SPSPR Model - Framework for ICT Services Management

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Abstract: In this paper we discuss existing frameworks for the management of ICT services and their limitations in the context of emerging enterprise computing environment characterized by use of externally sourced services. We identify the requirements for a service management framework with particular focus on definition and categorization of ICT services that facilitates the development of a service catalogue. The main section of this paper describes our approach to ICT service management as embodied in the SPSPR framework.

Keywords: Service Management, Service categorization, Service Catalogue, Service Management Framework

1. Introduction

The topic of ICT (Information and Communication Technologies) services management has recently received extensive attention in research literature and among ICT practitioners. According to Bon et al. [1] “IT Services Management is the management of all processes that cooperate to ensure the quality of live IT services, according to the levels of service agreed with the customer. Initiation, design, organization, management, provision, support and improvement of IT services tailored to the needs of organization are addressed”. Important prerequisite for ICT service management is a comprehensive framework that enables the design and implementation of a service catalogue based on consistent service definition and categorization. Several frameworks including ITIL (Information Technology Infrastructure Library) [7] and TOGAF (The Open Group Architecture Framework) [8] incorporate services as basic components of the architecture, but differ substantially in key aspects including the classification of services and the role of ICT service architecture in the framework.

As a result of this situation ICT service providers as well as ICT service users apply their own classification, and this creates complications for the ICT service market as well as in design of ICT service catalogues. Absence of a clear specification of ICT services architecture makes development of enterprise IS (Information Systems) solutions difficult, especially when different forms of outsourcing are used. This can be particularly challenging in the context of cloud computing services, with organizations using SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service) services from a range of different service providers [14].

In this paper we identify the requirements for ICT service management for cloud computing services (Section 2), and then describe the SPSPR framework (Section 3) and our approach to ICT service definition (Section 4) and classification (Section 5), and service architecture (Section 6). In Section 7 we present our conclusions.

2. Cloud computing requirements for ICT service management

Cloud computing introduces specialized requirements for the extension of existing service management frameworks to allow the integration and management of different types of ICT services potentially sourced from a number of external providers. The most important requirements are the following:

- Clear categorization of ICT services that can be used by both ICT service providers and ICT service users.
- Integrated enterprise-wide service catalogue for both internally and externally sourced ICT services.
- The ICT services management framework should not force user organizations to make decisions about application and technological architectures before deciding which services will be outsourced, as in the case of outsourced services the application and technological architectures become the service provider responsibility.
- The framework should enable the integration of internally and externally delivered services.
3. SPSPR Framework

Our contribution to the ICT services management frameworks is the SPSPR (S-Strategy, P-Business Processes, S-ICT Services, P-ICT Processes, R-ICT Resources) framework. SPSPR is a layered framework (Figure 1) that is used to represent the relationship between business management and ICT management in the context of cloud computing.

ICT services constitute the interface between business and ICT that describes how individual business processes or their sub-activities are supported. ICT service may be delivered internally or purchased from external service providers. ICT service providers are responsible for ICT processes that support ICT services, for ICT resources that are consumed by these processes, and for the underlying application and technology architectures. An important component of the SPSPR framework are metrics (represented by clocks in Figure 1) that measure quality, volume, efficiency and other characteristics of monitored components within the overall framework. The principal objective of the SPSPR framework is a clear identification of responsibilities at different levels of enterprise management, allowing mapping of business goals to the ICT management layer.

![Figure 1: SPSPR model](image-url)

Strategic business management is the domain of top-management who is responsible for setting the business goals and priorities and for creating conditions and resources enabling the realization of these goals. As indicated by the arrows between first and second layer of the architecture this includes selecting products and services that the organization produces, and identifying key customers and business partners. Top-management is also responsible for providing and maintaining resources (people, knowledge, finance, technology, etc.) necessary for achieving organizational goals.

Enterprises accomplish business goals by means of core business processes. Design and management of business processes so that organizations achieve their strategic goals is the main task described by the second level of the SPSPR model – level of core and supporting processes. Main activities at this level are the following: a) definition and optimization of business processes, b) operational management of processes and capacities, c) processes monitoring d) process execution and e) resources management.

The manager responsible for process definition and optimization is responsible for designing the process (individual activities, their sequences, etc.) in such a way that the process leads to the production of competitive product/service in optimal time, volume, quality and at acceptable cost. The following metrics may be used to measure the efficiency business processes: volume of sold products/services, profit from the sale of products/services, etc.
We now come to the first key feature of the SPSPR model. A part of the process definition must include a proposal of ICT services that will optimally support the business process. This is, in fact, an explicitly stated responsibility of a process manager (process owner) of “ordered volume and ordered quality” of ICT services. The process manager has to calculate the acceptable (maximum) cost of ordered ICT services. The costs of ICT services is one of the business process cost items and once it becomes too high, the final product/service would be no longer competitive. This is one of the key points of the model. When it is not possible to ensure required ICT services for this limited cost, then it is crucial to adjust the main process and its requirements for ICT services (see Figure 2).

![Figure 2: Responsibilities of different managers in the SPSPR model](image)

The process manager is responsible for purchasing the necessary ICT services from the ICT services manager(s). In the case of the centralized model of ICT management, the CIO is responsible for all ICT services and decides the form (internal / external / combination) of their implementation. However, in the case of the decentralized model, the process manager can decide to procure services from external providers. Using the same ICT services definition and structure for both, internal and external providers makes it possible to compare the relative benefits of each option using consistent criteria (e.g. functionality of application for production logistics).

We now come to the third layer of the SPSPR architecture – the layer of ICT services. The ICT services manager is responsible for the delivery (operation) of the contracted services. In the case of externally purchased ICT services, the problem of information service management reduces to the contract development and management. The contract includes service level agreements (SLA) for all contracted services. When the service is implemented in-house, the CIO is responsible for ensuring the availability of the required ICT processes and related resources.

The criterion of ICT services manager effectiveness and efficiency is not only the extend of fulfillment of the service parameters as specified in the SLA, but also keeping service costs lower or equal to the
contracted price, and at the same time are comparable (by using benchmarking) with the prices of similar services on the ICT market.

ICT service is produced by ICT processes (e.g. change management, incident management, etc.). These processes, managed by ICT process managers constitute the fourth level of the SPSPR model. Importance of ICT process quality increases especially with the following parameters of ICT services:

- Importance of business process, which is supported by a given ICT service (critical business processes need high quality services).
- Number of service users; the more users are using a given service the more mature ICT service is required.
- Requirements on service quality (availability, response time, security etc.).
- Total number of ICT services (as the number of services increases, integration requirements and corresponding resources increase).
- Total volume of ICT resources, which are consumed by ICT processes.

It follows from above description that the maturity of ICT services should grow with the number of internally provided ICT services and with the level of SLA parameters.

ICT resources management is the last layer in SPSPR model. Resources include: technology infrastructure (hardware, network, and system software), application software, data, material and ICT personnel. Managers at this level hold typical ICT roles such as application administrator, network administrator, database administrator, etc. Their responsibility is to operate and maintain resources at acceptable costs. The following activities belong to the administration of technological resources: monitoring of resource utilization and its capacity changes following changes in service requirements, monitoring of developing trends and planning resource upgrades, etc. Human resources management deals with recruiting new employees with required qualifications, career development planning, retraining, etc. A measure of the effectiveness and efficiency resource managers is acquisition, maintenance and development of resource at the level of quality comparable with the quality available on the market, and the capacity required by internally provided information services.

Business responsibilities of ICT department can be deduced from SPSPR model, and include the following:

- Cooperation on business strategy.
- Cooperation with business managers, in order for them to use ICT effectively ICT for support of their business processes and business goals (by formulation of requirements for ICT services).
- Review of consistency and implementation ability of required services.
- Delivery of services with agreed content, quality, volume and costs, and on time.
- Costs of internally provided services should be equal or lower to services available on the market.

Secondary responsibilities include mainly:

- Proper choice of sourcing for ICT services, processes and resources.
- Quality (appropriate level of maturity) of ICT processes.
- Information system integrity.
- ICT costs should correlate with enterprise performance, e.g. volume of delivered ICT services should react to seasonal business changes.
- ICT flexibility towards changes in business requirements.

4. ICT services

4.1 ICT Service definition

For modeling and management of ICT support for business processes, distinction between business services and ICT services is useful. Business services are produced by enterprise business processes and provided by the enterprise to its customers. ICT services are provided by enterprise ICT department or by an external provider. In special cases both service types merge to constitute a single composite service (e.g. when ICT service is provided directly to a customer).

Number of different definitions of ICT service has been presented in the literature. There is a lack of agreement about the definition and confusion about the terminology, making the term ICT service fuzzy. Examples of different service definitions include the following:
• "ICT service is coherent group of activities, provided by enterprise ICT department, which may be, as a whole, provided or withdraw from ICT user" [10].
• "ICT service is represented by activities and/or information provided by ICT service provider for ICT service consumer" [13].
• "ICT service is a particular functionality, provided by ICT service provider, which enables execution of a particular business process" [12].
• "ICT service is provided for one or more customers. It is based on ICT use and supports customer's business processes. ICT service is created by people, processes and technology and should be specified in service level agreement" [7].
• "ICT service is an abstraction of some ICT entity, by which we represent the entity capability to realize a task, which from the point of view of service provider as well as of service consumer has coherent functionality. In order for ICT service to be used, it must be realized by some concrete provider's source and accepted by suitable consumer's receptor [3].
• "ICT service is implementation of well defined business function, which is executed independently on the state of any other service defined in a system. Services present well specified set of interfaces and are executed on the basis of agreement between service client and service provider that is specified beforehand" [11].

4.2 ICT Service definition in SPSPR framework

In the SPSPR framework we use the following definition of ICT service: "ICT service is represented by coherent activities and information delivered by ICT service provider to service consumer. ICT service is implemented by ICT processes, which consume ICT resources (hardware, software, data, expertise, etc.) during their execution. Service is realized on the basis of agreed business and technological conditions."

Business and technological conditions are described in the SLA and typically specify the following ICT service characteristics: service provider, authorized service consumers, locations where the service is available, time periods when the service is available, service content (functionality, data, support, etc.), service volume (number of users, data volume etc.), service quality (availability, response time, reliability, etc.), service costs (including additional penalties e.g. for provider noncompliance with service quality conditions), knowledge/technologies of service consumer necessary for service consumption, mechanisms for providing service continuity in the case of a disaster, security rules and mechanisms, form, content and periodicity of service reporting and revision.

In the SPSPR framework, the following operations are defined for individual ICT services: definition, design, implementation, installation, maintenance, modifications, continuous improvement, standardization, customization, contract/agreement conclusion, operation and delivery to specific consumer, scaling (management of service volume and of capacities necessary for its provisioning), service quality control, service costs and payments, and suspension of operation.

The following operations/activities are implemented for all provided ICT services: strategy, architecture, integration, standardization (merging of several similar services into one service), packaging (several services form a "service package" which is delivered and paid for as a whole).

5. ICT services Classification

Service catalogue that includes list of services provided by the ICT department, is an important prerequisite of enterprise computing management based on ICT services. A good design of the catalogue is a basic prerequisite for efficient ICT service management as it enables efficient access to ICT services, and service classification is an essential part of catalog design.

Current approaches to ICT services management (e.g. ITIL and TOGAF) are focused on ICT processes and their quality, maturity, efficiency etc.. They do not deal with classification of ICT services and with an architectural framework for services, making selection of external services and their incorporation into the enterprise information system difficult.

A number of different approaches to ICT service classification have been proposed; for example Jelinek et al. [6] propose five different approaches based on service content, type of service consumption, type of service consumer, type of service provider, resources and knowledge required from provider.

In the SPSPR framework the main classification criteria for is based on service content. This criterion focuses on what is delivered by service provider to service consumer and on the relationship of delivered service to consumer's business. ICT services are classified in two groups:
ICT services for business, i.e. services that directly support enterprise processes and end-users, including information, application, infrastructure, supporting and mixed ICT services.

ICT services for enterprise ICT development. These services are used for improvement of current ICT services or for development of new ICT services, and are not directly consumed by the business. This group includes software development, application implementation and integration, technology infrastructure improvement and consulting services.

In this paper we focus on Business/ICT relationship, and therefore we only discuss ICT services for business in the rest of the paper.

**Information service** is a service where the required information (e.g. current stock price, weather forecast, map of given locality, book, photo, film) is delivered by service provider to service consumer. Information should be delivered in required structure, format and at the right time. Service provider is responsible for information quality (e.g. relevance). Information services are mostly delivered using a software application, but the details functionality of the application is not of direct relevance to the user.

Functionality of business application (e.g. accounting, CRM, e-mail, air-ticket ordering) is represented by the content of application service (or SaaS). Data processed by application may be fully owned by the consumer (e.g. accounting, CRM), fully owned by provider (e.g. Google search engine) or owned jointly by both (e.g. air-ticket ordering). Service provider is responsible for data transformation, and the data owner is responsible for correctness (quality) of input data.

Implementation and operation of ICT infrastructure (e.g. servers, networks, operating systems, databases) required for application processing represent the content of infrastructure services. In addition to SaaS, two main types of cloud computing services are defined:

- IaaS (Infrastructure as a Service), hardware and software infrastructure services that do not include development platforms and integration tool services.
- PaaS (Platform as a Service), development platform and integration tool services.

Supporting services are needed to support information, application and infrastructure services, and include training, implementation, service customization and integration, help desk services, etc. In practice such services are often tightly coupled, resulting in mixed services.

6. ICT services architecture

In this section we briefly discuss ICT services architectures in the SPSPR framework and leading frameworks TOGAF [8] and ITIL [7].

6.1 ICT services architecture in SPSPR framework

ICT services architecture comprises definitions of individual ICT services used by the enterprise and their relationships. Service dependencies, i.e. situations where a particular service is dependent on the provision of some other service(s) (e.g. infrastructure service as a prerequisite for application service) are represented by service links.

Service consumers and service providers have different objectives in utilizing ICT service architecture. Service consumers focus on provisioning and integrating (either internally or externally) ICT services required for supporting business processes. Service providers focus on delivering service portfolios maximizing the revenues for a specific consumer segment and territory.

Individual ICT services are mapped to objects in SPSPR framework (e.g. business processes, company departments, etc.) specifying corresponding service consumers. Mapping services to ICT processes identifies ICT processes that take part in service delivery. Mapping services to ICT applications specifies which applications provide the service.

In the SPSPR framework the ICT services and their architecture represent the main communication tool between business and ICT. Using this approach the ICT services encapsulate ICT processes and resources (including application architecture) so that business users do not have to be concerned with their implementation details. This approach has two significant benefits:

- All technical details of ICT service provisioning, including which application provides the service functionality are omitted from the interface between business and ICT and become the responsibility of ICT service provider.
- Information, application and technological architectures of ICT services delivered by external providers do not need to be described in detail by the service consumer.
6.2 ICT services in TOGAF and ITIL

TOGAF and ITIL are currently the most popular frameworks for enterprise computing management. TOGAF is EA (Enterprise Architecture) framework. ITIL is mainly oriented towards ICT services management. TOGAF is based on EA repository; ITIL uses information storage in form of Configuration Management Database (CMDB). Recent proposals for the integration of the two frameworks include Braun and Winter [2] who argue that “In case of EA being the central enterprise engineering concept and ITIL being the dominant operational model for IT, ITIL has to be sufficiently integrated into EA” and also propose integration of EA and ITIL meta-models. ICT services management may be integrated into TOGAF (or into another EA framework) by a cross-layer view [2]. Although both frameworks include ICT services and a catalogue as key meta-model elements, they do not deal with ICT services architecture.

6.3 Figure 3: TOGAF - Architecture Development Method

There are different opinions about ICT services architecture used in frameworks such as TOGAF. According to Hrabe [5] “Services are used in enterprise in number of different types and categories and ICT services architecture is not possible without inclusion of links with number of objects from different areas of enterprise architecture. Therefore it is not necessary and makes no sense to search for neither specific (isolated) general services architecture nor ICT services architecture. “

We support the view that the inclusion of ICT services architecture in TOGAF can be beneficial. This will involve the inclusion of two new phases (i.e. “ICT services architecture design” and “Decision on ICT services sourcing”) between two existing TOGAF phases (i.e. “Business architecture” and “IS architecture”) – see Figure 3, addressing the requirement for the inclusion of outsourced ICT services within the scope of enterprise architecture [4].

7. Conclusion

In conclusion, our approach based on the SPSPR framework described in this paper brings the following benefits for enterprise ICT management:

- Clear definition of responsibilities in relation to ICT for various levels of enterprise managers.
- Transparency of enterprise business goals decomposition for the ICT operations management.
- Development of schema from which the metrics for key success factors for individual process types and responsible managers may be deduced.
• All technical details of ICT services provisioning are excluded from the interface between business and ICT which simplifies the specification of ICT services requirements for business managers.
• Detailed information, application and technological architectures for ICT services delivered by external providers do not need be specified by the user organization.

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9. References

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