architecture building blocks, governance components and the organization's ecosystem, including externally provided services and related capabilities, to enable reliable but agile and efficient response to strategic objectives.

Purpose

Support the digital transformation strategy of the organization and deliver the desired value through a road map of incremental changes. Use a holistic I&T approach, ensuring that each initiative is clearly connected to an overarching strategy. Enable change in all different aspects of the organization, from channels and processes to data, culture, skills, operating model and incentives.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG05 Customer-oriented service culture • EG08 Optimization of internal business process functionality • EG12 Managed digital transformation programs	AG08 Enabling and supporting business processes by integrating applications and technology

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals
EG01 a. Percent of products and services that meet or exceed targets in revenues and/or market share b. Percent of products and services that meet or exceed customer satisfaction targets c. Percent of products and services that provide competitive advantage d. Time to market for new products and services	AG08 a. Time to execute business services or processes b. Number of I&T-enabled business programs delayed or incurring additional cost due to technology-integration issues c. Number of business process changes that need to be delayed or reworked because of technology-integration issues d. Number of applications or critical infrastructures operating in silos and not integrated
EG05 a. Number of customer service disruptions b. Percent of business stakeholders satisfied that customer service delivery meets agreed levels c. Number of customer complaints d. Trend of customer satisfaction survey results	
EG08 a. Satisfaction levels of board and executive management with business process capabilities b. Satisfaction levels of customers with service delivery capabilities c. Satisfaction levels of suppliers with supply chain capabilities	
EG12 a. Number of programs on time and within budget b. Percent of stakeholders satisfied with program delivery c. Percent of business transformation programs stopped d. Percent of business transformation programs with regular reported status updates	

Align, Plan and Organize

Align, Plan and Organize

A. Component: Process	

Management Practice	Example Metrics
APO02.01 Understand enterprise context and direction. Understand the enterprise context (industry drivers, relevant regulations, basis for competition), its current way of working and its ambition level in terms of digitization.	a. Level of understanding within I&T management of current enterprise organization and context b. Level of knowledge within I&T management of enterprise goals and direction c. Level of understanding of key stakeholders for I&T and their detailed requirements

Activities	Capability Level
1. Develop and maintain an understanding of the external environment of the enterprise.	2
2. Develop and maintain an understanding of the current way of working, including the operational environment, enterprise architecture (business, information, data, applications and technology domains), enterprise culture and current challenges.	
3. Develop and maintain an understanding of future enterprise direction, including enterprise strategy, goals and objectives. Understand the ambition level of the enterprise in terms of digitization, which may include a range of increasingly aspirational goals, from cutting costs, increasing customer centricity, or getting to market faster by digitizing internal operations, to creating entirely new revenue streams from new business models (e.g., platform business).	
4. Identify key stakeholders and obtain insight on their requirements.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
COSO Enterprise Risk Management, June 2017	7. Strategy and Objective-Setting—Principle 6

Management Practice	Example Metrics
APO02.02 Assess current capabilities, performance and digital maturity of the enterprise. Assess the performance of current I&T services and develop an understanding of current business and I&T capabilities (both internal and external). Assess current digital maturity of the enterprise and its appetite for change.	a. Percent of staff satisfied with current capabilities b. Percent of business owner satisfaction with investment in and utilization of the internal and external asset base to meet critical success factors

Activities	Capability Level
1. Develop a baseline of current business and I&T capabilities and services. Include assessment of externally provisioned services, governance of I&T, and enterprisewide I&T-related skills and competencies.	2
2. Assess digital maturity across different dimensions (e.g., ability of leadership to leverage technology, level of accepted technology risk, approach to innovation, culture and knowledge level of users). Assess appetite for change.	3

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
COSO Enterprise Risk Management, June 2017	7. Strategy and Objective-Setting—Principle 6; 9. Review and Revision—Principle 15

Management Practice	Example Metrics
APO02.03 Define target digital capabilities. Based on the understanding of enterprise context and direction, define the target I&T products and services and required capabilities. Consider reference standards, best practices and validated emerging technologies.	a. Percent of enterprise objectives addressed by the I&T goals/objectives b. Percent of I&T objectives that support the enterprise strategy

Activities	Capability Level
1. Summarize enterprise context and direction and identify specific I&T aspects of enterprise strategy (e.g., digitizing processes, implementing new technology, supporting legacy architecture, applying new digital business models, developing digital product portfolio, etc.).	2
2. Define high-level I&T objectives and goals and specify their contribution to enterprise objectives.	
3. Detail required I&T services and products to realize enterprise objectives. Consider validated emerging technology or innovation ideas, reference standards, competitor business and I&T capabilities, comparative benchmarks of good practice, and emerging I&T service provision.	3
4. Determine I&T capabilities, methodologies and organizational approaches required to realize the defined I&T product and service portfolio. Consider different development methodologies (Agile, scrum, waterfall, bimodal IT), depending on business requirements. Consider how each could help realize I&T objectives.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

66

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO02.04 Conduct a gap analysis. Identify gaps between current and target environments and describe the high-level changes in the enterprise architecture.	a. Number of high-impact changes required in the different enterprise architecture domains b. Number of significant gaps between current environment and good practices

Activities	Capability Level
1. Identify all gaps and changes required to realize the target environment.	3
2. Describe high-level changes in enterprise architecture (business, information, data, applications and technology domains).	
3. Consider the high-level implications of all gaps. Assess the impact of potential changes on business and I&T operating models, I&T research and development capabilities, and I&T investment programs.	
4. Consider the value of potential changes to business and IT capabilities, I&T services and enterprise architecture, and the implications if no changes are realized.	4
5. Refine the target environment definition and prepare a value statement outlining benefits of the target environment.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	**Example Metrics**
APO02.05 Define the strategic plan and road map. Develop a holistic digital strategy, in cooperation with relevant stakeholders, and detail a road map that defines the incremental steps required to achieve the goals and objectives. Ensure focus on the transformation journey through the appointment of a person who helps spearhead the digital transformation and drives alignment between business and I&T.	a. Level of stakeholder support for the digital transformation plan b. Percent of initiatives in the I&T strategy that are self-funding (with financial benefits exceeding costs) c. Degree of correspondence between enterprise strategy and I&T strategy and objectives

Activities	Capability Level
1. Define initiatives required to close gaps between current and target environments. Integrate initiatives into a coherent I&T strategy that aligns I&T with all aspects of the business.	3
2. Detail a road map that defines the incremental steps required to achieve the goals and objectives of the I&T strategy. Ensure actions are included to train people with new skills, support adoption of new technology, sustain change throughout the organization, etc.	
3. Consider the external ecosystem (enterprise partners, suppliers, start-ups, etc.) to help support execution of the road map.	
4. Group actions into programs and/or projects with a clear goal or deliverable. For each project, identify high-level resource requirements, schedule, investment/operational budget, risk, change impact, etc.	
5. Determine dependencies, overlaps, synergies and impacts among projects, and prioritize.	
6. Finalize road map, indicating relative scheduling and interdependencies of projects.	
7. Ensure focus on the transformation journey. Appoint a champion of digital transformation and alignment between business and I&T (chief digital officer [CDO] or other traditional C-suite role).	
8. Obtain support and formal approval of plan from stakeholders.	
9. Translate objectives into measurable outcomes represented by metrics (what) and targets (how much). Ensure that outcomes and measures correlate to enterprise benefits.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ISF, The Standard of Good Practice for Information Security 2016	SG2.1 Information Security Strategy
ITIL V3, 2011	Service Strategy, 4.1 Strategy management for IT services

Align, Plan and Organize

A. Component: Process *(cont.)*

Management Practice	Example Metrics
APO02.06 Communicate the I&T strategy and direction. Create awareness and understanding of the business and I&T objectives and direction, as captured in the I&T strategy, through communication to appropriate stakeholders and users throughout the enterprise.	a. Frequency of updates to the I&T strategy communication plan b. Percent of stakeholders aware of I&T strategy and direction

Activities	Capability Level
1. Develop a communication plan covering the required messages, target audiences, communication mechanisms/channels and schedules.	3
2. Prepare a communication package that delivers the plan effectively, using available media and technologies.	
3. Develop and maintain a network for endorsing, supporting and driving the I&T strategy.	
4. Obtain feedback and update the communication plan and delivery as required.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

B. Component: Organizational Structures

Key Management Practice	Chief Executive Officer	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	I&T Governance Board	Business Process Owners	Project Management Office	Data Management Function	Relationship Manager	Head Architect	Head Development	Head IT Operations	Head IT Administration	Service Manager	Information Security Manager	Business Continuity Manager	Privacy Officer
APO02.01 Understand enterprise context and direction.		A	R	R				R	R	R	R	R	R	R	R	R	R
APO02.02 Assess current capabilities, performance and digital maturity of the enterprise.		A	R	R				R		R	R	R	R	R	R	R	R
APO02.03 Define target digital capabilities.		R	R	A		R		R	R	R	R	R	R	R	R	R	R
APO02.04 Conduct a gap analysis.		R	R	R	A	R		R		R	R	R	R	R	R	R	R
APO02.05 Define the strategic plan and road map.		R	R	R	A	R	R	R		R	R	R	R	R	R	R	R
APO02.06 Communicate the I&T strategy and direction.	R	R	R	R	A												

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ISO/IEC 38502:2017(E)	5.4 Responsibilities of managers

C. Component: Information Flows and Items (see also Section 3.6)

Management Practice	Inputs		Outputs	
APO02.01 Understand enterprise context and direction.	**From**	**Description**	**Description**	**To**
	APO04.02	Innovation opportunities linked to business drivers	Sources and priorities for change	Internal
	EDM04.01	Guiding principles for allocating resources and capabilities		
	Outside COBIT	Enterprise strategy and strengths, weaknesses, opportunities, threats (SWOT) analysis		

Align, Plan and Organize

C. Component: Information Flows and Items (see also Section 3.6) *(cont.)*				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO02.02 Assess current capabilities, performance and digital maturity of the enterprise.	APO06.05	Cost optimization opportunities	Gaps and risk related to current capabilities	APO12.01
	APO08.05	Definition of potential improvement projects	Capability SWOT analysis	Internal
	APO09.01	Identified gaps in IT services to the business	Baseline of current capabilities	Internal
	APO09.04	Improvement action plans and remediations		
	APO12.01	Emerging risk issues and factors		
	APO12.02	Risk analysis results		
	APO12.03	Aggregated risk profile, including status of risk management actions		
	APO12.05	Project proposals for reducing risk		
	BAI04.03	• Prioritized improvements • Performance and capacity plans		
	BAI04.05	Corrective actions		
	BAI09.01	Results of fit-for-purpose reviews		
	BAI09.04	• Results of cost optimization reviews • Opportunities to reduce asset costs or increase value		
	EDM04.03	Feedback on allocation and effectiveness of resources and capabilities		
APO02.03 Define target digital capabilities.	APO04.05	• Results and recommendations from proof-of-concept initiatives • Analysis of rejected initiatives	Proposed enterprise architecture changes	APO03.03
			Required business and IT capabilities	Internal
			High-level I&T-related goals	Internal
APO02.04 Conduct a gap analysis.	APO04.06	Assessments of using innovative approaches	Gaps and changes required to realize target capability	APO01.03; APO13.02; BAI03.11; EDM04.01
	APO05.01	Investment return expectations	Value benefit statement for target environment	BAI03.11
	BAI01.05	Results of program goal achievement monitoring		
	BAI01.06	Stage-gate review results		
	BAI11.09	Post-implementation review results		
	EDM02.02	Evaluation of strategic alignment		

Align, Plan and Organize

C. Component: Information Flows and Items (see also Section 3.6) *(cont.)*				
Management Practice	**Inputs**		**Outputs**	
APO02.05 Define the strategic plan and road map.	**From**	**Description**	**Description**	**To**
	APO03.01	• Defined scope of architecture • Architecture concept business case and value proposition	I&T strategy and objectives	All APO; All BAI; All DSS; All MEA
	APO03.02	Information architecture model	Strategic road map	APO01.01; APO03.01; APO08.01; EDM02.01; EDM02.02
	APO03.03	Transition architectures	Definition of strategic initiatives	EDM02.01
	APO05.01	Funding options	Risk assessment initiatives	EDM02.01, APO12.01
	APO06.02	Budget allocations		
	APO06.03	I&T budget		
	BAI09.05	Action plan to adjust license numbers and allocations		
	DSS04.02	Approved strategic options		
	EDM02.01	Feedback on strategy and goals		
	EDM04.01	Approved resources plan		
	EDM04.03	Remedial actions to address resource management deviations		
APO02.06 Communicate the I&T strategy and direction.	EDM04.02	Communication of resourcing strategies	Communication package	All APO; All BAI; All DSS; All MEA
			Communication plan	Internal

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ITIL V3, 2011	Service strategy, 3.9 Service strategy inputs and outputs

D. Component: People, Skills and Competencies		
Skill	**Related Guidance (Standards, Frameworks, Compliance Requirements)**	**Detailed Reference**
Business plan development	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.3. Business Plan Development
Emerging technology monitoring	Skills Framework for the Information Age V6, 2015	EMRG
I&T strategy and planning	Skills Framework for the Information Age V6, 2015	ITSP
Strategy alignment	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.1. IS and Business Strategy Alignment

E. Component: Policies and Procedures

Relevant Policy	Policy Description	Related Guidance	Detailed Reference
I&T service strategy principles	For details, refer to related guidance.	ITIL V3, 2011	Service Strategy, 3. Service strategy principles
I&T strategy policy and principles	Provides holistic view of current business and I&T environment, strategic direction and initiatives required to transition to the desired future environment. Ensures that business and I&T strategy reflect target level of digitization.		

F. Component: Culture, Ethics and Behavior

Key Culture Elements	Related Guidance	Detailed Reference
Establish a culture and underlying values that fit the overall business strategy (i.e., customer oriented, innovation driven, product based). Find ways to inject speed into processes and introduce the supporting culture and behavior that allow moving at a faster pace. This could start with changing basic habits such as having more frequent strategy leadership meetings or automating certain activities. In the current context of digital business models, ecosystems and disruption, it is vital for many organizations to prioritize digital transformation in their strategy. Build a culture that challenges the status quo and explores new ways of working (e.g., invest in automation to respond rapidly to customers, develop sophisticated reporting and analytics to interpret customer needs, build innovative interfaces to gather customer data, create mechanisms to deliver content and offers across all relevant channels).	The Scaled Agile Framework for Lean Enterprises	Configurable framework that helps organizations deliver new products and solutions in the shortest sustainable lead time (all chapters)

G. Component: Services, Infrastructure and Applications

• Customer analytics
• Industry benchmarks
• Performance measurement system (e.g., balanced scorecard, skills management tools)
• Technology watch services and tools

Align, Plan and Organize

Page intentionally left blank

Align, Plan and Organize

Domain: Align, Plan and Organize Management Objective: APO03 — Managed Enterprise Architecture		Focus Area: COBIT Core Model

Description

Establish a common architecture consisting of business process, information, data, application and technology architecture layers. Create key models and practices that describe the baseline and target architectures, in line with the enterprise and I&T strategy. Define requirements for taxonomy, standards, guidelines, procedures, templates and tools, and provide a linkage for these components. Improve alignment, increase agility, improve quality of information and generate potential cost savings through initiatives such as re-use of building block components.

Purpose

Represent the different building blocks that make up the enterprise and its interrelationships as well as the principles guiding their design and evolution over time, to enable a standard, responsive and efficient delivery of operational and strategic objectives.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG05 Customer-oriented service culture • EG08 Optimization of internal business process functionality • EG12 Managed digital transformation programs	• AG06 Agility to turn business requirements into operational solutions • AG08 Enabling and supporting business processes by integrating applications and technology

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals
EG01 a. Percent of products and services that meet or exceed targets in revenues and/or market share b. Percent of products and services that meet or exceed customer satisfaction targets c. Percent of products and services that provide competitive advantage d. Time to market for new products and services	AG06 a. Level of satisfaction of business executives with I&T responsiveness to new requirements b. Average time to market for new I&T-related services and applications c. Average time to turn strategic I&T objectives into agreed and approved initiatives d. Number of critical business processes supported by up-to-date infrastructure and applications
EG05 a. Number of customer service disruptions b. Percent of business stakeholders satisfied that customer service delivery meets agreed levels c. Number of customer complaints d. Trend of customer satisfaction survey results	AG08 a. Time to execute business services or processes b. Number of I&T-enabled business programs delayed or incurring additional cost due to technology-integration issues c. Number of business process changes that need to be delayed or reworked because of technology-integration issues d. Number of applications or critical infrastructures operating in silos and not integrated
EG08 a. Satisfaction levels of board and executive management with business process capabilities b. Satisfaction levels of customers with service delivery capabilities c. Satisfaction levels of suppliers with supply chain capabilities	
EG12 a. Number of programs on time and within budget b. Percent of stakeholders satisfied with program delivery c. Percent of business transformation programs stopped d. Percent of business transformation programs with regular reported status updates	

A. Component: Process	
Management Practice	**Example Metrics**
APO03.01 Develop the enterprise architecture vision. The architecture vision provides a first-cut, high-level description of the baseline and target architectures, covering the business, information, data, application and technology domains. The architecture vision provides the sponsor with a key tool to sell the benefits of the proposed capabilities to stakeholders within the enterprise. The architecture vision describes how the new capabilities (in line with I&T strategy and objectives) will meet enterprise goals and strategic objectives and address stakeholder concerns when implemented.	a. Level of architecture customer feedback b. Degree to which the baseline and target architectures cover the business, information, data, application and technology domains and frequency of updates

Align, Plan and Organize

73

Align, Plan and Organize

A. Component: Process *(cont.)*	
Activities	**Capability Level**
1. Identify key stakeholders and their concerns/objectives. Define key enterprise requirements to be addressed as well as architecture views to be developed to satisfy stakeholder requirements.	2
2. Identify enterprise goals and strategic drivers. Define constraints that must addressed, including both enterprisewide and project-specific constraints (e.g., time, schedule, resources, etc.).	
3. Align architecture objectives with strategic program priorities.	
4. Understand enterprise capabilities and goals, then identify options to realize those goals.	
5. Assess the enterprise's readiness for change.	
6. Define scope of baseline architecture and target architecture. Enumerate items that are in scope as well as those out of scope. (Baseline and target architecture need not be described at the same level of detail.)	
7. Understand current enterprise strategic goals and objectives. Work within the strategic planning process to ensure that I&T-related enterprise architecture opportunities are leveraged in the development of the strategic plan.	
8. Based on stakeholder concerns, business capability requirements, scope, constraints and principles, create the architecture vision (i.e., the high-level view of baseline and target architectures).	
9. Confirm and elaborate architecture principles, including enterprise principles. Ensure that any existing definitions are current. Clarify any areas of ambiguity.	3
10. Identify enterprise change risk associated with the architecture vision. Assess the initial level of risk (e.g., critical, marginal or negligible). Develop a mitigation strategy for each significant risk.	
11. Develop an enterprise architecture concept business case and outline plans and statement of architecture work. Secure approval to initiate a project aligned and integrated with the enterprise strategy.	
12. Define the target architecture value propositions, goals and metrics.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
National Institute of Standards and Technology Special Publication 800-53, Revision 5 (Draft), August 2017	3.15 Program management (PM-7)
The Open Group Standard TOGAF version 9.2, 2018	6. Phase A: Architecture Vision

Management Practice	Example Metrics
APO03.02 Define reference architecture. The reference architecture describes the current and target architectures for the business, information, data, application and technology domains.	a. Date of last update to domain and/or federated architectures b. Number of exceptions to architecture standards and baselines applied for and granted
Activities	**Capability Level**
1. Maintain an architecture repository containing standards, reusable components, modeling artifacts, relationships, dependencies and views, to enable uniformity of architectural organization and maintenance.	3
2. Select reference viewpoints from the architecture repository that enable the architect to demonstrate how stakeholder concerns are addressed in the architecture.	
3. For each viewpoint, select models needed to support the specific view required. Use selected tools or methods and the appropriate level of decomposition.	
4. Develop baseline architectural domain descriptions, using the scope and level of detail necessary to support the target architecture and, to the extent possible, identifying relevant architecture building blocks from the architecture repository.	
5. Maintain a process architecture model as part of the baseline and target domain descriptions. Standardize the descriptions and documentation of processes. Define the roles and responsibilities of the process decision makers, process owner, process users, process team and any other process stakeholders who should be involved.	
6. Maintain an information architecture model as part of baseline and target domain descriptions, consistent with enterprise strategy to acquire, store and use data optimally in support of decision making.	
7. Verify architecture models for internal consistency and accuracy. Perform a gap analysis between baseline and target. Prioritize gaps and define new or modified components that must be developed for the target architecture. Resolve incompatibilities, inconsistencies or conflicts within the target architecture.	
8. Conduct a formal stakeholder review by vetting proposed architecture against the original intent of the architecture project and the statement of architecture work.	
9. Finalize business, information, data, applications and technology domain architectures. Create an architecture definition document.	

A. Component: Process *(cont.)*	
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**
CMMI Data Management Maturity Model, 2014	Platform and Architecture—Architectural Approach; Platform and Architecture—Data Integration
ITIL V3, 2011	Service Strategy, 5.4 IT service strategy and enterprise architecture
National Institute of Standards and Technology Special Publication 800-37, Revision 2 (Draft), May 2018	3.1 Preparation (Task 9)
National Institute of Standards and Technology Special Publication 800-53, Revision 5 (Draft), August 2017	3.5 Configuration management (CM-8)
The Open Group Standard TOGAF version 9.2, 2018	7. Phase B: Business Architecture; 8. Phase C: Information Systems Architectures; 9. Phase C: Information Systems Architectures Data Architecture; 10. Phase C: Information Systems Architectures Application Architecture; 11. Phase D: Technology Architecture

Management Practice	Example Metrics
APO03.03 Select opportunities and solutions. Rationalize the gaps between baseline and target architectures, accounting for both business and technical perspectives, and logically group them into project work packages. Integrate the project with any related I&T-enabled investment programs to ensure that the architectural initiatives are aligned with and enable these initiatives as part of overall enterprise change. Make this a collaborative effort with key enterprise stakeholders from business and IT to assess the enterprise's transformation readiness, and identify opportunities, solutions and all implementation constraints.	a. Number of identified gaps in models across enterprise, information, data, application and technology architecture domains b. Percent of key enterprise stakeholders from business and IT to assess the enterprise's transformation readiness, and identify opportunities, solutions and all implementation constraints

Activities	Capability Level
1. Determine and confirm key enterprise change attributes. Consider enterprise culture, the potential impact of culture on implementation of architecture and the enterprise's capabilities for transition.	3
2. Identify any enterprise drivers that would constrain the sequence of implementation. Include a review of enterprise and line-of-business strategic and business plans. Consider current enterprise architecture maturity.	
3. Review and consolidate results of the gap analysis between baseline and target architectures. Assess implications with respect to potential solutions, opportunities, interdependencies and alignment with current I&T-enabled programs.	
4. Assess requirements, gaps, solutions and other factors to identify a minimal set of functional requirements whose integration into work packages would lead to a more efficient and effective implementation of target architecture.	
5. Reconcile the consolidated requirements with potential solutions.	
6. Refine initial dependencies and identify constraints on implementation and migration plans. Compile a dependency analysis report.	
7. Confirm the enterprise's readiness for, and the risk associated with, enterprise transformation.	
8. Formulate high-level strategy for implementation and migration. Implement target architecture (and arrange any transition architecture) according to overall enterprise strategy, objectives and timelines.	
9. Identify and group major work packages into a coherent set of programs and projects, respecting the direction and approach to enterprise strategic implementation.	
10. Develop transition architectures where the scope of change required by the target architecture necessitates an incremental approach.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
CMMI Data Management Maturity Model, 2014	Platform and Architecture—Architectural Approach; Platform and Architecture—Data Integration
The Open Group Standard TOGAF version 9.2, 2018	12. Phase E: Opportunities and Solutions

Align, Plan and Organize

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO03.04 Define architecture implementation. Create a viable implementation and migration plan in alignment with the program and project portfolios. Ensure the plan is closely coordinated to deliver value and that the required resources are available to complete the necessary work.	a. Clear definition of architecture implementation governance requirements b. Percent of stakeholders aware of architecture implementation and migration

Activities	Capability Level
1. Establish items required in the implementation and migration plan as part of program and project planning. Ensure that the plan aligns with requirements of relevant decision makers.	3
2. Confirm increments and phases of the transition architecture. Update the architecture definition document.	
3. Define and complete the architecture implementation and migration plan, including relevant governance requirements. Integrate the plan, activities and dependencies into program and project planning.	
4. Communicate the defined architectural road map to relevant stakeholders. Inform stakeholders about the target architecture definition, architecture guidelines and principles, service portfolio, etc.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
CMMI Data Management Maturity Model, 2014	Platform and Architecture—Architectural Approach; Platform and Architecture—Data Integration
The Open Group Standard TOGAF version 9.2, 2018	13. Phase F: Migration Planning

Management Practice	**Example Metrics**
APO03.05 Provide enterprise architecture services. Provide enterprise architecture services within the enterprise that include guidance to and monitoring of implementation projects, formalizing ways of working through architecture contracts, and measuring and communicating architecture's value and compliance monitoring.	a. Level of customer feedback for architecture services b. Percent of projects that utilize the framework and methodology to reuse defined components c. Percent of projects using enterprise architecture services d. Project benefits realized that can be traced back to architecture involvement (e.g., cost reduction through reuse)

Activities	Capability Level
1. Confirm scope and priorities and provide guidance for solution development and deployment (e.g., by using service-oriented architecture).	3
2. Manage enterprise architecture requirements and support business and IT with advice and expertise on architectural principles, models and building blocks. Guarantee that new implementations (as well as changes to current architecture) align with enterprise architecture principles and requirements.	
3. Manage portfolio of enterprise architecture services and ensure alignment with strategic objectives and solution development.	
4. Identify enterprise architecture priorities. Align priorities to value drivers. Define and collect value metrics and measure and communicate the value of enterprise architecture.	4
5. Establish a technology forum to provide architectural guidelines, advise projects and guide selection of technology. Measure compliance with standards and guidelines, including compliance with external requirements and internal business relevance.	5

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
CMMI Data Management Maturity Model, 2014	Platform and Architecture—Architectural Standards
ITIL V3, 2011	Service Design, 3.9 Service Oriented Architecture
The Open Group Standard TOGAF version 9.2, 2018	14. Phase G: Implementation Governance; 15. Phase H: Architecture Change Management

B. Component: Organizational Structures

Key Management Practice	Chief Operating Officer	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	I&T Governance Board	Architecture Board	Data Management Function	Head Architect
APO03.01 Develop the enterprise architecture vision.		R	R	R	R	A	R	R
APO03.02 Define reference architecture.		R	R	R	R	A	R	R
APO03.03 Select opportunities and solutions.		R	R	R	R	A	R	R
APO03.04 Define architecture implementation.	R	R	R	R	R	A	R	R
APO03.05 Provide enterprise architecture services.	R	R	R	R	R	A		R

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
The Open Group Standard TOGAF version 9.2, 2018	41. Architecture Board

C. Component: Information Flows and Items (see also Section 3.6)

Management Practice	Inputs		Outputs	
	From	**Description**	**Description**	**To**
APO03.01 Develop the enterprise APO03.01 architecture vision.	APO02.05	Strategic road map	Defined scope of architecture	APO02.05
	EDM04.01	Guiding principles for enterprise architecture	Architecture concept business case and value proposition	APO02.05; APO05.02
	Outside COBIT	Enterprise strategy	Architecture principles	BAI02.01; BAI03.01; BAI03.02
APO03.02 Define reference architecture.	APO01.04	• Definition of organizational structure and functions • Enterprise operational guidelines	Process architecture model	APO01.04
	APO01.06	• Evaluation of options for IT organization • Defined operational placement of IT function	Information architecture model	APO02.05; APO14.03; BAI02.01; BAI03.02; DSS05.03; DSS05.04; DSS05.06

Align, Plan and Organize

C. Component: Information Flows and Items (see also Section 3.6) (cont.)

Management Practice	Inputs		Outputs	
	From	**Description**	**Description**	**To**
APO03.02 Define reference architecture. (cont.)	APO01.07	Data classification guidelines	Baseline domain descriptions and architecture definition	APO13.02; BAI02.01; BAI03.01; BAI03.02; BAI03.12
	APO14.01	Data management strategy		
	APO14.03	Metadata documentation		
	Outside COBIT	Enterprise strategy		
APO03.03 Select opportunities and solutions.	APO02.03	Proposed enterprise architecture changes	Transition architectures	APO02.05
	Outside COBIT	• Enterprise drivers • Enterprise strategies		
APO03.04 Define architecture implementation.			Implementation phase descriptions	BAI01.01; BAI01.02; BAI11.01
			Architecture governance requirements	BAI01.01; BAI11.01
			Resource requirements	BAI01.02
APO03.05 Provide enterprise architecture services.			Solution development guidance	BAI02.01; BAI02.02; BAI03.02; BAI03.12

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
National Institute of Standards and Technology Special Publication 800-37, Revision 2, September 2017	3.1 Preparation (Task 9): Inputs and Outputs
The Open Group Standard TOGAF version 9.2, 2018	6. Phase A: Architecture Vision: Inputs and Outputs; 7. Phase B: Business Architecture: Inputs and Outputs; 9. Phase C: Information Systems Architectures Data Architecture: Inputs and Outputs; 10. Information Systems Architectures Application Architecture: Inputs and Outputs; 11. Phase D: Technology Architecture: Inputs and Outputs; 12. Phase E: Opportunities and Solutions: Inputs and Outputs; 13. Phase F: Migration Planning: Inputs and Outputs; 14. Phase G: Implementation Governance: Inputs and Outputs; 15. Phase H: Architecture Change Management: Inputs and Outputs

D. Component: People, Skills and Competencies

Skill	Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
Architecture design	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.5. Architecture Design
Data analysis	Skills Framework for the Information Age V6, 2015	DTAN
Enterprise and business architecture	Skills Framework for the Information Age V6, 2015	STPL
Product / service planning	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.4. Product/Service Planning
Solution architecture	Skills Framework for the Information Age V6, 2015	ARCH

E. Component: Policies and Procedures

Relevant Policy	Policy Description	Related Guidance	Detailed Reference
Architectural principles	Defines general principles to inform rules and 20. Architecture Principles guidelines for architecture processes, procedures, layers, and overall use and interconnection of I&T resources and assets. Outlines architectural principles to enhance decision making. Ensures alignment of current and target architecture with enterprise objectives and strategy.	The Open Group Standard TOGAF version 9.2, 2018	20. Architecture Principles

F. Component: Culture, Ethics and Behavior

Key Culture Elements	Related Guidance	Detailed Reference
Create an environment in which management understands architectural needs relative to business goals and objectives. Drive effective practice of enterprise architecture throughout the organization (not only by enterprise architects). Ensure a holistic approach that links components more seamlessly (e.g., by moving away from dedicated teams of application specialists).		

G. Component: Services, Infrastructure and Applications

Architecture repository

Align, Plan and Organize

Page intentionally left blank

Domain: Align, Plan and Organize Management Objective: APO04 — Managed Innovation	Focus Area: COBIT Core Model

Description

Maintain an awareness of I&T and related service trends and monitor emerging technology trends. Proactively identify innovation opportunities and plan how to benefit from innovation in relation to business needs and the defined I&T strategy. Analyze what opportunities for business innovation or improvement can be created by emerging technologies, services or I&T-enabled business innovation; through existing established technologies; and by business and IT process innovation. Influence strategic planning and enterprise architecture decisions.

Purpose

Achieve competitive advantage, business innovation, improved customer experience, and improved operational effectiveness and efficiency by exploiting I&T developments and emerging technologies.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG13 Product and business innovation	• AG06 Agility to turn business requirements into operational solutions • AG13 Knowledge, expertise and initiatives for business innovation

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals
EG01 a. Percent of products and services that meet or exceed targets in revenues and/or market share b. Percent of products and services that meet or exceed customer satisfaction targets c. Percent of products and services that provide competitive advantage d. Time to market for new products and services	AG06 a. Level of satisfaction of business executives with I&T responsiveness to new requirements b. Average time to market for new I&T-related services and applications c. Average time to turn strategic I&T objectives into agreed and approved initiatives d. Number of critical business processes supported by up-to-date infrastructure and applications
EG13 a. Level of awareness and understanding of business innovation opportunities b. Stakeholder satisfaction with levels of product and innovation expertise and ideas c. Number of approved product and service initiatives resulting from innovative ideas	AG13 a. Level of business executive awareness and understanding of I&T innovation possibilities b. Number of approved initiatives resulting from innovative I&T ideas c. Number of innovation champions recognized/awarded

A. Component: Process	
Management Practice	**Example Metrics**
APO04.01 Create an environment conducive to innovation. Create an environment that is conducive to innovation, considering methods such as culture, reward, collaboration, technology forums, and mechanisms to promote and capture employee ideas.	a. Enterprise stakeholder perception and feedback on I&T innovation b. Inclusion of innovation or emerging technology-related objectives in performance goals for relevant staff

Activities	Capability Level
1. Create an innovation plan that includes risk appetite, a proposed budget for innovation initiatives and innovation objectives.	2
2. Provide infrastructure that can be a governance component for innovation (e.g., collaboration tools for enhancing work between geographic locations and/or divisions).	
3. Maintain a program-enabling staff to submit innovation ideas and create an appropriate decision-making structure to assess and move ideas forward.	3
4. Encourage innovation ideas from customers, suppliers and business partners.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

81

Align, Plan and Organize

A. Component: Process *(cont.)*		

Management Practice	Example Metrics	
APO04.02 Maintain an understanding of the enterprise environment. Work with relevant stakeholders to understand their challenges. Maintain an adequate understanding of enterprise strategy, competitive environment and other constraints, so that opportunities enabled by new technologies can be identified.	a. Percent of implemented initiatives with a clear linkage to an enterprise objective b. Percent of opportunities enabled by new technologies identified	

Activities	Capability Level
1. Maintain an understanding of industry and business drivers, enterprise and I&T strategy, and enterprise operations and current challenges. Apply the understanding to identify potential value-add technology and innovate I&T.	2
2. Conduct regular meetings with business units, divisions and/or other stakeholder entities to understand current business problems, process bottlenecks or other constraints where emerging technologies or I&T innovation can create opportunities.	3
3. Understand enterprise investment parameters for innovation and new technology so appropriate strategies are developed.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	Example Metrics	
APO04.03 Monitor and scan the technology environment. Set up a technology watch process to perform systematic monitoring and scanning of the enterprise's external environment to identify emerging technologies that have the potential to create value (e.g., by realizing the enterprise strategy, optimizing costs, avoiding obsolescence, and better enabling enterprise and I&T processes). Monitor the marketplace, competitive landscape, industry sectors, and legal and regulatory trends to be able to analyze emerging technologies or innovation ideas in the enterprise context.	a. Frequency of environment research and scans performed for identifying innovative ideas and trends b. Percent of stakeholders satisfied with efforts to monitor marketplace, competitive landscape, industry sectors, and legal and regulatory trends to analyze emerging technologies or innovation ideas in the enterprise context	

Activities	Capability Level
1. Understand enterprise appetite and potential for technology innovation. Focus awareness efforts on the most opportune technology innovations.	2
2. Set up a technology watch process and perform research and scanning of the external environment, including appropriate websites, journals and conferences, to identify emerging technologies and their potential value to the enterprise.	
3. Consult third-party experts as necessary to confirm research or supply information on emerging technologies.	
4. Capture I&T-innovation ideas from staff and review for potential implementation.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	Example Metrics	
APO04.04 Assess the potential of emerging technologies and innovative ideas. Analyze identified emerging technologies and/or other I&T innovative suggestions to understand their business potential. Work with stakeholders to validate assumptions on the potential of new technologies and innovation.	a. Percent of implemented initiatives that realize the envisioned benefits b. Percent of successful proof-of-concept initiatives to test emerging technologies or other innovation ideas	

Activities	Capability Level
1. Evaluate identified technologies, considering aspects such as time to reach maturity, inherent risk (including potential legal implications), fit with enterprise architecture and value potential, in line with enterprise and I&T strategy.	2
2. Identify issues that may need to be resolved or validated through a proof-of-concept initiative.	3
3. Scope the proof-of-concept initiative, including desired outcomes, required budget, time frames and responsibilities.	
4. Obtain approval for the proof-of-concept initiative.	
5. Conduct proof-of-concept initiatives to test emerging technologies or other innovation ideas. Identify issues and determine whether implementation or rollout should be considered based on feasibility and potential ROI.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

A. Component: Process *(cont.)*

Management Practice	Example Metrics
APO04.05 Recommend appropriate further initiatives. Evaluate and monitor the results of proof-of-concept initiatives and, if favorable, generate recommendations for further initiatives. Gain stakeholder support.	a. Number of proof-of-concept initiatives evaluated and approved for further rollout b. Number of proof-of-concept initiatives that have been leveraged in actual investment

Activities	Capability Level
1. Document proof-of-concept results, including guidance and recommendations for trends and innovation programs.	3
2. Communicate viable innovation opportunities into the I&T strategy and enterprise architecture processes.	
3. Analyze and communicate reasons for rejected proof-of-concept initiatives.	
4. Follow up on proof-of-concept initiatives to measure actual investment.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Management Practice	Example Metrics
APO04.06 Monitor the implementation and use of innovation. Monitor the implementation and use of emerging technologies and innovations during adoption, integration and for the full economic life cycle to ensure that the promised benefits are realized and to identify lessons learned.	a. Increase in market share or competitiveness due to innovations b. Number of lessons learned and opportunities for improvement captured for future use

Activities	Capability Level
1. Capture lessons learned and opportunities for improvement.	3
2. Ensure that innovation initiatives align with enterprise and I&T strategy. Monitor alignment continuously. Adjust innovation plan, if required.	
3. Assess new technology or I&T innovations implemented as part of I&T strategy and enterprise architecture development. Evaluate level of adoption during program management of initiatives.	4
4. Identify and assess potential value of innovation.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

B. Component: Organizational Structures

Key Management Practice	Executive Committee	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	Business Process Owners	Data Management Function	Head Human Resources	Relationship Manager	Head Architect	Head Development	Head IT Operations	Service Manager	Information Security Manager
APO04.01 Create an environment conducive to innovation.	A	R	R	R	R	R	R		R	R	R	R	R
APO04.02 Maintain an understanding of the enterprise environment.	A	R	R	R	R	R		R	R	R	R	R	R
APO04.03 Monitor and scan the technology environment.	A	R	R	R	R	R			R	R	R	R	R
APO04.04 Assess the potential of emerging technologies and innovative ideas.	A	R	R	R	R	R			R	R	R	R	R
APO04.05 Recommend appropriate further initiatives.	A	R	R	R	R	R			R	R	R	R	R
APO04.06 Monitor the implementation and use of innovation.	A	R	R	R	R	R			R	R	R	R	R

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this component	

Align, Plan and Organize

83

C. Component: Information Flows and Items (see also Section 3.6)

Management Practice	Inputs		Outputs	
APO04.01 Create an environment conducive to innovation.	**From**	**Description**	**Description**	**To**
	EDM03.01	Risk appetite guidance	Recognition and reward program	APO07.04
			Innovation plan	Internal
APO04.02 Maintain an understanding of the enterprise environment.	Outside COBIT	Enterprise strategy and strengths, weaknesses, opportunities, threats (SWOT) analysis	Innovation opportunities linked to business drivers	APO02.01
APO04.03 Monitor and scan the technology environment.	Outside COBIT	Emerging technologies	Research analyses of innovation possibilities	BAI03.01
APO04.04 Assess the potential of emerging technologies and innovative ideas.			Proof-of-concept scope and outline business case	APO05.02; APO06.02
			Evaluations of innovation ideas	BAI03.01
			Test results from proof-of-concept initiatives	Internal
APO04.05 Recommend appropriate further initiatives.			Analysis of rejected initiatives	APO02.03; BAI03.08
			Results and recommendations from proof-of-concept initiatives	APO02.03; BAI03.09
APO04.06 Monitor the implementation and use of innovation.			Assessments of using innovative approaches	APO02.04; BAI03.02
			Evaluation of innovation benefits	APO05.03
			Adjusted innovation plans	Internal

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this component	

D. Component: People, Skills and Competencies

Skill	Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
Business plan development	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.3. Business Plan Development
Emerging technology monitoring	Skills Framework for the Information Age V6, 2015	EMRG
Innovating	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.9. Innovating
Innovation	Skills Framework for the Information Age V6, 2015	INOV
Research	Skills Framework for the Information Age V6, 2015	RSCH
Technology trend monitoring	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.7. Technology Trend Monitoring

Align, Plan and Organize

E. Component: Policies and Procedures			
Relevant Policy	**Policy Description**	**Related Guidance**	**Detailed Reference**
Innovation principles	Defines general principles ensuring that new/innovative ideas are fully assessed when defining new strategic goals and decisions.		

F. Component: Culture, Ethics and Behavior		
Key Culture Elements	**Related Guidance**	**Detailed Reference**
Create an environment that is conducive to innovation by maintaining relevant HR initiatives, such as innovation recognition and reward programs, appropriate job rotation, and discretionary time for experimentation. Ensure close collaboration and coordination of initiatives across the organization.		

G. Component: Services, Infrastructure and Applications
• Collaboration platforms • Industry benchmarks • Technology watch services and tools

Align, Plan and Organize

Page intentionally left blank

Domain: Align, Plan and Organize Management Objective: APO05 — Managed Portfolio	Focus Area: COBIT Core Model

Description

Execute the strategic direction set for investments in line with the enterprise architecture vision and I&T road map. Consider the different categories of investments and the resources and funding constraints. Evaluate, prioritize and balance programs and services, managing demand within resource and funding constraints, based on their alignment with strategic objectives, enterprise worth and risk. Move selected programs into the active products or services portfolio for execution. Monitor the performance of the overall portfolio of products and services and programs, proposing adjustments as necessary in response to program, product or service performance or changing enterprise priorities.

Purpose

Optimize the performance of the overall portfolio of programs in response to individual program, product and service performance and changing enterprise priorities and demand.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG08 Optimization of internal business process functionality • EG12 Managed digital transformation programs	• AG03 Realized benefits from I&T-enabled investments and services portfolio • AG05 Delivery of I&T services in line with business requirements

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals

EG01   a. Percent of products and services that meet or exceed targets in revenues and/or market share
      b. Percent of products and services that meet or exceed customer satisfaction targets
      c. Percent of products and services that provide competitive advantage
      d. Time to market for new products and services
	AG03 a. Percent of I&T-enabled investments for which claimed benefits in the business case are met or exceeded
	      b. Percent of I&T services for which expected benefits (as stated in service level agreements) are realized

EG08   a. Satisfaction levels of board and executive management with business process capabilities
      b. Satisfaction levels of customers with service delivery capabilities
      c. Satisfaction levels of suppliers with supply chain capabilities
	AG05 a. Percent of business stakeholders satisfied that I&T service delivery meets agreed service levels
	      b. Number of business disruptions due to I&T service incidents
	      c. Percent of users satisfied with the quality of I&T service delivery

EG12   a. Number of programs on time and within budget
      b. Percent of stakeholders satisfied with program delivery
      c. Percent of business transformation programs stopped
      d. Percent of business transformation programs with regular reported status updates	

A. Component: Process

Management Practice	Example Metrics
APO05.01 Determine the availability and sources of funds. Determine potential sources of funds, different funding options and the implications of the funding source on the investment return expectations.	a. Ratio between funds allocated and funds used b. Ratio between retained earnings and funds allocated

Activities	Capability Level
1. Understand current availability and commitment of funds, current approved spend and actual spend to date.	2
2. Identify options for additional funding of I&T-enabled investments, considering both internal and external sources.	
3. Determine the implications of the funding source on the investment return expectations.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO05.02 Evaluate and select programs to fund. Based on requirements for the overall investment portfolio mix and the I&T strategic plan and road map, evaluate and prioritize program business cases and decide on investment proposals. Allocate funds and initiate programs.	a. Percent of projects in the I&T project portfolio that can be directly traced back to the I&T strategy b. Percent of business units involved in the evaluation and prioritization process

Activities	Capability Level
1. Identify and classify investment opportunities in line with investment portfolio categories. Specify expected enterprise outcome(s), initiatives required to achieve expected outcome(s), high-level costs, dependencies and risk. Specify methodology for measuring outcomes, cost and risk.	2
2. Perform detailed assessment of all program business cases. Evaluate strategic alignment, enterprise benefit, risk and availability of resources.	3
3. Assess impact of adding potential programs on overall investment portfolio, including changes that might be required to other programs.	
4. Decide which candidate programs should be moved to the active investment portfolio. Decide whether rejected programs should be held for future consideration or provided with seed funding to determine if business case can be improved or discarded.	
5. Determine required milestones for each selected program's full economic life cycle. Allocate and reserve total program funding per milestone. Move the program into the active investment portfolio.	
6. Establish procedures to communicate the cost, benefit and risk-related aspects of portfolios for consideration in budget prioritization, cost management and benefit management processes.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
PMBOK Guide Sixth Edition, 2017	Part 1: 1.2.3 Relationship of project, program, portfolio and operations management

Management Practice	**Example Metrics**
APO05.03 Monitor, optimize and report on investment portfolio performance. On a regular basis, monitor and optimize the performance of the investment portfolio and individual programs throughout the entire investment life cycle. Ensure continuous follow-up on the alignment of the portfolio with I&T strategy.	a. Trends in ROI of initiatives included in the I&T strategy b. Level of satisfaction with the portfolio monitoring reports c. Percent of programs aligned with enterprise business requirements

Activities	Capability Level
1. Review portfolio regularly to identify and exploit synergies, eliminate duplication among programs, and identify and mitigate risk.	3
2. When changes occur, reevaluate and reprioritize portfolio to ensure alignment with business and I&T strategy. Maintain target mix of investments so that the portfolio optimizes overall value. Programs may be changed, deferred or retired, and new programs may be initiated, to rebalance and optimize portfolio.	
3. Adjust enterprise targets, forecasts, budgets and, if required, degree of monitoring to reflect expenditures and enterprise benefits attributable to programs in the active investment portfolio. Charge back program expenditures. Establish flexible budgeting processes so that promising projects get resources to scale quickly.	
4. Develop metrics to measure I&T contribution to the enterprise. Establish appropriate performance targets reflecting required I&T and enterprise capability targets. Use guidance from external experts and benchmark data to develop metrics.	4
5. Provide an accurate view of the performance of the investment portfolio to all stakeholders.	
6. Provide reports for senior management's review of enterprise progress towards identified goals, stating what still needs to be spent and accomplished over given time frames.	
7. In regular performance monitoring, include information on the extent to which planned objectives have been achieved, risk mitigated, capabilities created, deliverables obtained and performance targets met.	
8. Identify deviations for budget vs. actual spend and expected ROI on investments.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO05.04 Maintain portfolios. Maintain portfolios of investment programs and projects, I&T products and services, and I&T assets.	a. Number of completed programs and projects b. Time since last update of services portfolio

Activities	Capability Level
1. Create and maintain portfolios of I&T-enabled investment programs, I&T services and I&T assets, which form the basis for the current I&T budget and support the I&T tactical and strategic plans.	3
2. Work with service delivery managers to maintain the service portfolios. Work with operations managers, product managers and architects to maintain the asset portfolios. Prioritize portfolios to support investment decisions.	
3. Remove a program from the active investment portfolio when the desired enterprise benefits have been achieved or when it is clear that benefits will not be achieved within the value criteria set for the program.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ITIL V3, 2011	Service Strategy, 4.2 Service portfolio management

Management Practice	**Example Metrics**
APO05.05 Manage benefits achievement. Monitor the benefits of providing and maintaining appropriate I&T products, services and capabilities, based on the agreed and current business case.	a. Percent of changes from the investment program reflected in the relevant I&T portfolios b. Percent of stakeholders satisfied with efforts to monitor the benefits of providing and maintaining appropriate I&T services and capabilities, based on the agreed and current business case

Activities	Capability Level
1. Use the agreed metrics and track how benefits are achieved, how they evolve throughout the life cycle of programs and projects, how they are being delivered from I&T products and services, and how they compare to internal and industry benchmarks. Communicate results to stakeholders.	4
2. Implement corrective action when achieved benefits significantly deviate from expected benefits. Update the business case for new initiatives and implement business process and service improvements as required.	5
3. Consider obtaining guidance from external experts, industry leaders and comparative benchmarking data to test and improve the metrics and targets.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

B. Component: Organizational Structures

Key Management Practice	Chief Financial Officer	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	I&T Governance Board	Business Process Owners	Portfolio Manager	Program Manager	Project Management Office
APO05.01 Determine the availability and sources of funds.	R	R			A		R		
APO05.02 Evaluate and select programs to fund.	R	R	R	R	A		R	R	
APO05.03 Monitor, optimize and report on investment portfolio performance.		R	R	R	A		R	R	
APO05.04 Maintain portfolios.		R	R	R	A		R	R	R
APO05.05 Manage benefits achievement.	R	R	R	R	A	R	R	R	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference								
No related guidance for this component									

C. Component: Information Flows and Items (see also Section 3.6)

Management Practice	Inputs		Outputs	
	From	Description	Description	To
APO05.01 Determine the availability and sources of funds.			Investment return expectations	APO02.04; APO06.02; BAI01.06; EDM02.02
			Funding options	APO02.05

Align, Plan and Organize

C. Component: Information Flows and Items (see also Section 3.6) *(cont.)*				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO05.02 Evaluate and select programs to fund.	APO03.01	Architecture concept business case and value proposition	Program business case	APO06.02; BAI01.02
	APO04.04	Proof-of-concept scope and outline business case	Business case assessments	APO06.02; BAI01.06
	APO06.02	• Budget allocations • Prioritization and ranking of I&T initiatives	Selected programs with ROI milestones	BAI01.04; EDM02.02
	APO06.03	• IT budget • Budget communications		
	APO09.01	Identified gaps in IT services to the business		
	APO09.03	Service level agreements (SLAs)		
	APO13.02	Information security business cases		
	BAI01.02	• Program benefit realization plan • Program concept business case • Program mandate and brief		
	EDM02.02	• Evaluation of strategic alignment • Evaluation of investment and services portfolios		
	EDM02.03	Investment types and criteria		
APO05.03 Monitor, optimize and report on investment portfolio performance.	APO04.06	Evaluation of innovation benefits	Investment portfolio performance reports	APO09.04; BAI01.06; EDM02.03; EDM02.04; MEA01.03
	BAI01.06	Stage-gate review results		
	EDM02.02	Evaluation of investment and services portfolios		
	EDM02.04	• Feedback on portfolio and program performance • Actions to improve delivery of value		
APO05.04 Maintain portfolios.	BAI01.09	Communication of program retirement and ongoing accountabilities	Updated portfolios of programs, services and assets	APO09.02; BAI01.01
	BAI03.11	Updated service portfolio		
APO05.05 Manage benefits achievement.	BAI01.04	Program budget and benefits register	Corrective actions to improve benefit realization	APO09.04; BAI01.06
	BAI01.05	Results of benefit realization monitoring	Benefit results and related communications	APO09.04; BAI01.06; EDM02.02
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**			
No related guidance for this component				

Align, Plan and Organize

D. Component: People, Skills and Competencies

Skill	Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
Benefits management	Skills Framework for the Information Age V6, 2015	BENM
Portfolio management	Skills Framework for the Information Age V6, 2015	POMG
Product / service planning	e-Competence Framework (e-CF)—A common European Framework for ICT Professionals in all industry sectors—Part 1: Framework, 2016	A. Plan—A.4. Product/Service Planning

E. Component: Policies and Procedures

Relevant Policy	Policy Description	Related Guidance	Detailed Reference
Portfolio principles	Defines general principles that ensure correct and diverse selection of programs and projects to achieve I&T strategy; considers alignment with business strategy, appropriate investment mix, etc.		

F. Component: Culture, Ethics and Behavior

Key Culture Elements	Related Guidance	Detailed Reference
Promote systematic management of I&T investments; measure and evaluate investment scenarios objectively.		
To support speed and agility, ensure that leaders evaluate the active investment portfolio decisively. If a prototype does not work, leadership must end the project decisively, incorporate lessons learned and move on. Quickly devote additional resources to successful projects in order to appropriately scale.		

G. Component: Services, Infrastructure and Applications

Portfolio/investment management tools

Domain: Align, Plan and Organize Management Objective: APO06 — Managed Budget and Costs	Focus Area: COBIT Core Model

Description

Manage the I&T-related financial activities in both the business and IT functions, covering budget, cost and benefit management and prioritization of spending through the use of formal budgeting practices and a fair and equitable system of allocating costs to the enterprise. Consult stakeholders to identify and control the total costs and benefits within the context of the I&T strategic and tactical plans. Initiate corrective action where needed.

Purpose

Foster a partnership between IT and enterprise stakeholders to enable the effective and efficient use of I&T-related resources and provide transparency and accountability of the cost and business value of solutions and services. Enable the enterprise to make informed decisions regarding the use of I&T solutions and services.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG04 Quality of financial information • EG07 Quality of management information • EG08 Optimization of internal business process functionality • EG09 Optimization of business process costs • EG12 Managed digital transformation programs	• AG04 Quality of technology-related financial information • AG09 Delivering programs on time, on budget and meeting requirements and quality standards

Example Metrics for Enterprise Goals		Example Metrics for Alignment Goals	
EG01	a. Percent of products and services that meet or exceed targets in revenues and/or market share b. Percent of products and services that meet or exceed customer satisfaction targets c. Percent of products and services that provide competitive advantage d. Time to market for new products and services	AG04	a. Satisfaction of key stakeholders regarding the level of transparency, understanding and accuracy of I&T financial information b. Percent of I&T services with defined and approved operational costs and expected benefits
EG04	a. Satisfaction survey of key stakeholders regarding the transparency, understanding and accuracy of enterprise financial information b. Cost of noncompliance with finance-related regulations	AG09	a. Number of programs/projects on time and within budget b. Number of programs needing significant rework due to quality defects c. Percent of stakeholders satisfied with program/project quality
EG07	a. Degree of board and executive management satisfaction with decision-making information b. Number of incidents caused by incorrect business decisions based on inaccurate information c. Time to provide information supporting effective business decisions d. Timeliness of management information		
EG08	a. Satisfaction levels of board and executive management with business process capabilities b. Satisfaction levels of customers with service delivery capabilities c. Satisfaction levels of suppliers with supply chain capabilities		
EG09	a. Ratio of cost vs. achieved service levels b. Satisfaction levels of board and executive management with business processing costs		
EG12	a. Number of programs on time and within budget b. Percent of stakeholders satisfied with program delivery c. Percent of business transformation programs stopped d. Percent of business transformation programs with regular reported status updates		

Align, Plan and Organize

A. Component: Process		
Management Practice	**Example Metrics**	
APO06.01 Manage finance and accounting. Establish and maintain a method to manage and account for all I&T-related costs, investments and depreciation as an integral part of enterprise financial systems and accounts. Report using the enterprise's financial measurement systems.	a. Numbers of deviations between expected and actual budget categories b. Usefulness of financial information as input to business cases for new investment in I&T assets and services	
Activities		**Capability Level**
1. Define processes, inputs, outputs and responsibilities for the financial management and accounting of I&T in alignment with the enterprise budgeting and cost accounting policies and approach. Define how to analyze and report (to whom and how) on the I&T budget control process.		2
2. Define a classification scheme to identify all I&T-related cost elements (capital expenditures [capex] vs. operational expenses [opex], hardware, software, people, etc.). Identify how they are captured.		
3. Use financial information to provide input to business cases for new investments in I&T assets and services.		3
4. Ensure that costs are maintained in the I&T assets and services portfolios.		
5. Establish and maintain practices for financial planning and the optimization of recurring operational costs to deliver maximum value to the enterprise for the least expenditure.		4
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**	
ITIL V3, 2011	Service Strategy, 4.3 Financial management for IT services	
Management Practice	**Example Metrics**	
APO06.02 Prioritize resource allocation. Implement a decision-making process to prioritize the allocation of resources and establish rules for discretionary investments by individual business units. Include the potential use of external service providers and consider the buy, develop and rent options.	a. Number of resource-allocation issues escalated b. Percent of alignment of I&T resources with high-priority initiatives	
Activities		**Capability Level**
1. Rank all I&T initiatives and budget requests based on business cases and strategic and tactical priorities. Establish procedures to determine budget allocations and cutoff.		2
2. Allocate business and IT resources (including external service providers) within the high-level budget allocations for I&T-enabled programs, services and assets. Consider the options for buying or developing capitalized assets and services vs. externally utilized assets and services on a pay-for-use basis.		
3. Establish a procedure to communicate budget decisions and review them with the business unit budget holders.		
4. Identify, communicate and resolve significant impacts of budget decisions on business cases, portfolios and strategy plans. For example, this may include when budgets require revision due to changing enterprise circumstances or when they are not sufficient to support strategic objectives or business case objectives).		
5. Obtain ratification from the executive committee for the I&T budget implications that negatively impact the entity's strategic or tactical plans. Suggest actions to resolve these impacts.		3
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**	
No related guidance for this management practice		
Management Practice	**Example Metrics**	
APO06.03 Create and maintain budgets. Prepare a budget reflecting investment priorities based on the portfolio of I&T-enabled programs and I&T services.	a. Number of budget changes due to omissions and errors b. Usefulness of I&T budget in identifying all expected I&T costs of I&T-enabled programs, services and assets	

A. Component: Process *(cont.)*	
Activities	**Capability Level**
1. Implement a formal I&T budget, including all expected I&T costs of I&T-enabled programs, services and assets.	2
2. When creating the budget, consider the following components: alignment with the business; alignment with the sourcing strategy; authorized sources of funding; internal resource costs, including personnel, information assets and accommodations; third-party costs, including outsourcing contracts, consultants and service providers; capital and operational expenses; and cost elements that depend on the workload.	
3. Document the rationale to justify contingencies and review them regularly.	
4. Instruct process, service and program owners, as well as project and asset managers, to plan budgets.	
5. Review the budget plans and make decisions about budget allocations. Compile and adjust the budget based on changing enterprise needs and financial considerations.	3
6. Record, maintain and communicate the current I&T budget, including committed expenditures and current expenditures, considering I&T projects recorded in the I&T-enabled investment portfolios and operation and maintenance of asset and service portfolios.	
7. Monitor the effectiveness of the different aspects of budgeting.	4
8. Use the monitoring results to implement improvements and ensure that future budgets are more accurate, reliable and cost-effective.	5

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
ISO/IEC 20000-1:2011(E)	6.4 Budgeting and accounting for services
PMBOK Guide Sixth Edition, 2017	Part 1: 7. Project cost management

Management Practice	Example Metrics
APO06.04 Model and allocate costs. Establish and use an I&T costing model based, for example, on the service definition. This approach ensures that allocation of costs for services is identifiable, measurable and predictable, and encourages the responsible use of resources, including those provided by service providers. Regularly review and benchmark the cost/chargeback model to maintain its relevance and appropriateness for evolving business and IT activities.	a. Percent of overall I&T costs that are allocated according to the agreed cost models b. Number of reviews and benchmarks of the cost/chargeback model and its appropriateness to evolving business and I&T activities

Activities	**Capability Level**
1. Decide on a cost allocation model that enables fair, transparent, repeatable and comparable allocation of I&T-related costs to users. A basic allocation model example is the even spread of shared I&T-related costs. This is a very simple allocation model that is easy to apply; however, depending on the context of the enterprise, it is often viewed as unfair and it does not encourage responsible use of resources. An activity-based costing scheme, in which costs are allocated to IT services and charged to users of these services, enables a more transparent and comparable allocation of cost.	3
2. Inspect service definition catalogs to identify services subject to user chargeback and those that are shared services.	
3. Design the cost model to be transparent enough to allow users to identify their actual usage and charges by using categories and cost drivers that make sense for the user (e.g., cost per help desk call, cost per software license) and to better enable predictability of I&T costs and efficient and effective utilization of I&T resources. Analyze cost drivers (time spent per activity, expenses, portion of fixed vs. variable costs, etc.). Decide on appropriate differentiation (e.g., different categories of users with different weights) and use cost approximations or averages when actual costs are highly variable in nature.	
4. Explain the cost model principles and outcome to key stakeholders. Obtain their feedback for further fine-tuning toward a transparent and comprehensive model.	
5. Obtain approval of key stakeholders and communicate the I&T costing model to the management of user departments.	
6. Communicate important changes in the cost/chargeback model principles to key stakeholders and management of user departments.	

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

Align, Plan and Organize

Align, Plan and Organize

A. Component: Process *(cont.)*	
Management Practice	**Example Metrics**
APO06.05 Manage costs. Implement a cost management process that compares actual costs against budget. Costs should be monitored and reported. Deviations from budget should be identified in a timely manner and their impact on enterprise processes and services assessed.	a. Percent of variance among budgets, forecasts and actual costs b. Timeliness of monitoring and reporting in the case of deviations and the impact of deviations on enterprise processes and services assessed

Activities	Capability Level
1. Obtain approval of key stakeholders and communicate the I&T costing model to the management of user departments.	2
2. Establish time scales for the operation of the cost management process in line with budgeting and accounting requirements and timeline.	
3. Define a method for the collection of relevant data to identify deviations in budget vs. actuals, investment ROI, service cost trends, etc.	
4. Define how costs are consolidated for the appropriate levels in the enterprise (central IT vs. IT budget within business departments) and how they will be presented to the stakeholders. The reports provide information on costs per cost category, budget vs. actuals status, top spending, etc., to enable the timely identification of required corrective actions.	3
5. Instruct those responsible for cost management to capture, collect and consolidate the data, and present and report the data to the appropriate budget owners. Budget analysts and owners jointly analyze deviations and compare performance to internal and industry benchmarks. They should establish and maintain the overheads allocation method. The result of the analysis provides an explanation of significant deviations and the suggested corrective actions.	
6. Ensure that the appropriate levels of management review the results of the analysis and approve suggested corrective actions.	
7. Ensure that changes in cost structures and enterprise needs are identified and budgets and forecasts are revised as required.	4
8. At regular intervals, and especially when budgets are cut due to financial constraints, identify ways to optimize costs and introduce efficiencies without jeopardizing services.	5

Related Guidance (Standards, Frameworks, Compliance Requirements)	Detailed Reference
No related guidance for this management practice	

B. Component: Organizational Structures						
Key Management Practice	Chief Financial Officer	Chief Information Officer	Chief Technology Officer	Chief Digital Officer	Portfolio Manager	Head IT Administration
APO06.01 Manage finance and accounting.	A				R	R
APO06.02 Prioritize resource allocation.	R	A	R	R	R	R
APO06.03 Create and maintain budgets.	R	A	R	R		R
APO06.04 Model and allocate costs.	R	A				R
APO06.05 Manage costs.	R	A	R	R		R
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**					
No related guidance for this component						

C. Component: Management Flows and Items (see also Section 3.6)				
Management Practice	**Inputs**		**Outputs**	
	From	**Description**	**Description**	**To**
APO06.01 Manage finance and accounting.	BAI09.01	Asset register	Financial planning practices	Internal
			I&T costs classification scheme	Internal
			Accounting processes	Internal
APO06.02 Prioritize resource allocation.	APO04.04	Proof-of-concept scope and outline business case	Budget allocations	APO02.05; APO05.02; APO07.05; BAI03.11
	APO05.01	Investment return expectations	Prioritization and ranking of I&T initiatives	APO05.02
	APO05.02	• Program business case • Business case assessments		
	EDM02.02	Evaluation of investment and services portfolios		
	EDM02.04	Actions to improve value delivery		
APO06.03 Create and maintain budgets.			I&T budget	APO02.05; APO05.02; APO07.01; BAI03.11
			Budget communications	APO05.02; APO07.01; BAI03.11
APO06.04 Model and allocate costs.			Operational procedures	Internal
			Cost allocation communications	Internal
			Cost allocation model	Internal
			Categorized I&T costs	Internal
APO06.05 Manage costs.	BAI01.02	Program benefit realization plan	Cost optimization opportunities	APO02.02
	BAI01.04	Program budget and benefits register	Cost consolidation method	Internal
	BAI01.05	Results of benefit realization monitoring	Cost data collection method	Internal
	EDM02.04	Feedback on portfolio and program performance		
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**			
PMBOK Guide Sixth Edition, 2017	Part 1: 7. Project cost management: Inputs and Outputs			

D. Component: People, Skills and Competencies		
Skill	**Related Guidance (Standards, Frameworks, Compliance Requirements)**	**Detailed Reference**
Financial management	Skills Framework for the Information Age V6, 2015	FMIT

Align, Plan and Organize

Align, Plan and Organize

E. Component: Policies and Procedures			
Relevant Policy	**Policy Description**	**Related Guidance**	**Detailed Reference**
Budgeting policy	Addresses preparation and timeline for the annual budget and forecasting of the annual financial position. Outlines required management reporting processes. Establishes accountability and responsibility for budget plan and other financial documents.		

F. Component: Culture, Ethics and Behavior		
Key Culture Elements	**Related Guidance**	**Detailed Reference**
Effective and efficient management of I&T is supported by a culture of transparency on budget, costs and benefits throughout the organization. Management should enable a culture of fact-based decision-making through, for example, comparable estimations of business and IT costs and benefits for input to portfolio management, fair cost allocation of IT assets and resources, and repeatable budgeting of IT budgets.		

G. Component: Services, Infrastructure and Applications
Cost accounting system

Domain: Align, Plan and Organize Management Objective: APO07 — Managed Human Resources	Focus Area: COBIT Core Model

Description

Provide a structured approach to ensure optimal recruitment/acquisition, planning, evaluation and development of human resources (both internal and external).

Purpose

Optimize human resources capabilities to meet enterprise objectives.

The management objective supports the achievement of a set of primary enterprise and alignment goals:

Enterprise Goals	Alignment Goals
• EG01 Portfolio of competitive products and services • EG10 Staff skills, motivation and productivity • EG13 Product and business innovation	• AG12 Competent and motivated staff with mutual understanding of technology and business • AG13 Knowledge, expertise and initiatives for business innovation

Example Metrics for Enterprise Goals	Example Metrics for Alignment Goals
EG01 a. Percent of products and services that meet or exceed targets in revenues and/or market share b. Percent of products and services that meet or exceed customer satisfaction targets c. Percent of products and services that provide competitive advantage d. Time to market for new products and services	AG12 a. Percent of I&T-savvy business people (i.e., those having the required knowledge and understanding of I&T to guide, direct, innovate and see I&T opportunities in their domain of business expertise) b. Percent of business-savvy I&T people (i.e., those having the required knowledge and understanding of relevant business domains to guide, direct, innovate and see I&T opportunities for the business domain) c. Number or percentage of business people with technology management experience
EG10 a. Staff productivity compared to benchmarks b. Level of stakeholder satisfaction with staff expertise and skills c. Percent of staff whose skills are insufficient for competency in their role d. Percent of satisfied staff	AG13 a. Level of business executive awareness and understanding of I&T innovation possibilities b. Number of approved initiatives resulting from innovative I&T ideas c. Number of innovation champions recognized/awarded
EG13 a. Level of awareness and understanding of business innovation opportunities b. Stakeholder satisfaction with levels of product and innovation expertise and ideas c. Number of approved product and service initiatives resulting from innovative ideas	

A. Component: Process	
Management Practice	**Example Metrics**
APO07.01 Acquire and maintain adequate and appropriate staffing. Establish and maintain a method to manage and account for all I&T-related costs, investments and depreciation as an integral part of the enterprise financial systems and accounts. Report using the enterprise's financial measurement systems.	a. Average duration of vacancies b. Percent of IT posts vacant c. Percent of staff turnover

Activities	Capability Level
1. Evaluate staffing requirements on a regular basis or upon major changes. Ensure that both the enterprise and the IT function have sufficient resources to support enterprise goals and objectives, business processes and controls, and I&T-enabled initiatives adequately and appropriately.	2
2. Maintain business and IT personnel recruitment and retention processes in line with the overall enterprise's personnel policies and procedures.	
3. Establish flexible resource arrangements, such as the use of transfers, external contractors and third-party service arrangements, to support changing business needs.	
4. Include background checks in the IT recruitment process for employees, contractors and vendors. The extent and frequency of these checks should depend on the sensitivity and/or criticality of the function.	3

Align, Plan and Organize

99

Align, Plan and Organize

A. Component: Process *(cont.)*	
Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**
COSO Enterprise Risk Management, June 2017	6. Governance and Culture—Principle 5
Skills Framework for the Information Age V6, 2015	SFIA and skills management—Acquire
Management Practice	**Example Metrics**
APO07.02 Identify key IT personnel. Identify key IT personnel. Use knowledge capture (documentation), knowledge sharing, succession planning and staff backup to minimize reliance on a single individual performing a critical job function.	a. Percent of critical jobs where the enterprise relies on a single individual b. Number of staff backup plans performed

Activities	**Capability Level**
1. As a security precaution, provide guidelines on a minimum time of annual vacation to be taken by key individuals.	2
2. Take appropriate actions regarding job changes, especially job terminations.	
3. Use knowledge capture (documentation), knowledge sharing, succession planning, staff backup, cross-training and job rotation initiatives to minimize reliance on a single individual performing a critical job function.	
4. Regularly test staff backup plans.	3

Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**
CMMI Cybermaturity Platform, 2018	RI.RR Identification of Roles and Responsibilities
Skills Framework for the Information Age V6, 2015	SFIA and skills management—Acquire
Management Practice	**Example Metrics**
APO07.03 Maintain the skills and competencies of personnel. Define and manage the skills and competencies required of personnel. Regularly verify that personnel have the competencies to fulfill their roles on the basis of their education, training and/or experience. Verify that these competencies are being maintained, using qualification and certification programs where appropriate. Provide employees with ongoing learning and opportunities to maintain their knowledge, skills and competencies at a level required to achieve enterprise goals.	a. Identified key skills and competencies missing in the resource matrix b. Number of identified gaps between required and available skills c. Number of training programs provided

Activities	**Capability Level**
1. Identify currently available skills and competencies of internal and external resources.	2
2. Identify gaps between required and available skills. Develop action plans, such as training (technical and behavioral skills), recruitment, redeployment and changed sourcing strategies, to address the gaps on an individual and collective basis.	
3. Review training materials and programs on a regular basis. Ensure adequacy with respect to changing enterprise requirements and their impact on necessary knowledge, skills and abilities.	3
4. Provide access to knowledge repositories to support the development of skills and competencies.	
5. Develop and deliver training programs based on organizational and process requirements, including requirements for enterprise knowledge, internal control, ethical conduct, security and privacy.	
6. Conduct regular reviews to assess the evolution of the skills and competencies of the internal and external resources. Review succession planning.	4

Related Guidance (Standards, Frameworks, Compliance Requirements)	**Detailed Reference**
ISF, The Standard of Good Practice for Information Security 2016	PM2.3 Security Education/Training
ISO/IEC 27001:2013/Cor.2:2015(E)	7.2 Competence
National Institute of Standards and Technology Framework for Improving Critical Infrastructure Cybersecurity V1.1, April 2018	PR.AT Awareness and Training
National Institute of Standards and Technology Special Publication 800-53, Revision 5 (Draft), August 2017	3.2 Awareness and training (AT-3, AT-4)
Skills Framework for the Information Age V6, 2015	SFIA and skills management—Deploy
The CIS Critical Security Controls for Effective Cyber Defense Version 6.1, August 2016	CSC 17: Security Skills Assessment and Appropriate Training to Fill Gaps