

Process Integration as a Tool for Organizations to Implement Multiple Best Practices and Standards

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Abstract: This paper seeks to identify the problem that ICT has in implementing the myriad best practices or standard audit applications. To accomplish this a DSR methodology – which aims to construct and validate prescriptive knowledge – is employed. It consists, among others, of mapping exercises and the implementation of a case study for the Service Level Agreement that incorporates the integration of four best practices: ITIL v4, CMMI v2, eTOM v21.0, and COBIT 5, using best of breed approach. Feedback collected from 20 entities around the globe has revealed that there are great challenges in being able to have certification to various standards. This describes a novel way of systematically integrating best practices addressing high-level and low-level processes.

The main contribution of this research is the introduction of a low-level, replicable method for integrating multiple best practices using the Best of Breed approach. This method operationalizes DSR for process-level harmonization across ITIL v4, CMMI v2, eTOM v21.0, and COBIT 5, enabling organizations to increase process maturity while reducing audit effort and integration complexity.

Keywords: Best practices, CMMI, ITIL, eTOM, COBIT, Process integration.

1. INTRODUCTION

Institutions and corporations are urged to thoroughly implement best practices, which have been created by various organizations with comparable objectives. This will help to ensure the effective integration of these practices and achieve the desired outcomes. The importance of establishing process improvement standards and best practices is becoming increasingly apparent in many organizations. This is significantly important as customers place a higher value on service quality in order to improve company strategies and increase customer satisfaction. Businesses nowadays are focusing on improving the quality of the delivered value, strengthening corporate governance, increasing market share and profit, and reducing total expenses. All of these issues raise the demand for the information and communications technologies (ICT) sector to improve its efficiency. An efficient approach to achieve this is a better utilization of ICT processes. Recent studies also highlight that the adoption of

best practice integration is becoming even more essential in the context of Industry 4.0 and operational-technology transformation (Shilenge & Telukdarie, 2021). Increased interest and expectations for higher levels of governance, audit, and control sparked this international trend.

Best practices and standards play an important role in helping organizations increase the efficiency and effectiveness of their business processes. According to Gartner, a best practice is a collection of activities that increase the efficiency (cost and risk) or effectiveness (service level) of the business discipline or process that it supports. It must be able to be adopted, duplicated, transferred, and altered across a wide range of sectors (Gartner, 2020). Axelos defines best practice as a mode of working that has been proven to be successful by several organizations. A standard is a document established by consensus and approved by a recognized body that provides for common and repeated use, mandatory requirements, guidelines, or characteristics for its subject (AXELOS, 2019). All best practices and standards are focused on different areas, and part of them may include prepared templates to aid in the adoption and documentation of the business process. Best practices enable ICT organizations to improve the quality and security of their services while optimizing the return on their investments.

To meet the objectives and increase service quality, most organizations set relevant best practices and standards. The clarity of best practice guidelines may be limited as it can be difficult to determine which one is appropriate for the organization and its specific area. Prior studies have shown that organizations often adopt ITIL alongside other standards and frameworks, highlighting the need for complementary rather than isolated implementation approaches (Soomro & Hesson, 2012). In addition, Prior empirical research confirms that organizations frequently struggle when adopting multiple improvement frameworks concurrently because of misaligned processes, duplicated effort, and inconsistent audit requirements (Cater-Steel, Tan, & Toleman, 2013). An ICT firm has the option to use a single set of best practices, which could imply they are losing out on part of the business' requirements and demands. Practical evidence also shows that organizations that attempt to implement multiple best practices, such as ITIL and CMMI simultaneously, often face misalignment, resistance, and overhead due to conflicting terminology and process structures (Latif, Din, & Ismail, 2010).

Each best practice collection has weaknesses and strengths, and part of the directions and processes provided by these best practices may not be appropriate for all business areas and domains. The ultimate purpose of this paper is to contribute to the creation of more mature ICT processes. These can be customized for diverse ICT sectors and can increase the delivery of the necessary value that the business requires.

The remainder of the paper is laid out as follows. Section 2 provides an overview of the best practices in scope. Section 3 illustrates where the integrated best practices overlap and describes the procedures for incorporating best practices and provides an example of how to do so. The best practices considered in this work are Information Technology Infrastructure Library (ITIL) V4, Capability Maturity Model Integration (CMMI) V2, Enhanced Telecom Operations Map (eTOM) v21.0, and Control Objectives for Information and Related Technologies (COBIT) 2019. The Best of Breed technique has been utilized in Section 4 to choose the process strength and innovation of the new integrated processes. In Section 5, the integration is completed for the case of Service Level Agreements, and the new integrated process is described. The Demonstration and Evaluation subsection details the questionnaire that was completed by numerous companies and includes numerical metrics as a validation for the research effort following the DSR methodology. The study concludes with a summary of our findings and a brief description of future work in this field.

2. MATERIALS AND METHODS

This research investigates the combination of crucial IT governance and management frameworks in the context of strategic alignment and operational efficiency. The business objectives of an organization are translated into IT operations through the five governance domains of the COBIT framework, while ITIL v4 focuses on the customer's perspective of service management with principles such as service value and service change in addition to its four dimensions and 34 practices. CMMI v2 supports process maturity and performance enhancement with its structured components such as appraisal capability and maturity levels. The eTOM model, which is used in the telecommunications industry, offers a divisional perspective to business processes from strategy, operations to enterprise management.

These frameworks are effective in isolation, however, there are integration challenges due to legacy processes and limited resources. For example, the use of ITIL v3 in eTOM creates a problem of alignment with practices of ITIL v4. On the other hand, ITIL v4 enables integration of newer frameworks such as Lean, Agile, and DevOps resulting in innovation and increased flexibility. This research draws from these frameworks and proposes an approach to individualize governance integration due to the challenges presented by digital transformation's fast-paced nature. This perspective is aligned with the unified governance roadmap approach that emphasizes sustainability and continuous value generation (Selig, 2018).

3. RESULTS

The reviewed literature highlights the integration of IT best practices as a valuable approach for achieving organizational objectives and improving IT management. While methodologies, tools, and standards such as ITIL, COBIT, CMMI, and eTOM are widely recognized, most studies emphasize their individual strengths but lack comprehensive frameworks for integration. Recent research has also focused on maturity evaluation models that compare ITIL, COBIT and CMMI concurrently, demonstrating the growing need for multi-framework assessment rather than isolated adoption (Aguilar et al., 2018). Research suggests that combining best practices can align IT with business goals, enhance process maturity, and reduce redundancy, yet systematic methods for low-level process mapping are largely absent. For example, the integration of ITIL with TOGAF has demonstrated improvements in enterprise architecture alignment and service delivery (Gama et al., 2015).

Several studies investigate specific integrations—such as ITIL with COBIT, ITIL with CMMI, or ITIL with ISO—showcasing benefits including improved information security, reduced duplication and better strategic alignment. Nonetheless, these efforts rarely provide detailed implementation procedures or scalable integration frameworks. Even research proposing harmonization frameworks across multiple reference models offers valuable high-level alignment but does not operationalize low-level process integration suitable for direct adoption by ICT organizations (Pardo et al., 2013). Additional studies have examined combinations including ITIL with CMMI, COBIT with ITIL, BSC with COBIT, BSC with ITIL, PMBOK with ISO 27002, and CMMI with COBIT to improve maturity and governance alignment; however, these efforts also remain limited to conceptual harmonization and do not provide prescriptive low-level process mapping (Desai, Bharadwaj, & Nagarkatti, 2007; Alfaraj & Qin, 2011; Ali, Soomro, & Brohi, 2013; Ghazouani, Medromi, Sayouti, & Faris, 2013; Debora Suryawan & Veronica, 2017). Similarly, combining ITIL, COBIT and ISO/IEC 27002 has demonstrated conceptual alignment benefits but still falls short of offering an actionable, low-level integration methodology applicable across industries (Gehrmann, 2012). Across the literature, common limitations include a focus on high-level integration without addressing detailed process dependencies, a lack of enhanced process examples and limited attention to practical implementation.

This study addresses these gaps by proposing a systematic method to integrate four best practices (ITIL, COBIT, CMMI, and eTOM) with detailed process mapping. The approach aims to offer a

replicable framework for organizations to achieve enhanced IT processes, aligning multiple standards to improve efficiency, compliance, and IT-business alignment.

4. DISCUSSION

The integration of the selected best practices presents a clear picture of their capabilities and areas of focus. Figure 1 highlights the relationship between COBIT 5, ITIL, eTOM, and CMMI, emphasizing their strengths and areas of expertise. The need to align these frameworks rather than apply them in isolation is well-established in prior industry guidance, particularly in early work advocating structured alignment between COBIT and ITIL to enhance business value (ITSMF & IT Governance Institute, 2005). COBIT 5 focuses on governance and ensuring compliance with relevant regulations, while ITIL primarily concentrates on service management. eTOM, specifically tailored for the telecommunications sector, encompasses parts of ITIL processes, such as Incident Management and Service Catalog Management. Lastly, CMMI can be applied to enhance the maturity level of any process. In section 4, we will use an example to further illustrate the overlap between these best practices as depicted in Figure 1.

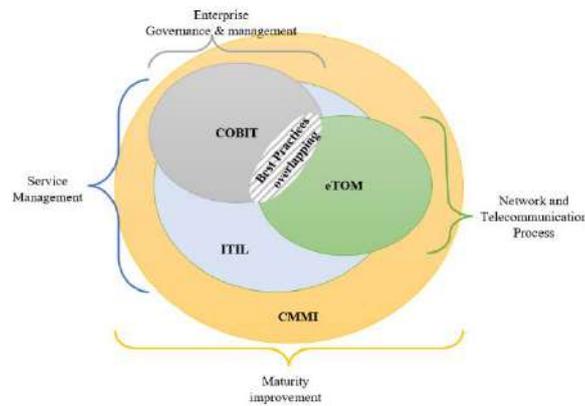


Figure 1. Best practices overlapping

Figure 2 outlines the steps involved in integrating best practices and how to get started. The first step is to review the targeted best practices and choose one as the baseline. Next, the low-level processes of all best practices must be studied, and the chosen baseline practice is listed down into a table. Processes from the same themes are identified and listed by row, while the columns represent the best practices in scope, including COBIT 5, ITIL v4, eTOM V21.0, and CMMI.

In the table, some processes may match with one or multiple processes from other best practices, while others may not match with any process due to their specialized nature. By identifying these matches and gaps, organizations can gain a better understanding of their operations and identify areas for

improvement. This approach can help to ensure that the organization is aligned with various standards and best practices, leading to increased efficiency, compliance, and overall performance.

COBIT 5 is chosen as a baseline for this proposal. Any other best practices can be used as a baseline, although the mapping in this case could be different. The domains connected to COBIT 5 are addressed one by one in Table I, Table II, Table III, Table IV, and Table V, and the domain's procedures are matched with all other processes from other best practices such as ITILV4, eTOM V21.0, and CMMI.

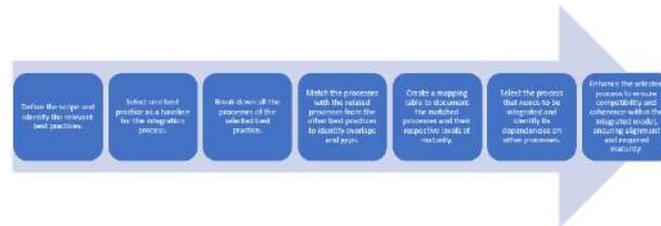


Figure 2. Integration steps

The Monitor, Evaluate, and Assess (MEA) domain in COBIT 5 is dedicated to establishing the necessary mechanisms for monitoring and evaluating the performance of an organization's IT-related processes. It focuses on assessing the effectiveness and efficiency of the enterprise's IT governance, risk management, and control frameworks, as well as identifying opportunities for improvement. The processes in the MEA domain are designed to provide a comprehensive view of the organization's IT-related performance and enable informed decision-making. In the following section, the processes in the MEA domain are listed and matched to other processes in Table 1.

Table 1. The mapping table of best practices integration related to the Monitor, Evaluate and Assess (MEA) domain.

COBIT5	ITILV4	eTOM V21.0	CMMI
MEA01 Managed Performance and Conformance Monitoring	GMP Measurement and reporting SMP Monitoring and event management GMP Continual improvement	ED_ EEM L3 Enterprise Performance Assessment ED_ CEP L3 Data Analytics ED_ CEP L3 Maturity assessment	L2M Work Monitoring and Control L2M Measurement and Analysis L5O Organization Performance Management L4Q Organization process Performance

<p>MEA02 Managed System of Internal Control</p>	<p>GMP Measurement and reporting SMP Monitoring and event management GMP Continual improvement</p>	<p>ED_ EEM L3 ITIL Continual Service Improvement ED_ FAM L3 Audit Management ED_ CEP L3 Data Analytics ED_ CEP L3 Maturity assessment</p>	<p>L2M Work Monitoring and Control L2M Measurement and Analysis L3D Organization Process Focus L3D Organization Process Definition L4Q Organization process Performance L4Q Quantitative work Management L5O Organization Performance Management 5O Causal Analysis and Resolution</p>
<p>MEA03 Managed Compliance with External Requirements</p>	<p>GMP Continual improvement GMP Measurement and reporting SMP Monitoring and event management</p>	<p>ED_ EEM L3 ITIL Continual Service Improvement ED_ FAM L3 Audit Management ED_ CEP L3 Maturity assessment</p>	<p>L2M Work Monitoring and Control L2M Measurement and Analysis L3D Organization Process Focus L3D Organization Process Definition L4Q Organization process Performance L4Q Quantitative work Management L5O Organization Performance Management 5O Causal Analysis and Resolution</p>

The Evaluate, Direct, and Monitor (EDM) domain in COBIT 5 is focused on setting strategic direction and aligning IT goals with the enterprise's overall objectives. The processes in this domain enable the organization to evaluate its current state, define its target state, and develop a roadmap to achieve its

objectives. The EDM domain provides the necessary mechanisms for effective management and governance of IT-related activities, ensuring that they are aligned with the organization's strategic objectives. In Table 2, the processes belonging to the EDM domain are listed and matched to other relevant processes, providing a comprehensive view of the organization's IT-related activities and their interdependencies.

Table II. Mapping table of best practices integration related to the Evaluate Direct and Monitor (EDM) domain.

COBIT5	ITILV4	eTOM V21.0	CMMI
EDM01 Ensure Governance Framework Setting and Maintenance	GMP Strategy management	ED_ SRM L3 Regulatory Management ED_ SRM L3 Legal Management	-
EDM02 Ensure Business Delivery	GMP Portfolio management GMP Relationship management SMP Business analysis	ED_ SEP L3 Strategic Business Planning ED_ SRM L3 Corporate Communications & Image Management PD_SIP_ILM L2 Product & Offer Capability Management SD_SIP_ILM L2 Service Capability Delivery RD_SIP_ILM L2 Resource Capability Delivery	L3D Strategic Service Management
EDM03 Risk Optimization	GMP Risk management GMP Information security management	ED_ ERM L3 Business Continuity Management ED_ ERM L3 Security Management ED_ ERM L3 ITIL Information Security Management ED_ FAM L3 Insurance Management	L3D Incident Resolution and Prevention

		ED_ FAM L3 Revenue Assurance Management	
EDM04 Ensure Resource Optimization	SMP Availability management GMP Capacity and performance management GMP Workforce and talent management	ED_ KRM L3 Technology scanning ED_ EEM L3 ITIL Availability Management ED_ EEM L3 ITIL Capacity Management ED_ HRM L3 workforce Development RD_L2 Resource Domain	L3D Strategic Service Management L3D Service System Development
EDM05 Ensure Stakeholder Transparency	GMP Portfolio management GMP Relationship management	ED_ SRM L3 Community Relations Management ED_ SRM L3 Shareholder Relations Management ED_ ERM L3 Integrity Management	L3D Strategic Service Management L3D Service System Development

The Align, Plan, and Organize (APO) domain in COBIT 5 is dedicated to aligning the organization's IT-related activities with its business objectives and strategy. The APO domain includes processes that are designed to enable effective planning and management of IT resources, ensuring that they are used efficiently and effectively to support the organization's goals. The processes in the APO domain also focus on organizing IT activities and ensuring that they are managed in a structured and systematic way. In Table 3, the processes that belong to the APO domain are listed, providing a comprehensive view of the organization's IT-related activities and their alignment with its strategic goals.

Table III. Mapping table of best practices integration related to the Align, Plan and Organize (APO) domain.

COBIT5	ITILV4	eTOM V21.0	CMMI
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APO01 Manage the IT Management Framework	GMP Continual improvement	ED_ EEM L3 ITIL Continual Service Improvement ED_ FAM L3 Audit Management	L2M Work Monitoring and Control L2M Measurement and Analysis L3D Organization Process Focus L3D Organization Process Definition L3D Organization Training L4Q Organization process Performance L4Q Quantitative work Management L5O Organization Performance Management
APO02 Manage Strategy	GMP Strategy management	ED_SEP L3 Strategic Business Planning SIP_SC L2 Market Strategy & Policy SIP_SC L2 Sales Strategy & Planning SIP_SC L2 Service Strategy & Planning	L3D Strategic Service Management
APO03 Manage Enterprise Architecture	-	ED_ SEP L3 Enterprise Architecture Management ED_ SEP L3 Group Enterprise Management	L3D Service System Development
APO04 Manage Innovation	GMP Portfolio management GMP Workforce and talent management	ED_ KRM L3 Research Management	L3D Service System Development

<p>APO05 Manage Portfolio</p>	<p>GMP Portfolio management SMP Service catalog management</p>	<p>ED_ EEM L3 ITIL Service Catalog Management ED_ SEP L3 Strategic Business Planning PD_SIP_SC L2 Product & offer Portfolio Planning PD_SIP_PLM L2 Product Lifecycle Management PD_SIP_PLM L2 Product Specification & Offering Development & Retirement</p>	<p>L3D Strategic Service Management</p>
<p>APO06 Manage Budget and Costs</p>	<p>GMP Service financial management</p>	<p>ED_ FAM L3 Financial Management ED_ FAM L3 Procurement Management ED_ FAM L3 Revenue Assurance Management</p>	<p>L2M Work Monitoring and Control</p>
<p>APO07 Manage Human Resources</p>	<p>GMP Capacity and performance management SMP Availability management GMP Workforce and talent management</p>	<p>ED_ HRM L3 HR Policies and Practices ED_ HRM L3 Organization Development ED_ EEM L3 ITIL Capacity Management ED_ EEM L3 ITIL Availability Management ED_ EEM L3 Facilities Management & Support ED_ HRM L3 workforce Strategy ED_ HRM L3 workforce Development ED_ HRM L3 Employee & Labor Relations Management ED_ SRM L3 Community Relations Management</p>	<p>L3D Capacity and Availability Management L3D Organization Training</p>

		ED_ SRM L3 Shareholder Relations Management	
APO08 Manage Relationship	SMP Capacity and performance management GMP Portfolio management GMP Relationship management	ED_ SEP L3 Business Development ED_ HRM L3 Organization Development ED_ HRM L3 Employee & Labor Relations Management ED_ SRM L3 Community Relations Management ED_ SRM L3 Shareholder Relations Management CD_ O F/A L2 Customer Management	L3D Strategic Service Management L3D Service System Development
APO09 Manage Service Agreements	SMP Service catalog management SMP Service Design SMP Service level management	ED_ EEM L3 ITIL Service Catalog Management ED_ EEM L3 ITIL Service Level Management	L3D Strategic Service Management L2M Service Delivery
APO10 Manage Suppliers	GMP Supplier Management	ED_ KRM L3 Technology Scanning SPD_ L1 Supplier/ Partner Domain	L2M Supplier Agreement Management
APO11 Manage Quality	GMP Continual improvement GMP Measurement and reporting	ED_ EEM L3 ITIL Continual Service Improvement ED_ EEM L3 Enterprise Quality Management SD_ O L2 Service Quality Management	L2M Work Monitoring and Control L2M Measurement and Analysis L3D Organization Process Focus

			L4Q Organization process Performance L4Q Quantitative work Management L5O Organization Performance Management L5O Causal Analysis and Resolution
APO12 Manage Risk	SMP Service continuity management GMP Information security management GMP Risk management	ED_ ILM L2 Enterprise Risk Management ED_ FAM L3 Insurance Management ED_ FAM L3 Revenue Assurance Management	L3D Service Continuity L3D Incident Resolution and Prevention
APO13 Manage Security	GMP Information security management	ED_ ERM L3 Security Management ED_ ERM L3 ITIL Information Security Management ED_ ERM L3 Board & Shares/Securities Management ED_ ERM L3 Integrity Management ED_ CEP L3 Data Governance ED_ CEP L3 Data Management	-

The Build, Acquire, and Implement (BAI) domain in COBIT 5 is dedicated to building, acquiring, and implementing IT solutions and services that meet the organization's requirements. The processes in this domain cover the entire lifecycle of IT development and implementation, from defining the requirements to deploying the solution. The BAI domain is critical to the success of the organization, as it enables the development and deployment of IT solutions that align with the enterprise's strategic goals. In Table 4, the matched list of processes that belong to the BAI domain are provided, offering a comprehensive view of the organization's IT-related activities and their interdependencies.

Table 4. Mapping table of best practices integration related to the Build, Acquire and Implement (BAI) domain.

COBIT5	ITILV4	eTOM V21.0	CMMI
BAI01 Manage Programs	SMP Service Design GMP Project management	ED_ EEM L3 Program & Project Management	L3D Service System Development L3D Service System Transition
BAI02 Manage Requirements Definition	SMP Service Design Service level management	ED_ EEM L3 ITIL Service Level Management SD SIP_SC L2 Service Strategy & Planning EPD SIP L2 Party Strategy & Planning	L2M Service Delivery
BAI03 Manage Solutions Identification and Build	SMP Release management	MSD L2 Solution Management	L3D Incident Resolution and Prevention L2M Service Delivery
BAI04 Manage Availability and Capacity	SMP Availability management SMP Capacity and performance management GMP Workforce and talent management	ED_ EEM L3 ITIL Availability Management ED_ EEM L3 ITIL Capacity Management ED_ HRM L3 workforce Strategy ED_ HRM L3 workforce Development	L3D Capacity and Availability Management
BAI05 Manage Organizational Change	GMP Organizational change management SMP Change control ITSM Roles	ED_ SEP L3 ITIL Change Management	L2M Requirements Management L2M Configuration Management
BAI06 Manage IT Changes	SMP Change control	ED_ SEP L3 ITIL Change Management	L2M Requirements Management L2M Configuration Management
BAI07 Manage Change Acceptance and Transitioning	SMP Service Design GMP Project management SMP Release management SMP Service validation and testing	ED_ SEP L3 ITIL Release and Deployment Management ED_ SEP L3 ITIL Change Management	L3D Service System Development L3D Service System Transition L2M Requirements Management

	TMP Deployment management SMP Change control		L2M Configuration Management
BAI08 Manage Knowledge	GMP Knowledge management	ED_ KRM L3 Knowledge Management ED_ KRM L3 Research Management	L2M Work Planning L2M Work Monitoring and Control
BAI09 Manage Assets	SMP IT asset management SMP Monitoring and event management TMP Infrastructure and platform management TMP Software development and management	ED_ EEM L3 ITIL Service Asset and Configuration Management ED_ FAM L3 Asset Management	L2M Configuration Management
BAI10 Manage Configuration	SMP IT asset management TMP Infrastructure and platform management TMP Software development and management	ED_ EEM L3 ITIL Service Asset and Configuration Management ED_ FAM L3 Asset Management	L2M Configuration Management
BAI11 Managed Projects	SMP Service Design GMP Project management	ED_ EEM L3 Program & Project Management	L3D Service System Development L3D Service System Transition

The Deliver, Service, and Support (DSS) domain in COBIT 5 is focused on the delivery, maintenance, and support of IT services, ensuring that they are reliable, available, and meet the organization's requirements. The DSS domain includes processes that are designed to enable effective service delivery, service management, and service support, ensuring that IT services are delivered in a structured and systematic way. In Table 5, the list of procedures that correspond to each DSS domain process is provided, along with a comparison to processes from other best practices. This helps organizations to identify the areas where COBIT 5 can be integrated with other best practices, providing a comprehensive view of the organization's IT-related activities and their alignment with its strategic goals.

Table 5. Mapping table of best practices integration related to the Deliver, Service and Support (DSS) domain.

COBIT5	ITILV4	eTOM V21.0	CMMI
DSS01 Manage Operations	SMP Incident management SMP Service desk SMP Monitoring and event management	ED_ EEM L3 ITIL Event Management ED_ EEM L3 ITIL Incident Management SD_SIP L2 Service Capability Delivery	L3D Incident Resolution and Prevention
DSS02 Manage Service Requests and Incidents	SMP Incident management SMP Service desk SMP Service request management	ED_ EEM L3 ITIL Incident Management ED_ EEM L3 ITIL Request Fulfillment	L3D Incident Resolution and Prevention L2M Service Delivery
DSS03 Manage Problems	SMP Problem Management	ED_ ERM L3 ITIL Problem Management	L3D Incident Resolution and Prevention L5O Causal Analysis and Resolution
DSS04 Manage Continuity	SMP Service continuity management	ED_ ERM L3 Business Continuity Management	L3D Service Continuity
DSS05 Manage Security Services	GMP Information security management	ED_ ERM L3 Security Management ED_ ERM L3 ITIL Information Security Management ED_ ERM L3 Board & Shares/Securities Management ED_ CEP L3 Data Governance ED_ CEP L3 Data Management	-
DSS06 Manage Business Process Controls	GMP Information security management	ED_ SEP L3 Business Development ED_ EEM L3 Process Management & Support ED_ FAM L3 Audit Management	L2M Work Monitoring and Control L5O Organization Performance Management L4Q Organization process Performance

In Table 6, the procedures of the integrated best practices that are connected to the Service Level Agreement (SLA) are presented. This table serves as a comprehensive guide for organizations looking

to align their SLA processes with the best practices of COBIT 5, ITIL, eTOM, and CMMI. As a proof of concept, we have selected the SLA process and taken the first step to align the relevant processes in each best practice. Through our analysis, we found that COBIT 5's "P009 Manage Service Agreements" covers SLA management, while ITIL's Service Management Practices (SMP), Service Catalog Management, and Service Level Management processes also address this topic. Notably, while ITIL's Service Catalog Management and Service Level Management processes are used in eTOM, Strategic Service Management, and Service Delivery processes are used in CMMI. The mapping of these processes helps organizations to understand the similarities and differences between the best practices and integrate them effectively to achieve their SLA objectives.

Table 6. Mapping table of the processes related to Service Level Agreement.

Process Name	Processes related to SLA
COBIT5	<ul style="list-style-type: none"> • PO09 Manage Service Agreements is a process in COBIT 5 that aims to ensure alignment between the ICT-enabled products and services provided by an organization and the needs and expectations of its stakeholders. The process involves identifying, specifying, designing, publishing, agreeing to, and monitoring IT products and services, service levels, and performance indicators. The ultimate goal is to ensure that the organization's IT-related activities are in line with its strategic objectives and are delivering value to its stakeholders.
ITIL v4	<ul style="list-style-type: none"> • SMP Service Catalog Management: The primary objective of the service catalog management practice is to establish a central repository of reliable and accurate information about all the services and service offerings of the organization. This information must be accessible to the relevant stakeholders, including customers and service providers, to ensure efficient and effective service delivery. • SMP Service Design: The primary goal of service design is to create high-quality and cost-effective services that meet the needs of the customers and align with the business strategy. This involves planning and coordinating people, processes, information, technology, and suppliers to ensure that the

	<p>services are fit for purpose, fit for use, and deliverable within the company's ecosystem.</p> <ul style="list-style-type: none"> • SMP Service Level Management (SLM): The primary goal of SLM is to establish and maintain mutually agreed Service Level Agreements (SLAs) with customers and ensure that the services provided meet the agreed-upon service levels. In addition, SLM is responsible for reviewing and validating all Operational Level Agreements (OLAs) and Underpinning Contracts (UCs) to ensure that they support the delivery of the required services. SLM also monitors, measures, and reports on service levels to identify areas for improvement and ensure continuous service improvement.
eTOM v21.0	<ul style="list-style-type: none"> • ED_ EEM L3 ITIL Service Catalog Management: The purpose of the process is to provide a single source of consistent information about all IT services and service offerings and to ensure that this information is accessible to the appropriate people. It provides a model or template for other process areas to work with, in order to align with the ITIL methodology if applicable to the company. It is important to note that not all businesses will opt to use the ITIL methodology, and may instead use different Service Catalog Management (or equivalent) models. • ED_ EEM L3 ITIL Service Level Management: this process is responsible for negotiating Service Level Agreements with customers and creating services that meet the agreed-upon service levels. It provides a model or template for other process areas to work with, in order to align with the ITIL methodology if applicable to the company. However, not all companies will adopt the ITIL methodology, and in these cases, different Service Level Management (or equivalent) models may be more appropriate.
CMMI	<ul style="list-style-type: none"> • O L5 Strategic Service Management: The Strategic Service Management process aims to create and maintain standard services that align with the organization's strategic goals and objectives. It involves developing and implementing a service strategy, identifying service requirements, and designing service solutions that meet those requirements. By focusing on the

strategic aspects of service management, this process helps ensure that services are aligned with the organization's overall goals and priorities.

- M L2 Service Delivery: The Service Delivery process in CMMI-SVC is responsible for delivering services in accordance with service agreements. It encompasses activities such as service initiation, service monitoring and control, service reporting, and service delivery system improvement. By providing a structured approach to service delivery, this process helps ensure that services are delivered consistently and reliably, and that service level agreements are met.

The ITIL v3 process structure was chosen from a wide range of best practices. This process has been chosen as it provides clear instructions for constructing the systematic steps required for extracting the components of the integrated process, and it provides a good explanation for the process modules that should exist in each process. Figure 3 describes the major components that should be present in each process. This article recommends that the integrated processes' basic components have the same structure. This will facilitate researchers looking for best practices to follow our strategy while ensuring a more methodical integration.

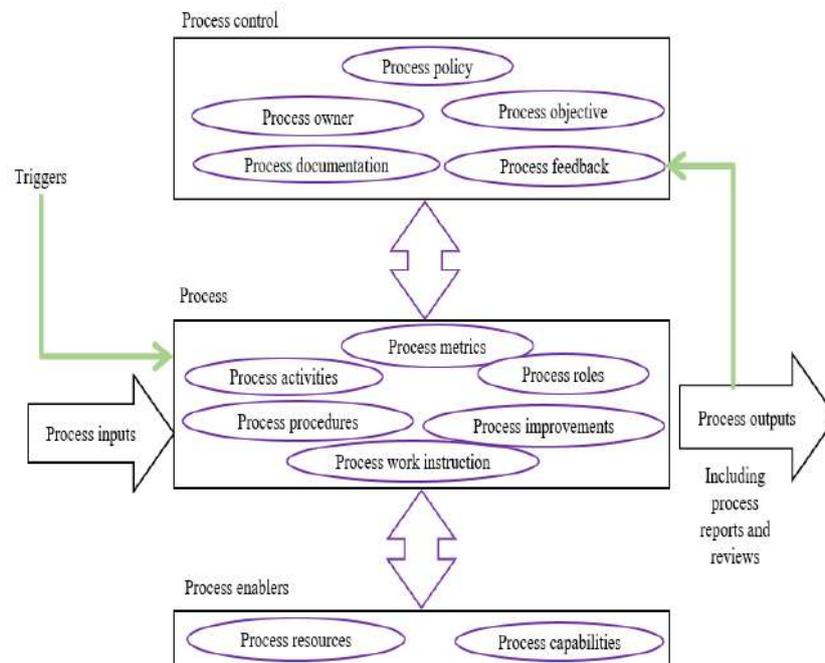


Figure 3. ITIL v3 process model (OGC, 2012).

In this article, the ITIL v3 process framework is used to create an integrated SLA process in a systematic manner. From an operational standpoint, this structure was chosen because it provides complete, practical, and proven direction for any process. The ITIL v3 process module includes:

- Process Definition, which explains the business use-cases, as well as the input and output that make up the process components of this section: process objective and process policy.
- Process Lifecycle, that includes process activities, procedures, work instructions, process enhancements, and it encompasses the process components.
- Process Requirements, which consist of the process documentation, process resources, and process capabilities.
- Process Metrics, which consist of the process components of this part, are process metrics and process feedback.
- Process Roles and Responsibilities, which consist of the process components of this part: Process owner, process roles, and process resources.

5. DEMONSTRATION AND EVALUATION

After developing the artifact, a proper demonstration of the artifact must be undertaken according to the design science research (DSR) processes (Peppers, 2007). Artifacts in design science research (DSR) are thought to contain information. This knowledge includes everything from design logic, construction processes, and tools to assumptions about the context in which the artifact will be used (Gregor, 2002). The Design and Development Research (DDR) perspective further emphasizes that the artifact must be rigorously constructed and documented in a way that supports both scientific examination and practical application (Ellis & Levy, 2010).

The development and evaluation of artifacts thus plays a key role in the DSR process, which is centered on "create and evaluate" as outlined by Hevner et al. (2004) and reinforced by March and Storey (2008).

Design science research (DSR) is an iterative process that involves designing, developing, and evaluating artifacts such as models, methods, constructions, instantiations, and design theories. DSR is concerned with the creation of new or improved solutions to problems, and it can lead to the development of new explanatory theories, social innovations, design and development models, and implementation processes or methods. Some of the characteristics of DSR include the integration of

design and research, a focus on problem-solving, and the use of rigorous methods to evaluate the effectiveness of the artifacts produced.

To gather information on the challenges faced by organizations in implementing multiple best practices, the authors invited several companies to participate in an interview and present their experiences. Following this, the participants were asked to complete a questionnaire. Twenty organizations accepted the invitation, and their outcomes are detailed in the following sections. The exercise was conducted with CIOs, ICT Leaders, ICT Consultants, and ICT Directors who were identified as appropriate decision-makers for the questionnaire at that time. Table 7 provides further details on the interview.

Table 7. Information about interviewees.

Country	Position
UK	DOSO Director
Turkey	ITSM consultant
South Africa	CIO
Vietnam	Senior Business Consultant
Spain	Service Delivery & Operations Manager
India	Project Manager
Singapore	Service Management Consultant
The Netherlands	IT Manager and Business Processes
UK	Senior Product Manager
Finland	Head of Services
The Netherlands	Chair
Germany	CIO
Australia	Service Management consultant
USA	Assistant vice President
UK	Senior Project Manager

India	IT Services Architect
USA	Manager
India	Head of Product Engineering
USA	Strategy & Digital Marketing Consultant
Germany	Director PLM Process

To ensure that respondents were able to follow the questionnaire accurately, they were provided with a copy of it before the presentation. During the presentation, the activities in the questionnaire were explained in detail. To maintain scientific rigor, all presentations were conducted by the same person. The questionnaire covered information about the interviewee, their industry, and their ICT department or team, and included questions about their impression and assessment of best practice integration.

The questionnaire uses a 5-point Likert scale with five options: strongly agree, agree, neutral, disagree, and strongly disagree (Schuman, 1981).

The chosen organizations are distinguished by a number of factors. The writers have attempted to approach several organizations' surroundings since the beginning of the study in order to achieve some variety. The organization's details are listed in Table 8 and in Figure 4.

Table 8. Information about the organizations that participated in the questionnaire.

Sector	Country	Organization Size	ICT employees
Telecommunications	UK	43,000	20,000
Information Technology	Turkey	200	175
Telecommunications	South Africa	3,500	200
Information Technology	Vietnam	30	20
Information Technology	Spain	200	150
Information Technology	India	450,000	350,000
Information Technology	Singapore	180	150
Retailing	The Netherlands	1,800	70

Information Technology	UK	5,000	4,000
Telecommunications	Finland	150,000	90,000
Education	The Netherlands	100,000	11,000
Health	Germany	11,000	1,200
Resources	Australia	45,000	1,200
Information Technology	USA	30,000	13,000
Telecommunications	UK	93,000	32,000
Information Technology	India	150,000	148,000
Information Technology	US	1,000	100
Information Technology	India	180	10
Consultancy	USA	22	12
Health	Germany	11,000	2,000

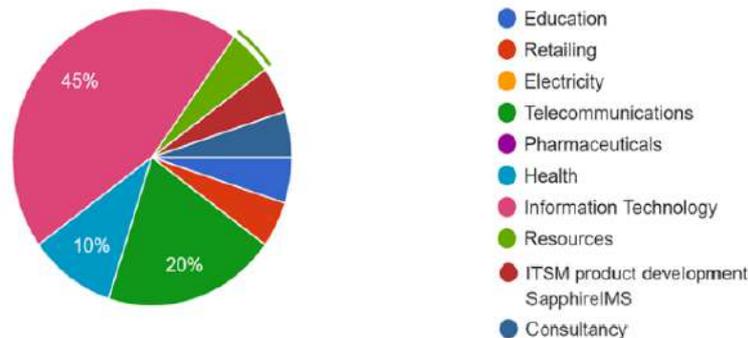


Figure 4. Information about the industry of the chosen organizations

The companies that were interviewed were carefully selected from various industries and varied in size and structure, with all having sizable ICT departments. In compliance with the General Data Protection Regulation (GDPR), their personal information was kept confidential and not disclosed. The primary aim of the interviews was to elicit feedback on the integration of best practices and to identify the benefits that were gained from implementing these practices in different organizations.

The authors contend that the exhibition of the object was successful in achieving these goals, as the interviews provided valuable insights into the challenges and opportunities related to the adoption of best practices.

5.1 Data Analysis

Similar empirical results were demonstrated in earlier studies focused on integrated ICT frameworks in the banking sector, where organizations faced comparable challenges in managing multiple best practices (Mukenge Tshinu et al., 2008).

The results presented in Figure 5 demonstrate the prevalence of certain best practice frameworks in the organizations that participated in the study. Notably, ITIL was used by the vast majority of companies, indicating its popularity and effectiveness in the field. Additionally, the significant use of other frameworks, such as PMP and CMMI, suggests that organizations are recognizing the importance of implementing multiple best practices to achieve optimal results.

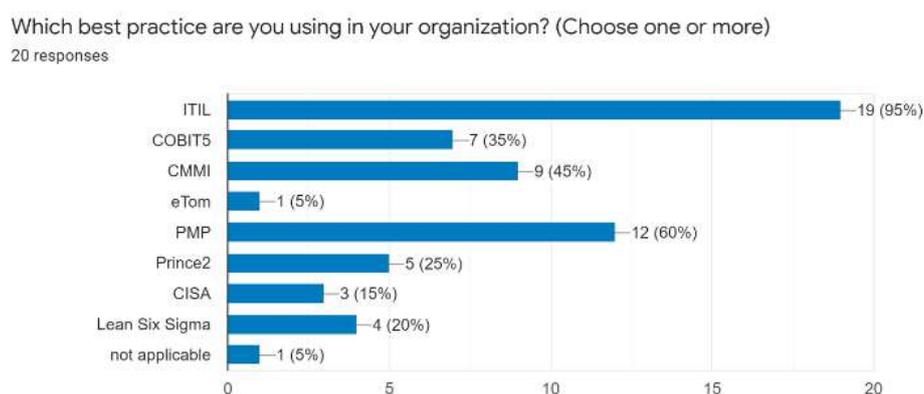


Figure 5. Information about the best practices that have been applied in the chosen companies.

Similarly, the findings from the study reveal that a significant percentage of the selected enterprises follow various international standards. As depicted in Figure 6, 70% of the companies adhere to ISO 20000, 65% to ISO 9001, and 55% to ISO 27001. The results suggest that these standards are widely accepted and implemented by ICT organizations, emphasizing their importance in ensuring quality and security in service management.

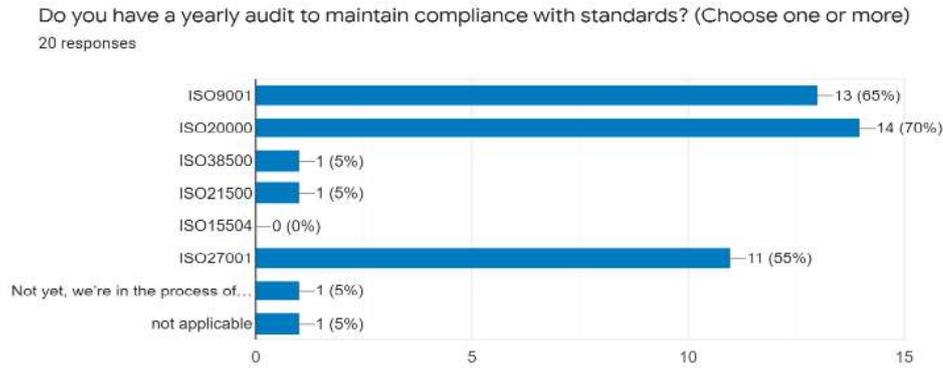


Figure 6. Information about the standards that have been implemented in the chosen organizations.

Based on the survey results, it is evident that the majority of companies recognize the need to implement multiple standards and best practices simultaneously. About 80% of the respondents agreed that simply implementing a best practice without customization would be ineffective. This highlights the importance of adapting best practices to suit an organization's specific needs and requirements. The survey results provide valuable insights into the challenges faced by organizations in implementing best practices and the importance of tailoring them for maximum effectiveness.

According to the findings presented in Figure 7, a significant proportion of the participants expressed skepticism towards the implementation of best practices without customization or adaptation. Specifically, half of the respondents strongly disagreed with the notion that best practices can be effectively implemented without any customization, while an additional 30% held a less extreme, yet still skeptical, viewpoint. These results suggest that a one-size-fits-all approach to best practice implementation is unlikely to be successful, and that organizations should carefully consider their specific needs and contexts when selecting and adapting best practices.

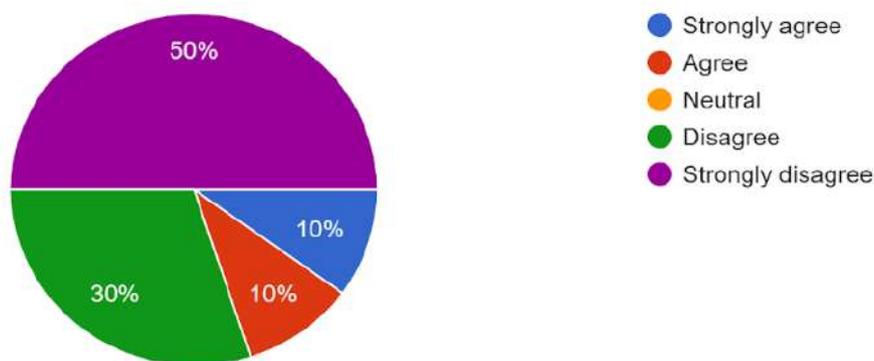


Figure 7. The implementation of the best practice without customization or adaptation.

The results presented in Figure 8 highlight a significant issue faced by the majority of the firms participating in the study, as 80% of them agreed with the problem statement regarding the challenges of obtaining certification from multiple standards simultaneously. These difficulties arise when attempting to implement a universal process across multiple best practices and standards, indicating the need for a more flexible approach to achieve successful implementation. The findings suggest that a tailored approach to implementing best practices and standards, rather than a one-size-fits-all approach, may be more effective in overcoming the identified hurdles.

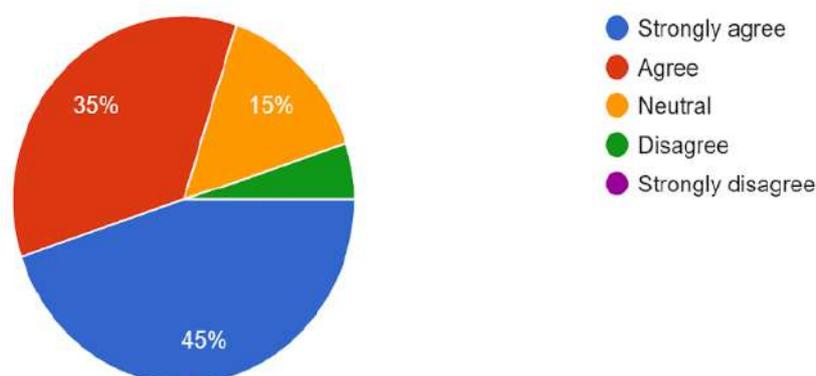


Figure 8. The percentage of the organizations that are facing challenges with multiple best practices and standards.

5.2 Example of enhanced process: SLA

Following the procedures outlined in the previous sections, this section explains how to construct the integrated process. The following processes from the best practices were used from the integration table (Table III): Align, Plan and Organize (APO) Manage Service Agreements from COBIT 5 (ISACA, 2018), SMP Service Catalog Management, SMP Service Design, SMP Service Level Management from ITIL v4 (AXELOS, 2019), ITIL Service Catalog Management and ITIL Service Level Management from eTOM (TM Forum, 2019) and finally, from CMMI, the Strategic Service Management and Service Delivery (Forrester et al., 2011). These process selection criteria have been created by identifying all processes that are connected to SLA topic.

5.2.1 Process Definition

One of the key goals of a SLA is to document the agreement between a service provider and the customer(s) or user(s). This document should include the agreed-upon measurable targets for the services in question, as well as the terms, conditions, penalties, and other terms.

In order to supply services that fulfill the user's expectations, services are defined, and realistic service levels are agreed with the customer(s) or user(s). On a regular basis, the defined service levels and the

user's service demands are reviewed with the users. The SLA can be changed depending on the situation. Actual service levels are compared to the specified service levels, and regular reports are sent to users and management. When service levels are breached without cause, corrective action should be performed.

For a successful SLA, it is crucial to have policies and requirements that are linked to a specific service in the service catalog, as individual measurements without a service context are ineffective. Additionally, SLAs should focus on specific outcomes rather than just operational indicators and should combine various measures, including customer satisfaction and critical business results, into a well-balanced package. To ensure that the SLA reflects an agreement between the service provider and the service user, all stakeholders, including partners, sponsors, users, and consumers, must be included in a dialogue and engagement. Lastly, it is important that the SLA is written in a straightforward manner that is easy for all parties to comprehend and use.

Developing an effective SLA requires a clear understanding of the services being provided, the value they bring, the business environment, the organization, and the tools available for measurement (AXELOS, 2019). To gain this understanding, it can be helpful to ask a series of questions. For example, it's important to consider whether value is perceived from the customer's perspective and to understand the scope of the company's responsibilities. The role of technology in SLA measurement should also be taken into account. Additionally, it's important to identify key business areas, individuals, and activities, and determine which operations are the most critical to the company's success. Understanding the company's goals, objectives, and measurements for the year can provide further context. It's also useful to assess the general public's view and evaluation of the ICT/Technology service, and to consider how the service can make a greater impact for the company. By answering these questions, a more comprehensive SLA can be developed.

5.2.2 Process Lifecycle

A Service Level Agreement (SLA) is a contract between a service provider and its customer that defines the quality and level of service that the customer can expect to receive. The SLA lifecycle refers to the different stages that a typical SLA goes through, from its initial creation to its ongoing management and improvement over time. By following the SLA lifecycle, service providers can ensure that they are providing high-quality services that meet the needs of their customers, while also managing costs and optimizing their resources.

By combining and implementing resources and capabilities, the process lifecycle, defined as a set of coordinated activities that will obtain a generation of the SLA, together with a revision and an enhancement of the current agreements (Forrester et al., 2011). The integrated process lifecycle is illustrated in Figure 9, from the starting conversation for gathering requirements through the end of the cycle for reporting and corrective actions.

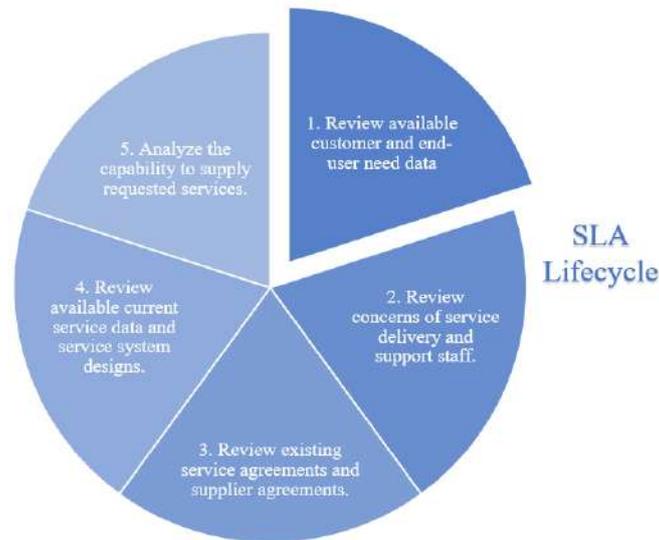


Figure 9. SLA lifecycle

The SLA lifecycle consists of several key stages that are essential to managing service levels effectively. In this process, customer needs and concerns, existing agreements, service data, and capability to supply services are reviewed to ensure that the service provider is meeting agreed-upon service levels while optimizing costs and resources. These stages will be listed and described in more detail below.

1. Review available customer and end-user need data

To ensure a successful service agreement, it's important to have a thorough understanding of customer and end-user needs. This can include goals that may not be explicitly stated as service requirements. To update this information, gathering needs from customers and end-users through methods such as face-to-face or remote meetings, surveys, customer-supplied plans, and work statements can be helpful. Another effective approach is shadowing to gain insights into how users interact with the service. By updating available data on customer and end-user requirements, service providers can align their service offerings with the needs and expectations of their customers, leading to a more successful service agreement.

2. Review concerns of service delivery and support staff.

Before developing a service agreement, it's crucial to re-evaluate service delivery concerns and support personnel. These stakeholders work closely with customers and end-users and play a vital role in fulfilling service needs and expectations. They also have unique operational knowledge that can help identify potential consequences of a new service agreement. Obtaining this data can be done through a variety of methods, such as online or in-person meetings, as well as feedback mechanisms like surveys or emails. Understanding the viewpoints of service delivery and support staff is essential for ensuring a successful service agreement that meets the needs and expectations of all stakeholders.

3. Review existing service agreements and supplier agreements.

When revising service contracts, it's essential to consider both existing services and suppliers. This involves several key factors, such as evaluating the impact of the customer's supplier agreements on the requested service delivery. Additionally, it may be necessary to review the requested service requirements and compare them to standard service definitions. The next step is to revise existing service level and supplier agreements, including underpinning contracts and operational level agreements, to ensure they have the capacity to meet the specified service's requirements. By taking these steps, service providers can ensure that they have the necessary agreements in place to deliver high-quality services that meet the needs and expectations of their customers and end-users.

4. Review available current service data and service system designs.

To ensure the service is capable of meeting the specified requirements, it's essential to review the available data and system designs. This includes assessing the existing service data, such as performance metrics, incident histories, and capacity and availability management data, and reviewing capabilities like monitoring. Additionally, it may be necessary to gather industry benchmarks or alternative information to address service requirements that were not previously considered by the supplier. A thorough review of the available data and system designs can help identify any gaps in the service's capability and determine necessary improvements.

5. Analyze the capability to supply requested services.

The capacity to provide the required services should be determined by developing a holistic strategy for service delivery. This may involve a make-buy-reuse strategy that includes utilizing existing service system resources, modifying or creating new service systems to meet new requirements, or outsourcing some services or the entire service system to a third party. holistic strategy to complete the specified service delivery.

5.2.3 Process Requirements

The SLA document is a critical component of the SLA lifecycle and should include a variety of information and requirements. This includes a page with signatures and identification of participants, as well as key personnel. The document should also outline job scheduling, access control, contingency planning, trouble monitoring, change management, and other relevant procedures. Additionally, the SLA should clearly define criteria for measuring service quality, turnaround time, and any SLA exclusions. Charges for the service should also be included, as well as procedures for changes and non-achievement penalties. Finally, the SLA should detail the service levels that are expected, including availability, reliability, performance, capacity for growth, support supplied to users, continuity planning, security, and minimum acceptable level of given system functioning (TM Forum, 2019), (AXELOS, 2019), (Gartner, 2020), and (ISACA, 2018).

5.2.4 Process Metrics

Table 9 lists a collection of common measurements that can be used to evaluate and benchmark SLA performance. All of the best practices' Key Performance Indicators (KPIs) have been chosen. All KPIs should be relevant as each of them measure the level of service agreement from a different perspective (Forrester et al., 2011), (AXELOS, 2019), (Gartner, 2020), and (ISACA, 2018).

Table 9. Enhanced SLA's KPIs as a result of best practices integration.

Key Performance Indicator (KPI)	Definition
Services covered by SLA	The number of services that are covered by the SLA.
Services covered by OLAs (Operational level Agreement) /UCs (Underpinning Contract)	The number of services for which SLAs are backed up by OLAs/UCs.
Monitored SLA	Number of monitored services/service level agreements (SLAs) where flaws and countermeasures are reported.
SLA under Review	The number of services/SLAs that are checked on a regular basis.
Fulfillment of Service Levels	The number of services/SLAs that meet the agreed-upon service levels.

Number of Service Issues	There are a number of difficulties with service delivery that have been identified and addressed in an improvement plan.
The percentage of reviewed SLA	In relation to all active SLA, the number of SLA that are being reviewed.
The percentage of service levels (in SLA)	The percentage of service levels that are really measured (in SLA).
Number of SLA Complaints	In absolute numbers, the number of customer complaints owing to unmet service levels.
Amount for SLA correction	Costs of remedial action as a result of not meeting service levels.
Number of penalties for SLA breaches	Costs incurred as a result of contractual penalties for failure to meet service levels.
Number of SLA implemented improvements	In absolute numbers, the number of executed improvement potentials from the examination of service level arrangements.
The cost of SLA activities	SLA's total costs of activities.

5.2.5 Process Roles and Responsibilities

Table 10 summarizes the roles required for the integrated process, as well as the activities and responsibilities that each function is responsible for. These roles were compiled from all best practices (AXELOS 2019; Forrester et al., 2011; Gartner, 2020; ISACA, 2018).

Table 10. Enhanced SLA's roles and responsibilities as a result of best practices integration.

Roles	Responsibilities
Process owner	<p>A position in charge of verifying that a process is suitable for its intended purpose.</p> <p>This role's responsibilities include process and metric sponsorship, design, and continuous improvement.</p> <p>In larger businesses, separate Process Owner and Process Manager roles may exist, with the Process Manager being in charge of the process's operational management.</p>
Service Level Manager	This role's primary task is to negotiate SLAs and guarantee that they are met.

	<p>They ensure that all IT SLA Service Management processes, Operational Level Agreements (OLA), and Underpinning Contracts (UCs) are acceptable for the customer's agreed-upon service level targets.</p> <p>The Service Level Manager also keeps track of service levels and reports on them.</p>
Service Owner	<p>The primary purpose of this position is to provide a certain service within agreed-upon service levels.</p> <p>When negotiating Operational Level Agreements (OLAs), the service owner usually acts as the Service Level Manager's counterpart.</p> <p>Typically, the Service Owner is in charge of a group of technical experts or an internal support organization.</p>
Customer	<p>A customer is a person who purchases IT services.</p> <p>And this function might be filled by a person or group responsible for defining and agreeing on service level targets.</p>
User	<p>On a daily basis, a person who uses one or more IT services.</p> <p>Customers and Service Users are not the same thing because some Customers do not use IT services directly.</p>
Process Consultant	<p>Typically, one or two outside consultants are brought in to assist in setting up, planning, leading, and monitoring success in organizational process improvement. These professionals bring process improvement experience from a variety of organizations and industries.</p>
Sponsor	<p>This person is usually in charge of allocating finances and employees. This individual is normally at or above the directorate level.</p>

6. CONCLUSION

This research provides a systematic and replicable method for integrating multiple best practice frameworks through low-level process mapping and a Best of Breed approach. The proposed method operationalizes Design Science Research (DSR) for practical harmonization across ITIL v4, CMMI v2, eTOM v21.0, and COBIT 2019, offering organizations a structured solution to improve process

maturity while reducing audit effort, duplicated activities, and integration complexity. The goal of the research is to devise a solution that would provide a middle ground by using the strengths of different frameworks (ITIL v4, CMMI v2, eTOM v21.0, and COBIT 5) while minimizing their weaknesses.

The study employed the DSR methodology of Design Science Research and the Best of Breed approach in creating and validating an integrated method. There has been a confirmation from 20 organizations' feedback of ICT professionals, which are based worldwide, for the need of such a solution. They agreed that the integrated approach would ease implementation difficulties, save time for audits, and enhance compliance and process maturity.

This more structured approach allows the documentation of processes as per different views and also sets forth the SLA process as an example of Application of Concepts. This addition will not only strengthen the ICT best practice adoptions but also will lay groundwork for further study and practice of effective enchainment of standards to best practice. The method makes it possible to achieve enhanced organizational maturity, while simultaneously saving time and ensuring adherence to different standards.

7. CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper. The research was conducted independently and without any commercial or financial relationships that could be construed as a potential conflict of interest.

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9. ACRONYMS

Table 11. Acronyms mentioned in this study.

Acronyms	Full Meaning
CMMI	Capability Maturity Model Integration
ITIL	Information Technology Infrastructure Library
ITSM	Information Technology Service Management
COBIT	Control Objectives for Information and Related Technologies
ICT	Information and communications technology
IT	Information technology
eTOM	Enhanced Telecommunication Operating Manual
CCTA	Central Computer and Telecommunications Agency
ISACA	Information Systems Audit and Control Association
DevOps	Software development (Dev) and IT operations (Ops)

SEI	Software Engineering Institute
SIP	Strategy, Infrastructure and Product
OP	Operations
EM	Enterprise Management
GMP	General management practices
SMP	Service management practices
TMP	Technical management practices
L2M	Maturity Level 2 Managed (CMMI-SVC)
L3D	Maturity Level 3 Defined (CMMI-SVC)
L4Q	Maturity Level 4 Quantitatively Managed (CMMI-DEV)
L5O	<u>Maturity Level 5 Optimizing (CMMI-DEV)</u>
EDM	Evaluate Direct and Monitor
APO	Align, Plan and Organize
BAI	Build, Acquire and Implement
DSS	Deliver, Service and Support
MEA	Monitor, Evaluate and Assess
S&EP	Strategic & Enterprise Planning
K&RM	Knowledge & Research Management
EEM	Enterprise Effectiveness Management
F&AM	Financial & Asset Management

ERM	Enterprise Risk Management
HRM	Human Resource Management
S&ERM	Stakeholder & External Relation Management
CEP	Common Enterprise Processes
SLA	Service Level Agreement
OLA	Operational Level Agreement
UC	Underpinning Contract
CIO	chief information officer
PLM	Product Lifecycle Management