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An Extensive Review of IT Service Design in Seven International ITSM Processes Frameworks: Part II

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ABSTRACT

The main international IT Service Management processes frameworks (ITIL v2, ISO/IEC 20000, COBIT 4.0, CMMI-SVC, MOF 4.0, and ITUP) include the design of IT services as part of their main best practices. However, despite having a common purpose and conceptual structure, they are organized differently. Hence, ITSM academic researchers and practitioners need to integrate a broad and diverse literature in relation to these frameworks. In Part I of this research, the authors pursued the goal of a descriptive-comparative analysis of fundamental concepts and IT service architecture design models used in the seven ITSM frameworks. In this paper (Part II) we complete this systemic analysis by using the ISO/IEC 15288 systems engineering standard and focusing on the IT design processes and practices reported in the aforementioned ITSM frameworks. Specifically, CMMI-SVC and ITUP are assessed in overall as the strongest frameworks from an engineering view, MOF 4.0 and ITIL v3 as moderate, and ISO/IEC 20000, ITIL v2 and COBIT as the weakest. ITSM academicians and in particular practitioners thus will need to distinguish their utilization according to the level of required detail of the IT service design process. This paper aims to advance our comprehension and understanding on the state of the art regarding what are IT services and how they can be designed. Thus it is of broad significance to ITSM researchers and practitioners.

Keywords: *CMMI-SVC, COBIT 4.0, MOF 4.0, Systems Services, ISO/IEC 15288 Standard, ISO/IEC 20000, IT Service Design, ITIL v2, ITIL v3, ITSM Processes Frameworks, ITUP*

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INTRODUCTION

In the Part I of this research (Mora et al., 2014), we addressed the practical and research issues experienced by Information Technology Service Management (ITSM) practitioners and academic researchers alike, regarding the broad and diverse literature on the fundamental concepts and IT architecture design models used in the main seven ITSM processes frameworks: ISO/IEC 20000 (ISO, 2005; 2010), ITIL v2 (van Bon et al., 2005), ITIL v3 (Cartlidge, 2007; van Von et al., 2007), COBIT (ITGI, 2005), CMMI-SVC (SEI, 2010), ITUP® (EMA, 2006; Ganek & Kloeckner, 2007; IBM, 2010), and MOF® 4.0 (Microsoft, 2008).

Accordingly we have conducted an extensive review of IT service design processes of the aforementioned seven relevant ITSM processes frameworks. Research questions were established as follows: (i**)** *what are the foundational concepts of service, IT service, system and service system used in each ITSM processes framework?; (ii) what is the used description for an IT service architecture design in each ITSM processes framework ?; and (iii) what are the degree of compliance of the first two previous elements regarding the modern view of services and service systems ?*

In this Part II of this research, we complete our analysis focusing on the IT service design processes and practices reported in the seven ITSM processes frameworks. For this aim, we use again a systems view through the system engineering standard ISO/IEC 15288. The systems engineering discipline concerns with the integrated design of man-made systems under an organizational context, has elaborated systematic design processes (Buede, 2000; Sage, 2000; Farr & Buede, 2003). The standard ISO/IEC 15288 (ISO, 2007) is the main one used in this research for conducting a comparison of the design process posed in the seven ITSM process frameworks versus the standardized ISO/IEC 15288 processes (e.g. versus the specific processes related with the system design purpose). This systems engineering standard ISO/IEC 15288 has been used previously as a theoretical framework for conceptual studies in the domain of business organizational process (Arnold & Budson, 2004) and design of eco-industrial parks (Haskins, 2007).

Given that designing an IT service must consider the interactions of several human and technology components (hardware, software, DBMS, networks, data, applications, environment, and internal and external teams), an IT service and their generative IT service system constitutes man-made engineered systems. Consequently, IT service design processes, and their detailed study on how to systematically conduct it emerges as a relevant systems engineering design problem (Uebernickel, 2006; Ebert et al., 2007; Weist, 2009; Alter, 2011, 2012).

The specific research questions established in this Part II are as follows*: (i) what is the core structure (phases, activities, roles, and artifacts) of the IT service design process posed in each ITSM processes framework? and (ii) what are the degree of compliance of the IT service design process included in the these ITSM frameworks regarding the standard design process posed in the systems engineering ISO/IEC 15288 standard ?* The used research approach can be classified as conceptual analysis (Glass et al., 2004). Conceptual analysis (Mora et al., 2008) is conducted with the following general steps: (i) knowledge gap identification, (ii) research purpose, goals and questions, (iii) descriptive-comparative review, (iv) conceptual data collection, and (v) conceptual analysis and synthesis.

The remainder of this paper continues as follows: in section 2, we review the foundations of IT Service Design concepts and processes. In section 3, we report a substantial description of each one. Finally, in section 4, we use a systems view to report the scholarly and practical implications of findings. We end this paper with limitations and recommendations for further research.

DESCRIPTION OF THE IT SERVICE DESIGN PROCESSES IN THE SEVEN ITSM PROCESSES FRAMEWORKS

IT Service Design Process in ITIL v2

In ITIL v2 (van Bon et al., 2005) there is no particular design phase explicitly reported. Similarly the concept of service design is not also explicitly reported. However, in ITIL v2, the implicit design of the IT operated services is accounted partially for the following processes: (i) ICT Architecture Design and Planning (in ICT Infrastructure Management), (ii) Configuration Management (in Service Support category), (iii) Service Level Management (in Service Delivery category), (iv) Release Management (in Service Support category), (v) Application Development (in Application Management category), and (vi) Planning for Implementing IT Service Management process category.

According to ITIL v2 (Rudd & Hodgkiss, 2004, p. 19) the ICT Infrastructure Management processes *are responsible for managing a service through each of the stages in its lifecycle, from requirements, through design, feasibility, development, build, test, deployment, operation and optimization to retirement*. In particular, the ICT Architecture Design and Planning function concerns rather a high-level analysis of requirements and a high-level design for a new or changed IT service than a well-defined process of design. As ITIL v2 (idem, p. 20) indicates, the ICT Design and Architecture Planning function *is responsible for all of the strategic issues associated with the running of an ICT function.*

In the Configuration Management process it is required that the documentation of the configuration items includes documents of requirements, system design, build, and production. In Service Level Management (SLM) process it is required to: (i) to identify service level needs for defining the service level requirements (SLRs), and (ii) to define the services using service specification sheets (Spec sheets). Such Spec sheets describe a service both a customer and technical perspective. Furthermore, they establish the customer-oriented service characteristics with the IT technical components for delivering them. Spec sheets also include the links between SLAs (service level agreements) and OLAs (operational level agreements) and UCs (underlying contracts). While that SLR is an analysis product, Spec sheets are clearly implicit design products. Such information is used lately for elaborating the Service Catalog.

In Release Management (RM), the policies and procedures for designing, developing or ordering/purchasing of configuration items for the IT services are established. While that RM is more focused on the building, testing, and deploying activities, in ITIL v2 can be also included as part of the implicit design activities. Application Development (AD) (idem, p. 25) is concerned with the activities needed to plan, design, and build an application that can ultimately be used by some part of the organization to address a business requirement. AD must be realized linking their activities with the related in RM. In Planning for Implementing ITSM category, an initial service catalog or portfolio is elaborated. Such product implies early conceptual high-level analysis and design activities.

Hence, however, an explicit consideration of a design process was not found in ITIL v2.

IT Service Design Process in ITIL v3

In ITIL v3 (Rudd & Llyod, 2007), there is a full phase devoted to the Service Design process. This fact suggests the relevance of design activities for fulfilling the expected quality of service levels to be delivered. In this Service Design phase are included the following processes: Service Catalog Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, and Supplier Management. Interesting to be identified, is the non-explicit definition of a Service Design process per se.

In contrast, in ITIL v3, five dimensions of service design to be considered and included

in a IT service design are proposed: Services, Design of Service Management systems and tools, Technology architectures and management systems, Processes, and Measurement methods and metrics. However, in the section 3 entitled Service Design Principles, ITIL v3 reports a set of activities that grouped pursue a design goal. These are not presented as an integrated process, but they can identified as follows: (i) Identifying service requirements, (ii) Identifying and documenting business requirements and drivers, (iii) Designing and Risk Assessment, (iv) Evaluation of alternative solutions, (v) Procurement of the preferred solution, and (vi) Develop the service solution.

For ITIL v3 (idem) design is an activity that identifies requirements and then defines a solution that is able to meet these requirements. Systems (e.g. IT services in particular) must be carefully planned and designed in order to be as expected. An informal design process cannot establish performance, risk-based, security and cost-effective guarantees to users. Design IT systems helps mainly to avoid costly system disruptions in operational settings caused by design flaws, and to produce expected performances. A high quality design implies to achieve it into the design space caused by the application of constrains (usually bounds on available resources) rather attaining the maximum or minimums values without consideration to the attached design constrains.

In ITIL v3 the role of Service Design is established as: "The design of appropriate and innovative IT services, including their architectures, processes, policies and documentation, to meet current and future agreed business requirements". Service design must consider the following elements in ITIL v3: business process to be supported, the service itself, SLAs/SLRs, Infrastructure (all of the IT equipment necessary to delivery the service to the customers and users), Environment (the environment required to secure and operate the infrastructure), Data, Applications, Support Services, Operational Level Agreements (OLAs) and contracts: any underpinning agreements necessary to deliver them, Support Teams, and Suppliers.

IT Service Design Process in ISO/IEC 20000

In the three first ISO/IEC 20000 (ISO, 2005) documents, derived from ITIL v2 mainly, is not reported an explicit IT service design phase or process. However ISO/IEC 20000-4:2010 (ISO, 2010) documents, two of the four new processes reported are linked to service design activities. This new category is called Design and Transition of New or Changes Services, and the two linked processes are: Service Requirements, and Service Design.

In Service Requirements, the service requirements are established and agreed. The service may be asked from the Service Catalogue (build for catalogue mode) or as totally new services (build to order mode). Five products are expected of this process: required characteristics and context of service, constraints for a service solution, service requirements, validation of such service requirements, and a set of final agreed and negotiated implemented requirements.

In Service Design, the new or changed service is designed and developed. This process must generate an agreed solution including the service itself and service components. The design must guarantee that the agreed service requirements be satisfied. Four products are expected from this process: a new or changed service design which meets business needs and service requirements, a service specification, a detailed list of infrastructure and service components to support the designed service, and the development of the designed service.

Similarly to ITIL v2, additional processes are partially linked for this service design aim: Service Level Management (SLM), Release Management (RM), and Configuration Management (CM). In SLM the need of defining a service catalogue and service level agreements implies service design activities to be fulfilled. In RM, a final release package must be designed, build and configured. In turn, in CM all technical information of the configuration items (e.g. their components, physical, and logical interrelationships) must be documented.

IT Design Process in COBIT 4.0

COBIT 4.0 (ITGI, 2005) is a governance of IT process framework. IT governance is defined as "the responsibility of executives and the board of directors, and consists of the leadership, organizational structures and processes that ensure that the enterprise's IT sustains and extends the organisation's strategies and objectives" (COBIT, p. 5). COBIT 4.0 is more focused on control rather execution activities. Nevertheless, COBIT 4.0 provides best practices that can help to "optimise IT-enabled investments, ensure service delivery and provide a measure against which to judge when things do go wrong". While that the concept of IT service is not defined in COBIT 4.0, it is used in several sections. Furthermore, the concepts of OLA, SLA, service provider, and service desk, are already used and defined. Thus, COBIT 4.0 uses the approach of services implicitly.

COBIT 4.0 includes 4 process categories: Plan and Organize (PO), Acquire and Implement (AI), Deliver and Support (DS), and Monitor and Evaluate (ME). In COBIT 4.0, an explicit IT service design process is not reported. However, implicitly several process in the Acquire and Implement (AI) category accounts for them. An additional process is reported in the Service Deliver and Support (DS) category.

In the AI process category, IT solutions are identified, developed or acquired, as well as implemented and integrated into the business process for realizing the IT strategy. AI has 7 processes: AI1 Identify Automated Solutions, AI2 Acquire and Maintain Application Software, AI3 Acquire and Maintain Technology Infrastructure, AI4 Enable Operation and Use, AI5 Procure IT Resources, AI6 Manage Changes and AI7 Install and Accredit Solutions and Changes.

The process identified more directly related with the design, building and testing of IT service systems corresponds to AI1 and AI2 for IT service design; AI3, AI4 and AI5 for IT service build; and AI6 and AI7 for IT service implementation. In DS process category, the process DS1 Define and manage service levels also contributes to the IT service design purpose. In particular while that AI1 activity is regarding to the identification of acquisition of integral IT solutions (like an ERP), AI2 is regarding to specific software isolated solutions. However, in both activities there are implicit design activities. AI1 activity accounts for analysis and design implicit activities for "the definition of the needs, consideration of alternative sources, review of technological and economic feasibility, execution of a risk analysis and cost-benefit analysis, and conclusion of a final decision to 'make' or 'buy'" (ITGI, 2005, p. 73).

AI2 activity accounts for analysis and design implicit activities for "the design of the applications, the proper inclusion of application controls and security requirements, and the actual development and configuration according to Standards" (idem, p. 77). AI3 activity concerns with "the acquisition, implementation and upgrade of the technology infrastructure" (idem, p. 81). Such acquisition decisions demands an implicit analysis and design process of plausible technology infrastructure to be acquired. In DS1 activity are conducted activities for elaborating the service catalogue. The specific activities are: creating service requirements, service definitions, service level agreements (SLAs), operating level agreements (OLAs) and funding sources. Products of such activities are lately organized in the service catalogue.

According to COBIT 4.0 (idem, p. 12), in order *to respond to the business requirements for IT, the enterprise needs to invest in the resources required to create an adequate technical capability (e.g., an enterprise resource planning system) to support a business capability (e.g., implementing a supply chain) resulting in the desired outcome (e.g., increased sales and financial benefits)*. IT resources includes (idem, p. 12): *applications as the automated user systems and manual procedures that process the information; information as the data in all their forms input, processed and output by the information systems, in whatever form is used by the business; infrastructure as the technology and facilities (hardware, operating systems, database management systems, net-*

working, multimedia, etc., and the environment that houses and supports them) that enable the processing of the applications; and people as the personnel required to plan, organize, acquire, implement, deliver, support, monitor and evaluate the information systems and services. They may be internal, outsourced or contracted as required. Together IT resources and IT process define an IT architecture.

Hence, COBIT 4.0 does not report an explicit IT service design process, but implicitly has activities that partially accounts for such a purpose.

IT Service Design Process in CMMI-SVC

In CMMI-SVC (SEI, 2010) there are 4 process categories: Support (SUP), Process Management (PRM), Project Management (PM), and Service Establishment and Delivery (SED). The design process is explicitly addresses the Service System Development category, where design refers to "the definition of the service system's components and their intended set of relationships; these components will collectively interact in intended ways to achieve actual service delivery" (idem, p. 448).

In the SED category there are 5 processes: Strategic Service Management (STSM), Service System Development (SSD), Service System Transition (SST), Service Delivery (SD), and Incident Resolution and Prevention (IRP). STSM process concerns with the identification of the strategic needs of services for a variety of markets, as well as with their business and technical descriptions (e.g. via a service catalog). SSD process concerns with the design, building/assembling or service components, and their verification and validation in a development environment. For it, SSD interacts with REQM (Requirements Management process into Project Management category). In SST process, the verified and validated service system is deployed in a production environment, and SD process accounts for the current provision of the services through the released service system. Finally, IRP process addresses the incidents occurred in the IT service system. Hence, SSD is the process directly related with the design of service systems. The purpose of SSD is established as "to analyze, design, develop, integrate, verify, and validate service systems, including service system components, to satisfy existing or anticipated service agreements" (idem, p. 437).

The three specific goals of SSD are the following: SG1 Develop and Analyze Stakeholder Requirements, SG2 Develop Service Systems, and SG3 Verify and Validate Service Systems. From these goals, the first two specific goals address the analysis and design activities in CMMI-SVC. SG1 covers "the transformation of collected stakeholder needs, expectations, and constraints into requirements that can be used to develop a service system that enables service delivery" (idem, p. 439). SG2 is concerned with "evaluating and selecting solutions that potentially satisfy an appropriate set of requirements; developing detailed designs for the selected solutions; implementing the designs of service system components as needed; and integrating the service system so that its functions can be verified and validated" (idem, p. 446).

In CMMI-SVC 12 specific practices are included in these three specific goals. From them, the three specific practices in SG1 and the first three ones in SG2 correspond to design purposes. These specific practices are the following: SP 1.1 Develop Stakeholder Requirements, SP 1.2 Develop Service System Requirements, and SP 1.3 Analyze and Validate Requirements, in SG1; SP 2.1 Select Service System Solutions, SP 2.2 Develop the Design, and SP 2.3 Ensure Interface Compatibility, in SG2. Additionally, CMMI-SVC reports several typical work products as output artifacts of these specific practices.

IT Service Design Process in ITUP

In ITUP (Ganek & Kloeckner, 2007; IBM, 2010), there are 8 process categories: A1 Governance and Management System, A2 Customer Relationships, A3 Direction, A4 Realization, A5 Transition, A6 Operations, A7 Resilience and A8 Administration.

The design, building and testing of IT services corresponds to five processes in the Realization category. In ITUP a service design defines "how each service is delivered by using a combination of people, processes, tools, and technology" (Black et al., 2007, p. 408). In ITUP the Realization category "exists to create solutions that will satisfy the requirements of IT customers and stakeholders, including both the development of new solutions and the enhancements or maintenance of existing ones. Development includes options to build or buy the components of that solution, and the integration of them for functional capability" (IBM, 2010).

The five processes in Realization category are the following: A41 Solution Requirements for a systematic capture of the functional and nonfunctional requirements of the solution; A42 Solution Analysis and Design for creation of a documented design from solution requirements; A43 Solution Development and Integration for creation and assembly of solution elements; A44 Solution Test for validation and verification of implemented requirements; and A45 Solution Acceptance for validation that the developed solution meets the needs of the stakeholders.

According to ITUP the Realization category of process *exists to create solutions that will satisfy the requirements of IT customers and stakeholders, including both the development of new solutions and the enhancements or maintenance of existing ones*. Development includes options to build or buy the components of that solution, and the integration of them for functional capability.

The ITUP (professional version) reports for each process an extensive documentation of phases, activities (as workflows), roles, and artifact templates (as work products). Additionally, specific IT tools for supporting each process are suggested.

IT Service Design Process in MOF 4.0

In Microsoft Operations Framework (MOF 4.0) (Microsoft, 2008) exists 4 process categories: Plan, Deliver, Operate, and Manage. The first three phases are ongoing active phases and the 4th phase helps to them as a foundational and managerial layer. The goal of MOF 4.0 is *to provide guidance to IT organizations to help them create, operate, and support IT services while ensuring that the investment in IT delivers expected business value at an acceptable level of risk* (idem, p. 5).

Design of IT service systems is realized in the Deliver phase in MOF 4.0, the goal of which is *to ensure that IT services are developed effectively, are deployed successfully, and are ready for Operations* (idem, p. 6). This phase consists of five processes: Envision, Project Planning, Build, Stabilize and Deploy. The design of an IT service corresponds to Envision and Project Planning processes, its elaboration to Build, and its testing to Stabilize. An IT services is finally transferred to the production environment in Deploy process.

The first three activities are directly concerned with the analysis and design of IT service issues: (i) Envision, (ii) Project Planning, and (iii) Built. In these activities the business needs and requirements prior to planning a solution are captured, a functional specification and a high-level solution design is prepared, and work plans, cost estimates, and schedules for the deliverables are developed. In MOF 4.0 the project team creates in Envision and Project Planning three design documents (conceptual, logical and physical design) as well as a separate functional specification. In Build, a low-level solution and featured design is realized. This solution is ready for external testing and stabilization. Finally, the highest-quality solution by performing thorough testing and release candidate piloting is released.

Similarly to ITUP, MOF 4.0 reports for each process an extensive documentation of phases, activities (as workflows), roles, and artifacts templates (as outcomes), with additional guidance documents (called business accelerators) being provided. For design purposes the vision scope and the functional specification templates are reported, hence the MOF 4.0 model provides

rich and extensive process documentation guidelines for designing an IT Service.

In Table 1, a summary of remarks on the IT service design processes is reported. In Table 2, a descriptive comparison of main phases, activities, artifacts, roles and related activities of service design process realized in each one of the seven ITSM models and standards is reported. Phases concern with the highest level category of actions posed for the ITSM model or standard for design an IT service. Activities account for more detailed actions into each phase. Artifacts refer to the specific outputs generated in these activities. Roles are people accountability and responsibility positions charged with the management or execution of the activities. Finally, related activities are those ones that have interactions with the specific IT service design core activities. Information reported in Table 2 is useful to show – from a high to mid conceptual descriptive level perspective – the essential structure (phases, activities, roles, artifacts and related activities) of the IT service design processes.

A SYSTEMIC REVIEW OF FINDINGS

Models and standards of processes have been elaborated to provide a set of best and generic management, engineering and organizational practices for performing high-quality processes (e.g. efficiency and effectiveness) in several disciplines (Mora et al., 2009a). Aims of both schemes are: define processes, measure process capability level, and improve process. According to SEI (2006) "a process model is a structured collection of practices that describe the characteristics of effective processes." However, no single approach has achieved a generalized acceptance, which is not surprising, as there are a multitude of other contextual and situational factors that influence the choice of process and process management decisions (Clarke & O'Connor, 2012). Furthermore there have been attempts to develop a mechanism for relating process decisions and industrial contexts (Jeners et al., 2013). In particular, Mora et al., (2009a) indicates that the ISO 9000:2000 series of standards (ISO, 2006) endorse a process and a systems approach through their principles 4th and 5th respectively. The principle 4's rationale states that the resources and activities must are managed as processes. In turn, the Principle 5's rationale sets forth that the process be organized via a systems view. Furthermore, the ISO 9000:2000 standard remarks that while "… the way in which the organization manage its processes is obviously to affect its final (quality of) product" (ibid).

Hence, the concepts of systems and process are fundamental for standards and models of processes. The concept of system has been already discussed in section 2.1. The concept of process can defined as "set of interrelated or interacting activities, which transforms inputs into outputs. These activities require allocation of resources such as people and materials." (ISO 9000, 2001).

Thus, in this research in order to establish useful insights on the seven ITSM service design process descriptions, we use a process-systematic and systemic process for engineering man-made systems from a standard: ISO/IEC 15288 Systems engineering system life cycle processes standard (ISO, 2002). This standard was developed to "encompasses the life cycle of man-made systems, spanning the conception of the ideas through to the retirement of the system. It provides the processes for acquiring and supplying system products and services that are configured from one or more of the following types of system components: hardware, software, and human interfaces. This framework also provides for the assessment and improvement of the project life cycle." (ISO, 2002).

System engineering is a relative new discipline defined as "an interdisciplinary approach and means to enable the realization of successful (cost-efficient and trustworthy) systems" (INCOSE, 2004; Sage, 2000; Laporte & O'Connor, 2014). For the systems engineering discipline, a system is "an integrated set of elements that accomplish a defined objective. These ele-

Table 1. Highlights on design and service design concepts in ITSM service design processes

Source	On Design and IT Service Design Concept Remarks
ITIL v2	• None explicit IT service design process neither a design concept are reported. • A design and planning function of ICT architecture is reported to account for the ICT side of an IT service. • In Service Level Management (SLM) process is required: (i) to identify service level needs for defining the service level requirements (SLRs), and (ii) to define the services using service specification sheets (Spec sheets). • Spec sheets also include the links between SLAs and OLAs and UCs.
ITIL v3	• *Design is an activity or process that identifies Requirements and then defines a solution that is able to meet these Requirements.* • An informal design process cannot establish performance, risk-based, security and cost-effective guarantees to users. • Five dimensions of service design are proposed: Services, Design of Service Management systems and tools, Technology architectures and management systems, Processes, and Measurement methods and metrics. • Seven specific processes are included in service design: Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, and Supplier Management.
ISO 20000	• None explicit design concept is reported in first three ISO 20000 documents. • In ISO 20000-4:2010 standard, a new category of processes called Design and Transition of New or Changed Services, is reported. • Two of the four processes are linked to design purposes: Service Requirements and Service Design. • Additionally, several processes accounts partially for this service design aims: Service Level Management (SLM), Release Management (RM), and Configuration Management (CM).
COBIT 4.0	• None explicit IT service design process neither a design concept are reported. • There are implicit design processes in Acquire and Implement (AI) category.
CMMI-SVC	• In two goals are addressed the analysis and design activities: (i) SG1 Develop and Analyze Stakeholder Requirements, and (ii) SG2 Develop Service Systems. • Design *refers to the definition of the service system's components and their intended set of relationships; these components will collectively interact in intended ways to achieve actual service delivery.*
ITUP	• There is a particular process category called Solution Development or Realization concerned with the design process. • Service design "defines how each service is delivered by using a combination of people, processes, tools, and technology".
MOF 4.0	• *Conceptual design involves understanding the business requirements and defining the features that users need to do their jobs.* • *Logical design uses the conceptual design and the current state of the technology infrastructure to define the new architecture at a high level.* • *Physical design describes the desired architecture in greater detail than the logical design. It also defines the hardware configurations and software products to be used.* • There is a particular process category (Deliver phase) where the services are planned, designed, built and deployed (MOF4, 2008). • Three activities are directly concerned with analysis and design issues: (i) Envision, (ii) Project Planning, and (iii) Built. • In MOF 4.0 the project team creates in Envision and Project Planning three design documents (conceptual, logical and physical design) as well as a separate functional specification. In Build, a low-level solution and feature design is realized.

Table 2. Descriptive comparison of IT service design and related activities in the seven ITSM models and standards

Model or Standard	Service Core Design Phases / Process Categories	Service Core Design Process / Activities (Artifacts)	Service Design Main Related Process / Activities (Artifacts)	Service Design and Related Roles	Another Service Design Related Activities
ITIL v2	SERVICE DELIVERY	SERVICE LEVEL MANAGEMENT: A1. Identification of Customer's needs (open document). A2. Definition of Services (SLRs, Business and Technical Spec Sheets). A3. Finalization of Agreements (SLAs, OLAs, UCs). ICT INFRASTRUCTURE MANAGEMENT: F1. Architecture Design and Planning (ICT architecture plans).	SERVICE RELEASE MANAGEMENT: A1. Release Policy and Planning (Release Policies). A.2 Release Design, Building, and Configuration (Release Procedures). A.3 Release Testing and Acceptance (Release Tests). A.4 Rollout Planning (Rollout Plan).	Main Roles: 1. Service Level Manager. 2. IT Service Architect (derived). 3. IT Service Team (derived). Related Roles: 1. Release Manager. 2. IT Operations Manager (derived).	The activities A2 and A3 interact directly with CAPACITY MANAGEMENT, AVAILABILITY MANAGEMENT, IT SERVICE CONTINUITY, SECURITY MANAGEMENT, CONFIGURATION MANAGEMENT, AND FINANCIAL MANAGEMENT FOR IT SERVICES processes. Other interactions are with SERVICE LEVEL MANAGEMENT, CONFIGURATION MANAGEMENT, AND CHANGE MANAGEMENT processes.
ITIL v3	SERVICE DESIGN	IMPLICIT SERVICE DESIGN (Service Design Package): A1. Identifying service requirements. A2. Identifying and documenting business requirements and drivers. A3. Designing and Risk Assessment. A4. Evaluation of alternative solutions. A5. Procurement of the preferred solution. A6. Develop the service solution.		Main Roles: 1. Service Design Manager. 2. IT Designer/Architect. 3. Service Design Process Managers. 4. Customer. 5. User.	It interacts with the SERVICE CATALOGUE MANAGEMENT, SERVICE LEVEL MANAGEMENT, CAPACITY MANAGEMENT, AVAILABILITY MANAGEMENT, IT SERVICE CONTINUITY MANAGEMENT, INFORMATION SECURITY MANAGEMENT, and SUPPLIER MANAGEMENT.

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Table 2. Continued

Model or Standard	Service Core Design Phases / Process Categories	Service Core Design Process / Activities (Artifacts)	Service Design Main Related Process / Activities (Artifacts)	Service Design and Related Roles	Another Service Design Related Activities
ISO 20000	SERVICE DESIGN AND TRANSITION	SERVICE REQUIREMENTS (derived activities): A1. Identification of required characteristics and context of service. A2. Identification of constraints for a service solution. A3. Elicitation of service requirements. A4. Validation of service requirements. A5. Agreement of final implementable requirements. SERVICE DESIGN (derived activities): A1. General Design of a new or changed service design. A2. Specification of service. A3. Identification of detailed list of infrastructure and service components. A4. Development of the designed service.	SERVICE RELEASE - RELEASE MANAGEMENT A1. Design, build and configure release (Release Package). A2. Release verification and acceptance (Verified and Accepted Release Package). SERVICE DELIVERY - SERVICE LEVEL MANAGEMENT A1. Service Catalogue Definition (Service Catalogue) A.2 Service Level Agreements Definition (SLAs) SERVICE CONTROL - CONFIGURATION MANAGEMENT A1. Configuration Identification (CMDB descriptors). SERVICE PLANNING AND MONITORING 3.1 Feasibility Analyses (Economic, Technical, Operational) 3.2 Risk Analysis 3.3 Provision Plans 3.4 Monitoring Plans	Main Roles: 1. Service Design Team. Related Roles: 1. Release Manager. 2. Service Level Manager. 3. Configuration Manager.	It interacts with SERVICE LEVEL MANAGEMENT, RELEASE MANAGEMENT, CONFIGURATION MANAGEMENT, and SERVICE PLANNING AND MONITORING.

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Table 2. Continued

Model or Standard	Service Core Design Phases / Process Categories	Service Core Design Process / Activities (Artifacts)	Service Design Main Related Process / Activities (Artifacts)	Service Design and Related Roles	Another Service Design Related Activities
COBIT 4.0	ACQUISITION AND IMPLEMENTATION	AI1. IDENTIFY AUTOMATED SOLUTIONS (Business requirements feasibility study). AI1.1 Definition and Maintenance of Business Functional and Technical Requirements. AI1.2 Risk Analysis Report. AI1.3 Feasibility Study and Formulation of Alternative Courses of Action. AI1.4 Requirements and Feasibility Decision and Approval. AI2. ACQUIRE AND MAINTAIN APPLICATION SOFTWARE (Application and package software knowledge, Initial SLA). AI2.1 High-level Design. AI2.2 Detailed Design. AI2.3 Application Control and Auditability. AI2.4 Application Security and Availability. AI2.5 Configuration and Implementation of Acquired Application Software.	AI3. ACQUIRE AND MAINTAIN TECHNOLOGY INFRASTRUCTURE (Configured system to be tested/installed, Initial OLAs). AI4. ENABLE OPERATION AND USE (User, operational, support, technical and administration manuals). AI5. PROCURE IT RESOURCES (Procured items, Contractual arrangements). AI6. MANAGE CHANGE (Change process description, Change status reports, Change authorization). AI7. INSTALL AND ACCREDIT SOLUTIONS AND CHANGES (Released configuration Items). DELIVER AND SUPPORT – DS1. DEFINE AND MANAGE SERVICE LEVELS (SLAs, OLAs, New/Updated Service Requirements).	Main Roles: 1. Process Manager Owner 2. Chief Architect 3. Head of Operations 4. Head of Development 5. Head of IT Administration	It interacts with DS1 DEFINE AND MANAGE SERVICE LEVELS, DS3 MANAGE PERFORMANCE AND CAPACITY, DS4 ENSURE CONTINUOUS SERVICE, DS5 ENSURE SYSTEMS SECURITY, DS6 IDENTIFY AND ALLOCATE COSTS, DS12 MANAGE THE PHYSICAL ENVIRONMENT, and DS13 MANAGE OPERATIONS processes.
CMMI-SVC	SERVICE ESTABLISHMENT AND DELIVERY	SERVICE SYSTEM DEVELOPMENT SG 1 Develop and Analyze Stakeholder Requirements (Service System Requirements Package). SP 1.1 Develop Stakeholder Requirements. SP 1.2 Develop Service System Requirements. SP 1.3 Analyze and Validate Requirements. SG 2 Develop Service Systems (Service System Design and Development Package). SP 2.1 Select Service System Solutions. SP 2.2 Develop the Design. SP 2.3 Ensure Interface Compatibility.	SG 2 Develop Service Systems (Service System Design and Development Package). SP 2.4 Implement the Service System Design. SP 2.5 Integrate Service System Components. SG 3 Verify and Validate Service Systems (Service System Verification and Validation Package). SP 3.1 Prepare for Verification and Validation. SP 3.2 Perform Peer Reviews. SP 3.3 Verify Selected Service System. SP 3.4 Validate the Service System.	Main Roles: 1. Project Manager 2. SSD Manager 3. SSD Team 4. Customer 5. Users	It interacts with REQUIREMENTS MANAGEMENT and SERVICE SYSTEM TRANSITION processes.

continued on following page

Table 2. Continued

Model or Standard	Service Core Design Phases / Process Categories	Service Core Design Process / Activities (Artifacts)	Service Design Main Related Process / Activities (Artifacts)	Service Design and Related Roles	Another Service Design Related Activities
MOF 4.0	DELIVER	ENVISION (Vision, Conceptual Design, Risk Analysis) A1. Organize the core project team. A2. Write the vision/scope document. A3. Approve the vision/scope document. PROJECT PLANNING (Project Plan, Design Functional Specification, Requirements-Design Tracing) A1. Evaluate products and technologies. A2. Write the functional specification. A3. Package the master project plan. A4. Create the master schedule. A5. Review the Project Plans Approved Milestone.	BUILD (Developed Solution) A1. Prepare for development. A2. Develop the solution. A3. Prepare for release. A4. Review the Scope Complete Milestone and sign off the milestone review report. STABILIZE (Tested and Stable Solution) A1. Stabilize a release candidate. A2. Conduct a pilot test. A3. Review the Release Readiness Milestone.	Main Roles: 1. Solution Manager 2. Program Manager 3. Product Manager 4. Customers 5. Users Related Roles: 6. Test Manager 7. Developers 8. Testers 9. User experience	They interact with several processes of PLAN, OPERATE and MANAGE phases.
ITUP	REALIZATION	SOLUTION REQUIREMENTS (Solution Requirements Package) A1. Establish Solution Requirements Framework. A2. Refine and Verify Business Context. A3. Document and Analyze Solution Requirements. A4.Validate Solution Requirements with Stakeholders. A5. Manage Solution Requirements Baseline. A6. Evaluate Solution Requirements Performance. SOLUTION ANALYSIS AND DESIGN (Solution Analysis and Design Package) A1. Establish Solution Analysis and Design Framework. A2. Create Conceptual Solution Design. A3. Identify and Select Solution Components. A4. Create Detailed Solution Design. A5. Validate Solution Design With Stakeholders. A6. Evaluate Solution Analysis and Design Performance.	SOLUTION DEVELOPMENT AND INTEGRATION (Solution Development Package) A1. Establish Solution Development and Integration Framework. A2. Develop Solution Development and Integration Plan. A3. Prepare Solution Development and Integration Environment. A4. Acquire or Create Solution Components. A5. Integrate Solution Components. A6. Refine and Tune Integrated Solution. A7. Verify Integrated Solution. A8. Evaluate Solution Development and Integration Performance.	Main Roles: 1. Realization Manager 2. Realization Architect 3. Realization Team 4. Customer 5. Users	SOLUTION TEST (Solution Test Package) A1. Establish Solution Test Framework. A2. Develop Solution Test Strategy and Plans. A3. Prepare and Manage Solution Test Environment. A4. Perform Solution Test. A5. Analyze and Report Solution Test Results. A6. Evaluate Solution Test Performance SOLUTION ACCEPTANCE (Solution Acceptance Package) A1. Establish Solution Acceptance Framework. A2. Create Solution Acceptance Plan. A3. Define Solution Acceptance Criteria A4. Perform Solution Acceptance Review. A5. Certify Solution Acceptance. A6. Package Certified Solution. A7. Evaluate Solution Acceptance

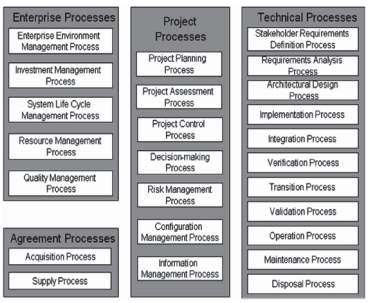
ments include products (hardware, software, firmware), processes, people, information, techniques, facilities, services, and other support elements." (INCOSE, 2004). Thus, we consider that a systems engineering view considers a more suitable concept of a system for the IT service design rather the limited definitions of software or information system. The ISO/IEC 15288 standard contains 4 process categories: Enterprise, Project, Technical and Agreement. Each one includes respectively 5, 7, 11 and 2 processes, as illustrated in Figure 1.

In our analysis of the seven IT service design process we included only the most related processes with a system design purpose. However, given the disparity of views in the seven ITSM schemes we consider useful to establish three essential categories of purpose: planning-control, analysis-design, and build-transition. Using this categorization, we were able to select the most related design processes from the four ISO/IEC 15288 process categories to be used as the normative comparative particular model. These selected processes were the following: acquisition and supply processes (from Agreement category); project planning, project control, decision-making, and risk management (from Project category); and stakeholder requirements definition, requirement analysis, architectural design, implementation, integration, verification, transition and validation processes (from Technical category).

Acquisition process (ISO, 2002) accounts for the activities for conducting a systematic acquisition of products or services required for a system with a supplier. Main outcomes are: (i) a set of potential suppliers, (ii) an agreement of acquisition with acceptance criteria, and (iii) the product or service in compliance with the agreement. Main activities are: (i) prepare the acquisition, (ii) advertise the acquisition and select the supplier, (iii) initiate an agreement, (iv) monitor the agreement, and (v) accept the product or service. Supply process (ISO, 2002) concerns with the provision to an acquirer with a product or service that meets the agreed requirements. Main outcomes are: (i) an acquirer for a product or service, (ii) an agreement of acquisition with acceptance criteria, and (iii) the product or service in compliance with the agreement. Main activities are: (i) identify opportunities, (ii) respond to a tender, (iii) initiate an agreement, (iv) execute the agreement, (v) deliver and support the product or service, and (vi) close the agreement.

Project planning process (ISO, 2002) basically defines the scope, roles, activities, deliverables, schedules, and resources required for conducting an effective and efficient project. Its main outcomes are: (i) project plans, (ii) list of resources, and (iii) list of roles. Its main activities are: (i) define the project, (ii) plan the project resources, (iii) plan the project technical and quality management, and (iv) activate the project. In turn, Project control process (ISO, 2002) refers to monitoring and corrective activities required to fit the planned schedules, budgets and technical objectives of the product or service. Its main outcomes are: (i) project performance and deviation metrics,

Figure 1. ISO/IEC 15288 standard



(ii) corrective actions, and (iii) realization of project objectives. Its main activities are: (i) assess the project, (ii) control the project, and (iii) close the project. Decision-making process (ISO, 2002) provides activities to select most adequate course of action when several plausible relevant alternatives are presented during the execution of the system life cycle processes. Its main outcomes are: (i) a decision-making method, (ii) a decision-making situation is structured, and (iii) decisions with their rationale. Its main activities are: (i) plan and define decisions, (ii) analyze the decision information, (iii) track the decision. Finally, risk management process (ISO, 2002) is *used to identify, analyze, treat and monitor the risks continuously.* Its main outcomes are: (i) scope of risk management, (ii) risk management methods, (iii) risk management actions. Its main activities are: (i) plan risk management, (ii) manage the risk profile, (iii) analyze the risks, (iv) treat the risks, (v) monitor the risks, and (v) evaluate the risk management processes.

In the Technical category Stakeholder requirements definition process refers to identification of stakeholders and their needs, expectations and desires which must be specified in technical feasible requirements. Its main outcomes are: (i) context and stakeholders description, (ii) needs and constraints for the system, and (iii) feasible stakeholders requirements. Its main activities are: (i) elicit stakeholder requirements, (ii) define stakeholder requirements, and (iii) analyze and maintain stakeholder requirements. Next technical process is Requirement analysis where stakeholders requirements are technically specified. Its main outcomes are: (i) technical requirements (functional, performance, security, and others), (ii) constraints, and (iii) acceptance criteria. Its main activities are: (i) define systems requirements, and (ii) analyze and maintain system requirements. Architectural design process, in turn, concerns with synthesizing a solution that can fit the technical requirements. Its main outcomes are: (i) a baseline system architecture design, (ii) a description of the elements of the system architecture and their interrelationships, and (iii) acceptance criteria. Its main activities are: (i) define the architecture, (ii) analyze and evaluate the architecture, and (iii) document and maintain the architecture.

Next technical processes are subsequent to design purposes. We report here their essential purposes however, because we consider relevant to a better understanding of the expected inputs to the design post-processes. These processes are: Implementation, Integration, Verification, Transition and Validation processes. Implementation process (ISO, 2002) *transforms specified behavior, interfaces and implementation constraints into fabrication actions that create a system element according to the practices of the selected implementation technology*. Integration process (ISO, 2002) *combines system elements to form complete or partial system configurations in order to create a product specified in the system requirements*. Verification process (ISO, 2002) *provides the information required to effect the remedial actions that correct non-conformances in the realized system or the processes that act on it*. Transition process (ISO, 2002*) installs a verified system, together with relevant enabling systems, e.g., operating system, support system, operator training system, user training system, as defined in agreements*. Finally, Validation process (ISO, 2002*) performs a comparative assessment and confirms that the stakeholders' requirements are correctly defined*.

Similarly to previous analysis, we used a color scheme scale for a better holistic comprehension of the individual assessments realized for each design issue (e.g. in each cell). Green color in cell is used for STRONG value, yellow color for MODERATE value, red color for WEAK value and gray color for NULL value. This ordinal scale refers to the extent of the ITSM process analyzed fits the ISO/IEC 15288 process recommendations.

Table 3 reports the qualitative evaluations realized by authors based in the free-access documents for the ITSM models and the commercial official documents for ITSM standards. These evaluations were realized regarding the support provisioned for each set of process in

the seven ITSM models and standards to the design of IT services. Under this purpose, the processes of ANALYSIS-DESIGN are essential, while that the pre and post processes of PLANNING-CONTROL PROJECT and BUILD-TRANSITION processes are considered complementary.

ITIL v2 and COBIT 4.0 are the weakest processes regarding their support for design an IT service. From both, however COBIT 4.0 provides strong support for pre and post design activities. Thus, ITSM practitioners and academicians that use some of these schemes will have to add specific design guidelines from other sources, or generating their own ad-hoc interpretations on the design process and required documentation.

Next schemes assessed as moderate ones are ITIL v3, ISO/IEC 20000 and MOF 4.0. It can be considered a non-expected finding. These three schemes provide strong post and pre (ITIL v3 and ISO/IEC 20000) design activities but the core design ones are assessed as moderated. In particular, requirements activities are strong in all of them, but the central design activity (architectural design) is weakly or moderately described in these three schemes.

Thus, ITSM practitioners and academicians that used some of these schemes will count with a better design guidance for requirements activities than those that use ITIL v2 or COBIT 4.0. However, they will be weakly supported in the critical and central activity of IT service design architecture. These findings must be carefully contrasted with the reported ones in section 4.2. ITIL v3 and MOF 4.0 documentation report several diagrams related with IT service design architecture models, with additional textual descriptions. Nevertheless, their particular design activities in both schemes are moderately reported.

Finally, the most complete schemes are CMMI-SVC and ITUP. Both provide strong guidelines for the three categories of processes. In particular, both schemes remark the relevance of the system architecture design as the main artifact to be generated in these processes. Hence, ITSM practitioners and academicians that use CMMI-SVC or ITUP will count with sufficient design guidelines from the pre, central and post required processes.

Table 3. Assessment of IT service design (and most related) process reported in the seven ITSM models and standards from a modern system and service view

SYSTEMS ENGINEERING ISO/IEC 15288 PROCESSES STANDARD	ITIL V2	ITIL V3	ISO/IEC 20000	COBIT 4.0	CMMI-SVC	ITUP	MOF 4.0
PLANNING-CONTROL PROJECT PROCESSES	WEAK	STRONG	STRONG	STRONG	STRONG	STRONG	MOD
• Acquisition / Supply processes	WEAK	STRONG	STRONG	STRONG	STRONG	STRONG	NULL
• Project planning / Project control processes	WEAK	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
• Decision-making / Risk management processes	WEAK	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
ANALYSIS-DESIGN PROCESSES	WEAK	MOD	MOD	WEAK	STRONG	STRONG	MOD
• Stakeholder requirements definition	MOD	STRONG	STRONG	WEAK	STRONG	STRONG	STRONG
• Requirements analysis	WEAK	STRONG	STRONG	WEAK	STRONG	STRONG	STRONG
• Architectural design	WEAK	WEAK	WEAK	WEAK	STRONG	STRONG	MOD
BUILD-TRANSITION PROCESSES	MOD	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
• Implementation / Integration processes	MOD	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
• Verification	MOD	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
• Transition	MOD	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
• Validation	MOD	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
OVERALL EVALUATION REGARDING THE SUPPORT PROVISIONED TO IT SERVICE DESIGN PURPOSE	**WEAK**	**MOD**	**MOD**	**WEAK**	**STRONG**	**STRONG**	**MOD**

Synthesis of Findings on the ITSM Models and Standards Regarding IT Service Design Purposes

We report the synthesis of the three systemic analyses realized in this research (two realized in Part I and one in Part II) in Table 4. When we consider the three analyzed issues (foundational concepts, IT service design architecture layers, and design processes), our systemic evaluation found that CMMI-SVC and ITUP models provide the best guidelines for designing an IT service from a holistic (systems) view with a strong assessment. Next better evaluated schemes in overall mode were ITIL v3 and MOF 4.0 with a strong to moderate assessment. ISO 20000 scheme was assessed as moderate to weak, due to the scarce information provided by the consulted documents. As instance, the design process is reported in a text about 450 words. Finally, ITIL v2 and COBIT 4.0 were assessed as the weakest schemes. As it was reported in section 4.3, both provide strong support for pre and post design activities, but for these central ones of interest in this research (e.g. design activities and foundations) their support is extremely limited.

From the qualitative results reported in Table 4 and all previous analyses, it is possible to identify useful insights for ITSM practitioners and academicians. These are the following: (i) all of the seven ITSM schemes have not updated their fundamental concepts of service and service systems; (ii) ISO/IEC 20000 standard while has received a strong acceptance in companies providing ITSM process guidance, regarding the particular process of designing IT services its contribution is moderate to weak; (iii) ITIL v2 can be still very useful for small companies that do not demand a rigorously and systematic IT service design process; (iii) COBIT 4.0 must be strongly complemented with other schemes when an IT service design process be addressed; (iv) both ITIL v3 and MOF 4.0 schemes provide useful insights for designing IT services in medium-sized companies but will require enhancements for IT services for large companies where well-defined technical specifications are demanded (including simulation tests likely); (v) CMMI-SVC and ITUP

Table 4. Synthesis of findings on seven ITSM models and standards regarding their IT service design processes

ANALYZED ISSUE	ITIL V2	ITIL V3	ISO/IEC 20000	COBIT 4.0	CMMI-SVC	ITUP	MOF 4.0
Foundational concepts of service, IT service, system and service system.	WEAK	MOD	MOD	MOD	MOD	MOD	MOD
IT service design architecture layers.	MOD	STRONG	WEAK	WEAK	STRONG	STRONG	STRONG
Design processes.	WEAK	MOD	MOD	WEAK	STRONG	STRONG	MOD
OVERALL EVALUATION	WEAK	MOD	WEAK	WEAK	STRONG	STRONG	MOD

provides almost guidance required to design IT services from a strict and systematic process more suitable for large companies.

CONCLUSION

In this research we have presented a systemic review, by using the theoretical lenses of the ISO/IEC 15288 systems engineering standard, of seven main international ITSM schemes on: (i) their foundational concepts of service, IT service, system and service system (Part I); (ii) their descriptions used for describing an IT service design architecture model (Part I); and (iii) their IT service design processes (pre, central and post ones) (Part II).

This extensive endeavor advances our comprehension and understanding on the state of the art regarding what are IT services and how they can be designed. To achieve this aim we formulated a series of research questions, all of which have been answered after a comprehensive review of the available documentation of the seven ITSM models and standards studied. Some expected findings have been confirmed but other new issues have been identified. As a main conclusion we can state that both ITSM academic researchers and practitioners interested in the design of IT services must choose very carefully and deliberately an ITSM model or standard. For small companies where a systematic and rigorously design is not required, the ITIL v2 or ISO 20000 schemes are sufficient. For medium-sized companies, where a more formal design process and design specification is demanded, ITIL v3 and MOF 4.0 are recommended. Finally, for large companies where IT services must be strictly and systematically designed, CMMI-SVC or ITUP schemes should be used.

Similarly to Part I, in this Part II research, we report a methodological inherent limitation that the assessment correspond to the conceptual analysis from the research team based on the available documents on the seven ITSM processes frameworks rather on an empirical (field study) research approach with ITSM practitioners, which may be suggested for completing this theoretical analysis from a system engineering viewpoint. It is worth noting that the academic team profile for the researchers conducting this study is as following: (i) two researchers trained in Systems Engineering, one Information Systems, and one in Computer Science, (ii) a joint general research experience about 60+ years (15, 15, 20, and 40 years respectively by order of authors), (iii) a joint particular research experience in ITSM topics since 2005 year, and (iv) strong experience in conceptual research (Mora et al., 2008). Nevertheless, we consider that other research team with similar academic profile and by using the same set of ITSM service design documents will arrive to a set of similar findings (not drastically different). We encourage to colleagues in ITSM research stream to pursue this conceptual and new empirical research efforts.

Finally, we make call for further conceptual and empirical research in IT service design methodologies to improve our understanding and provide better guidance to ITSM practitioners. A suggested next research step is the elaboration of an integrated IT Service Design process based in these findings for SMBs organizations.

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