The Use of ADM for SOA Design

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Abstract—**Service-oriented architecture (SOA) provides the flexibilities of dynamically composing business processes through the links of services.But how to analyze and design to achieve this architecture in large-scale IT environments does not have a matured method. In this paper,we present a method based on Architecture Development Method (ADM). A SOA based system " the Intelligent Platform of Virtual Travel Agency "(IPVTA) was researched and designed、implemented and obtain good results.**

Keywords-**SOA,ADM,TOGAF,EA**

I. Introduction

Enterprise business processes should be adjusted with the market changes, the corresponding business process management system should be able to support such variable business processes.SOA can be a good support for variable business processes，but how to analyze and design a SOA style system in large-scale does not have a matured method. The traditional software development methods like waterfall model or spiral model are no longer meet the needs of SOA design[1] . This paper aimed at the National Natural Science Foundation of "The key issues in smart flow application mode", We designed and developed a prototype system IPVTA. In this paper, we analyze the main steps of ADM and show how to use it in IPVTA.

The Open Group Architecture Framework (TOGAF) is an industry standard architecture framework that may be used freely by any organizations wishing to develop an information systems architecture for use within that organization. The ADM is the core of the TOGAF. It is applied to develop an enterprise architecture which will meet the business and information technology needs of an organization. SOA needs supports in some of the more familiar architecture frameworks[2], and there are already some examples in the implementations of other commercial EA combined with SOA [3][4] ,so it is feasible to use ADM for SOA based system design.

The remainder of this paper is as follows. In section 2 will be the introduction to the prototype system, section 3 is how to use the ADM for SOA design in the IPVTA, section 4 is the conclusion.

II. Experiments and Introductions
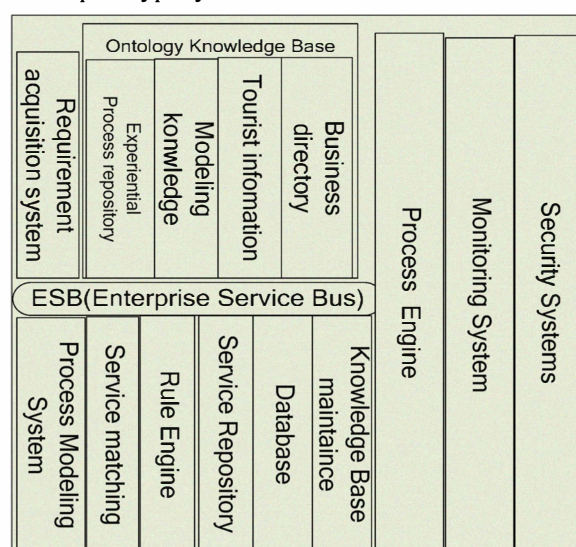
2.1 The prototype system: IPVTA

Figure1 Intelligent Platform of Virtual Travel Agency

The IPVAT is designed based on web service as shown in Figure1. When a customer arrives, the system needs to make an overall service plan for customer. The first step is to make travel routes and timetables according to the requirement got from the requirement acquisition system, and then customize a service process based on them by travel agency staff with the help of the Ontology Knowledge Base. This process include services in the early, mid and late of the travel. When the plan changed, travel agency staff can change the process without the help of IT experts.Travel agency experts can perform maintenance on the Knowledge Base through the maintenance subsystem. When the process model is generated successfully, the process will be bound with specific web services.

The system mainly include the following subsystem:

1. Requirement acquisition subsystem

The travel agency staff obtain the customer's requirement through interaction and then make a list of the customer's demand .The system should provide appropriate interaction function.

2．Process Modeling Center

The travel staff make travel process accord to the requirement list made by the requirement acquisition center with the help of the Ontology Knowledge Base and then Test the correctness of the process by the rule engine.

3．Ontology Knowledge Base

Ontology knowledge base with storage, reasoning,inquiry features is the foundation for the business process modeling, it provides the necessary support for the realization of process variability and reduce the communion barriers between business personnels and IT personnels.

4．Service matching System

According to the business process modeling , locating and binding specific web services.

5．Rule Engine

In the variable process management system, Business rules are packed into every business activities.This requires the system support real-time verification ,rule engine is a good solution for this area need.

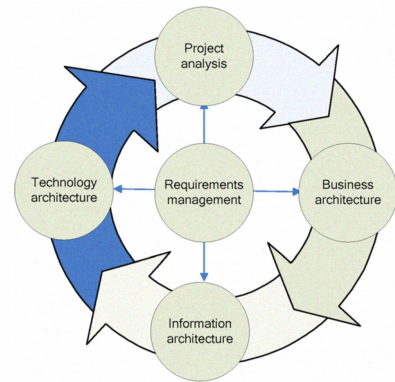6．Other systems like security system、monitoring system etc used to ensure the process running.
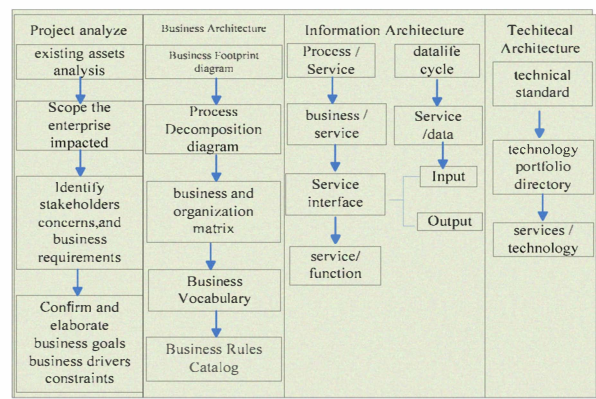
2.2 The step of using ADM for design.

The stand ADM is divided into the following phases: Preliminary Phase and Phase A to Phase H. The ADM is a generic method for architecture development, it will often be necessary to modify or extend the ADM to suit specific needs [5]. In our project, it is modified into four steps according to SOA thinking as shown in Figure 2.Project analysis 、 business architecture design 、 application architecture design and technical architecture design. The detail of every phase as shown in Figure 3.The rest of phases like Phase F、G、H used in our project without changes.

III.   The use of ADM

3.1 Projcet analysis

3.1.1 Existing assets analysis

The purpose of SOA is to achieve maximum reuse of exiting systems, Therefore, this step must be identify the modules that can be reused and select the appropriate packaging methods. In this research, we conduct a new project so we can ignore this step.

Figure 2 The modified ADM

Figure 3 The detail of the modified ADM

3.1.2 Scope the enterprise impacted

"SOA is not just thinking of IT technology, but also innovative business management thinking ,the focus is mainly on business process rather than departmental functions.[6]," The TOGAF is designed to achieve no boundaries workflow, SOA is a strategy to achieve business and IT alignment. Therefore, to determine the scope of organization impacted is important, we need to identify which is the core unit, which is subject to the unit, and all to be affected is tied to their related or might want to change their business structure.In the IPVTA,the organizations impacted are Travel agency、Airline company、Hotel、Transport companies etc.

3.1.3   Identify   stakeholders,concerns,and   business requirements

For example ,in this project the main stakeholders、concerns and requirements are as shown in table 1 .

stakeholders	concerns	requirements
Tourist	good travel experience	desired spots、good service
Travel agency	good services	dynamic adjustment 、
…	….	…

Table 1 The stakeholders、 concerns andrequirements

3.1.4 Confirm and elaborate business goals,business drivers,and constraints

Define the constraints that must be dealt with, including enterprise-wide constraints and project- specific constraints specific constraints (time,schedule,resources,etc.)..For example, Tourist want to Hk and tours must be no more than three days and no more than $2000 etc.

3.2 Business Architecture Design

How to analysis the business processes is the key to SOA implementation. This stage will focus on the organization's business structure analysis. Business architecture integrated enterprise business processes, people, operations and projects. Through the analysis, decomposition and then recombination of the processes of the company's business activities to meet reusability and flexibility.

3.2.1 Business Footprint diagram

Identify the business process goal, business functions and the relationship between business activities.
As shown in figure 4,it is a process of the travel agency serve for customer. The process can be divided into several sub-process.

3.2.2 Process Decomposition diagram

Decompose a process into the corresponding function modules,as shown in Figure 5.The Business Process Modeling Notation(BPMN) or Unified Modeling Language (UML)are appropriate notation for these diagrams.
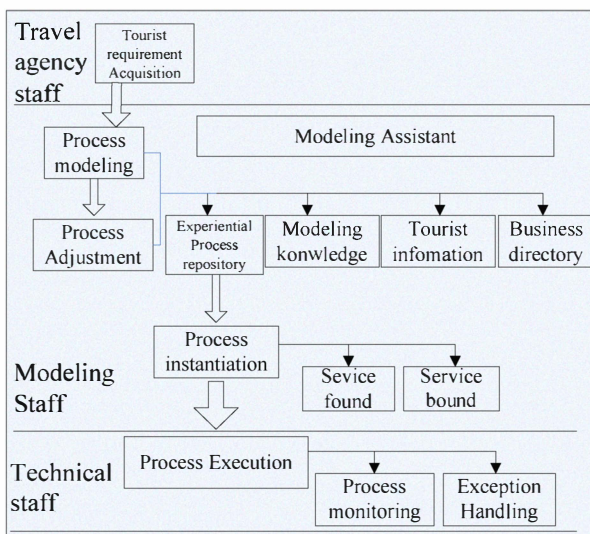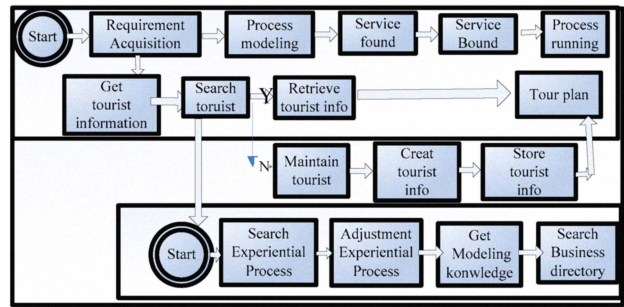

Figure 4 Business Footprint

Figure 5 Process Decomposition

3.2.3 business and organization matrix

A typical SOA structure is composed of service providers, service consumers and service registries. Therefore, through this matrix, identify each business and provider or consumer. One of the examples is as shown in Table2

Provider / Consumer	Airline-company	Hotel
Travel-agency	Book-ticket	Hotel-reservation

Table 2 business and organization matrix

3.2.4 Business Directory

This is a list of the key words used in the system. In order to increase the automation of the system, stakeholders use uniform naming standards. For example, an airline company provides service for people to buy tickets on internet, the service should be called "Book ticket". they are stored in the Ontology Knowledge Base[7] .

3.2.5 Business Rules Catalog

Identify the rules between the different business. For example ,business C is carried out only after business A and business B have been completed. In this prototype system,they are also stored in the Ontology Knowledge Base[7].

3.3 Information Systems Architecture

This step is to identify the services and business correspondence, the required level of granularity、 border, and the treaty and so on of services ,the relationships between services.

Information system consists mainly of two parts: the application architecture and data architecture. Application architecture main define the functions. The data architecture is to define the major types and sources of the data.

3.3.1Application Architecture:

1 Process / Service matrix

This shows which process include which groups of portfolio services.For example, modeling process and Book ticket process are as shown in table 3

Process name	Service	Service
Modeling Process	Search Experiential Process	Adjustment Experiential Process

Table 3 The Process/Service matrix

2business / service matrix

This shows which business activities is to be completed by which web service as shown in table 4,we can make it clear that which activities will be completed by which application/service as shown in table 3

Business	Customer information	Book air ticket
Service	customer	Air ticket

Table 4 business and service matrix

3 Service Interaction Model

This shows the interactions between web services as shown in Figure6
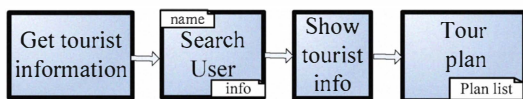

Figure 6 Service Interaction Model

4 Service function Definition

Through the previous analysis, we identified the service functions and interface. But most of the times,we should redesign the services based on a balanced consideration like the granularity,load balancing,quality of service etc.
design.

3.3.2 Data Architecture:

1 Data life cycle diagram

Through the data life cycle diagram, trace data in a business process how is it generated and how is it end. For example, the data life cycle in requirement acquisition process is as shown in Figure7.

Figure 7 The data Life Cycle

2 Service / Data

This is to describe the web service , and the data they involved .During the data architecture design period,it is mainly to analysis the relationship betweent web service and data. For example,in the payment service,it should get the customer information and the customer account information as shown in Figure 8.
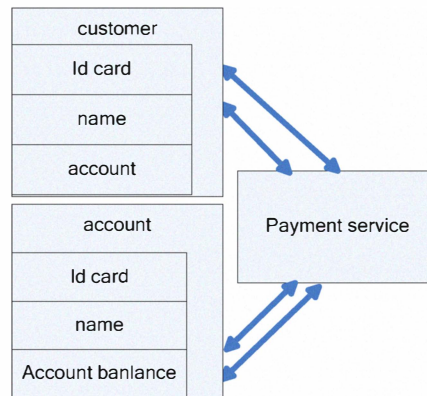

Figure 8 The data involved with Payment Service

3 Service and input/output

It shows a service input and output datas.

Interface Service	Input-interface	Output-Interface
Customer	id	name

Table5   service and interface matrix

3.4 Technical Architecture

3.4.1 technical standard catalog

This is to determine the technology used throughout the enterprise, such as basic platform, development tools, etc.

3.4.2 technology portfolio directory

This directory is mainly to make a system running the completion of the necessary software and hardware portfolio, including infrastructure software, such as operating system , as well as application software.

3.4.3 services / technology matrix

This shows which technology portfolio are used in which service，for example,the service is developed with JAVA or C++.

In section 3,the details of every phases are introduced and illustrate how to used it with examples.Though these steps,we can identify the functions and dates of every services.Compared with the previous object-oriented design methods,SOA design should pay more attention to the project analysis and business architecuure and information architectur. In the technical architecture design phase,we can use many methods from OO software engineering.

IV.   conclusion

SOA is a very promising thinking in systems design and development . Not only does it allow for the use of disperse systems and web services, but it allows for both business and data to be completed in a distributed manner. This paper gave a method based on ADM to Complete the design and development, But ADM is a comprehensive approach, How to make better use of it in enterprise IT environment, more application of examples are still needed.

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