

PERFORMANCE MEASUREMENT OF SERVICE OPERATION IN IBM**Professor Rupali Dilip Taru****Alamuri Ratnamala Institute of Engineering and Technology
Mumbai University, Mumbai, Maharashtra**

Abstract: Virtual Organization (VO) is a network of autonomous organizations sharing their competitive advantage to address a specific business opportunity. Due to autonomy of partners and the temporal and dynamic nature of VOs, collaborative VO management is crucial to its success. In addition, performance measurement plays an important role in non-centralized VO management solutions. In this research, we present a framework for process and performance management in service oriented virtual organizations. The framework comprises of 6 layers including an integrated performance management framework. In designing the components of the framework, standard reference architectures such as Open-EDI reference model and the IBM S3 Service Oriented Architecture (SOA), as well as best practices such as ITIL V3, PMBOK, SCOR and ECOLEAD are used. In addition to the framework, a distributed SOA-based architecture for business process execution and performance measurement is discussed. The proposed architecture is built using service zone specifications residing in each partner organization. It uses current SOA infrastructure of partner organizations to shape service zones which are federated into a virtual infrastructure that facilitates business process synchronization and execution. This infrastructure supports any of the common VO interaction topologies known as supply chain, star and peer-to-peer. This research facilitates inert-organizational business process design, synchronization of partner processes, collaborative performance management and distributed process automation in service oriented virtual organizations.

Keywords: Collaborative Process Management; Collaborative Performance Management; Service Oriented Architecture; Enterprise Service Bus; Service Federation.

I. Introduction

Participation in inter-organizational collaboration is inevitable in today's business environments, especially when organizations need to achieve a differentiated competitive advantage. While small and medium size enterprises (SME) do not have the power and resources to compete against large enterprises, the notion of collaboration is even more essential. Therefore, organizations are increasingly restructuring their process models and software infrastructures to facilitate dynamic and flexible environments to engage in more complex value creation chains, partnerships, and business ecosystems. This has resulted in more organized collaboration of enterprises, and a new area of interest known as Collaborative Networked Organizations (CNO). Temporary and opportunitybased CNOs which are known as gatherings of multiple organizations to address a specific business opportunity, are called Virtual Organizations (VO). VO collaboration and interactions are usually supported by computer networks [1]. Computer aided data interchange and software interaction between different organizations has evolved over time. Several frameworks and standards have been developed, especially for Business-to-Business (B2B) interactions. Also, there have been studies on agile and flexible communications, within networks of organizations. At their early stages, these frameworks were mostly relying on data interchange, but as they evolve, they have aimed to address higher level business processes between organizations [2]. EDI (Electronic Data Interchange), RosettaNet, ebXML (Electronic Business using eXtensible Markup Language) and SOA (Service Oriented Architecture) based solutions are examples of such interaction frameworks. These solutions are designed to handle long term B2B interactions, while VO partner interactions and collaborations faces specific challenges due to their nature of partnerships.

Among these challenges, dynamic reorganization during VO lifetime, privacy concerns of partners, and business process integration can be mentioned as examples [3].

As the world economy has shifted from a goods-based economy to a value creation-based economy, the service sector and service science have gained more and more attention. Therefore, SOA-based software adoption and usage have increased in the past decade. SOA-based solutions are strongly recommended for dynamic value creation systems [4]. Studies show that the success of SOA-based BPM-system (Business Process Management) implementations is highly dependent on the alignment of the solution towards organizational business strategies [5].

In this research, we provide a framework for business process design and performance management that

depends on a service oriented architecture and implementation of VO collaborative processes. The proposed framework enables networks of organizations to form virtual workflows based on their software infrastructures, and share and monitor their performance metrics without the need for a central authority. The service zone interaction model provides an abstraction layer that facilitates organizations to share their designated services with other partners while keeping their core competency private.

The rest of the paper is organized as follows. In Section 2, we discuss the background concepts. Section 3, describes the proposed framework and its various components. Section 4 presents the distributed architecture for implementing SOA-based BPM in VOs. In Section 5, we discuss characteristics of the proposed framework and architecture. Finally, the paper is concluded in Section 6.

II. Background

A. Virtual Organization

Collaborative networks focus on communication and exchange of information, knowledge and services for a mutual benefit. A simple example would be sharing of information on different experiences among business partners using a web communication tool. As these collaborative networks have evolved, various forms of CNOs have been formed among which virtual organizations are the most mature in terms of degree of inter-dependency and collaboration. While there are several definitions for VOs, none of them is unanimously accepted. In this paper, a Virtual Organization is considered as a dynamic, temporal consortium of autonomous legally independent organizations which cooperate with each other to take advantage of a business opportunity or cope with a specific need, where partners share risks, costs and benefits, and whose operation is achieved by sharing of skills, resources and competencies [6,7].

VOs have 4 phases in their lifecycle. First, the creation phase focuses on discovering and formalizing a collaborative business opportunity and proposes a collaborative solution to address that opportunity. The creation phase itself is usually divided into initiation and foundation stages. The second phase is VO operation, which consistently provides feedback from the VO's day to day activities and business processes. The third phase is called evolution. This phase concentrates on aligning the VO operations with its dynamic and fast changing environment; therefore the operation and evolution phases are closely related. Finally every virtual organization's purpose comes to an end. Therefore every virtual organization faces a dissolution phase. The dissolution phase focuses on separation of VO partners and inheritance of its shared resources [8].

Different classifications of VOs are derived from their characteristics. A common classification is based on VO topologies. In [7], three different topologies for VOs are discussed: the supply chain topology in which partners' collaboration follows a linear pattern where each partner communicates with its immediate neighbors. The star topology, also called hub and spoke, has a main contractor acting as the central partner. The collaboration between different partners is coordinated predominantly star-like between the central partner and other organizations. Finally in the third topology, peer-to-peer, partners interact with each other with no hierarchy or central control. The VO's processes are divided into operational processes and management processes. The operational topology describes the communication pattern and information flows needed for the production of a product or service, while the management topology describes authority and management principles of VO guidance process. A VO might follow one topology in its operation and another in its management [7].

B. Virtual Organization Management

VO management denotes "The organization, allocation and coordination of resources and their activities, as well as their inter-organizational dependencies to achieve the objectives within the required time, cost and quality frame" [7]. As implied by its definition, VO management focuses on the foundation, operation and evolution phases. Its main focus is on effective communication between the operation and evolution phases. As VOs aggregate several autonomous partners, and operate in a highly dynamic and temporal environment, their management is complex, and also critical to their success. Efficient VO management faces challenges such as temporality in its nature, distributed operation between different business partners, and the need to adapt to a fast changing environment which may cause restructuring in the management approach or even VO topology. In addition, VO operation often requires some degree of process integration. In order to support dynamic and agile management, real-time actions, and consequently, efficient performance management with reliable real-time indicators are required [7].

Four different approaches for VO management are identified. First, managing VO as a project using Project Management Body of Knowledge (PMBOK) [9] which defines a project as "a temporary effort to create a unique product or service". Therefore VO fits in PMBOKs definition of a project. However, some argue that VO management is much more complicated than a project. Because multiple organizations are involved, there is no central authority and VO creation requires initial preparation and continuous negotiation. The

second approach is to define and employ decision protocols and mechanisms to manage VOs. This approach usually lacks the guidelines and supporting methodologies for management activities. The third approach is to use PMBOK and other related project management frameworks as a reference model for VO management. Finally, the fourth approach is based on collaborative discussions between different VO partners [6], [7]. VOs have a wide range of characteristics with respect to their structure, time span, lifecycle and behavior. As such, it is extremely difficult to define a one-size-fits-all model covering all the identified requirements of VO management. As a result, the focus in VO management is mainly on governance and management services [10]. The ECOLEAD project has further elaborated VO management services as a key components for a successful management of virtual organization [11].

C. Service Oriented Architecture (SOA)

SOA is defined by OASIS as “A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measureable preconditions and expectations” [4]. According to this definition SOA is not just a flexible technology but it rather reflects a new way of thinking in the IT industry. SOA is an IT paradigm that facilitates agility and reusability in organizations. From a manager’s point of view “SOA is a journey that promises to reduce lifetime cost of the application portfolio, maximize Return on Investment (ROI) in both application and technology resources, and reduce lead times in delivering solutions to the business” [12]. From a business executive’s point of view “SOA is a set of services that can be exposed to their customers, partners and different parts of the organization” [12]. From an information systems architect’s point of view “SOA is a means to create dynamic, highly configurable and collaborative applications built for change which reduces IT complexity and rigidity” [12].

Today’s economy has shifted from a goods-based economy to a value production-based economy where service organizations play an important role. In today’s market, enterprises have to respond faster and more efficiently to shifting market requirements, regulations and customer needs. Tight competition is forcing businesses to provide more and more services to their customers to keep them satisfied [4]. Therefore organizations are moving towards reusing resources through using palettes of atomic or composite services that can be easily and dynamically assembled into business processes [5]. SOAs loose coupling, policy driven, composable service architecture shows a good degree of alignment to VOs specific needs. SOA’s success stories on dynamic business processes implementations make it a suitable candidate for VO business process management [12].

D. Performance Measurement and Management

Performance Measurement (PM) is defined as a systematic approach to planning and conducting the collection of data regarding accomplishment of tasks and corresponding objectives [13]. PM has evolved through different stages as shown in Figure 1. The initial building blocks of all PM initiatives are guidelines related to the discipline of PM which may be termed PM recommendations. The accumulation of these recommendations forms the PM frameworks which can be categorized as structural and procedural. A structural framework specifies the typology and structure of performance indicators. On the other hand, a procedural framework introduces a step-by-step process for developing performance indicators from strategy [14].

Use of procedural framework to develop a specific structure of performance indicators, along with other performance management tools and techniques builds a PM system. Finally using PM systems to provide information in order to make positive change in organizational culture, systems and processes, is called Performance Management. Inter-Organizational PM system is a fast growing facet of the PM literature [14].

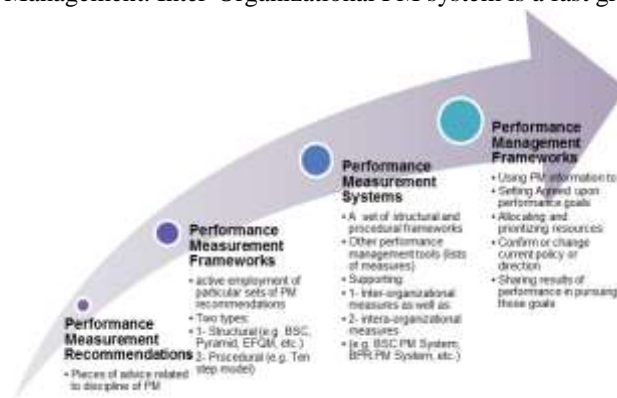


Figure 1: Performance Measurement Evolution – Toward Performance Management

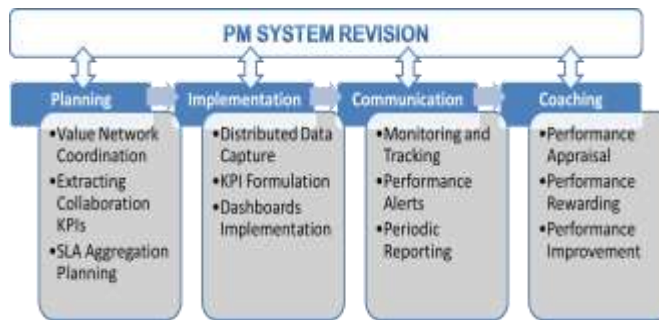


Figure 4: Procedural Framework for VO PM

The second phase includes the process of capturing data from distributed sources throughout the partners' performance information repositories. This implies establishing links between the performance data and performance indicators by implementing KPI formulations. Physical implementation of dashboards using business intelligence tools will be the last step of implementation phase.

The third phase encompasses the processes of information provision, interpretation, and communication. The modules in this phase are progress monitoring and tracking, performance alerting and periodic reporting. In fact communication of performance information should support both active and re-active approaches. Monitoring, tracking, and forecasting KPIs in a relatively real-time manner and providing periodic reports are means for active monitoring. On the other hand performance alerting as reporting specific events or outlier performance levels will facilitate re-active monitoring.

The fourth phase includes rewarding partners based on processes of performance evaluation. This keeps VO on track towards its target goals and values through supporting relevant improvements in operations and collaborations of partner organizations. This phase consists of performance appraisal, rewarding and improvement. The agreed upon levels of performance indicators in the most abstract layer (value network) can be used as a criterion to reward the partner organizations, based on their success in realizing added value for the customer.

The last phase includes different review procedures to improve each and every part of the PM system. These procedures will ensure that there is a feedback loop which

III. Conclusion

IV. *Table 1: Collaborative process management solution criteria*

provided distributed implementation architecture based on the proposed service zone specifications and interactions.

In today's value-based economy, organizational partnerships and collaborations play an extremely important role. Allies of organizations are providing increasingly more value added services to their end customers than traditional enterprises. Therefore, organized collaboration between partners and their effective and strategic management have become a major concern in the past decade. These collaborations in a global economy are facilitated by computer networks. Virtual Organizations - as the most mature collaborative networked organization - face challenges in their management due to their temporality, inter-dependency and partner autonomy.

In this research, we have proposed (a) an integrated framework for business process management and performance measurement that is aligned to its higher level value network and lower level implementation technology. The proposed framework consists of two major components, the business process design and the performance measurement system. Each component is designed and integrated using known reference frameworks; (b) Along with the framework; we have

The proposed architecture facilitates VO interactions by reusing existing partner resources. The architecture is based on federation of multiple enterprise service buses which provides a virtual hub with desired VO interaction topology such as supply chain, star, and peer-to-peer.

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