Design and Implementation to Intelligent Examination System for e-Business Application Operation

Xin Jin   YanLin Ma

School of Information

Central University of Finance& Economics

Beijing, 100081, P.R.China

Abstract: - This paper presents a design and implementation of an intelligent testing system for checking the e-business application operation capable of the examinees. A novel architecture for on-line examination system is proposed. That system adopts the common client-server pattern with two major parts, the client component also called Student site and the application-oriented server component here also called Teacher site. The Student site provides examinee a GUI (Graphics User Interface) embedded a WWW browser for answering the paper. The Teacher site mainly includes paper management subsystem for managing paper database, a building paper subsystem for building a new paper, and a scoring paper subsystem for scoring the paper of the examinees. In this paper, we also analyze the system architecture, some key questions and the corresponding solutions.

Key-Words: - intelligence, examination system, e-business simulation environment

1 Introduction

The use of information technology (IT) has become a primary survival factor for business organizations in a global competitive environment, as the e-business tide is spreading through various domains violently in modern society. Developing e-business is an important factor to accelerate national economy increasing.

In order to adapt and grasp this situation and respond the proposal in the Eleventh Five Planning of Nation "accelerate developing e-business, apply information technology widely and popular information knowledge and craftsmanship widely in the whole society.". So the education and the training of the e-business knowledge are actively developed in whole society. Under that great background, we develop the Examination System for e-Business Application Operation (ESBAO) which is a part of e-business education and training software system supported by Shanghai Informatization Office, so as to check the user's ability of the e-business application operation.

Commonly, the traditional e-business education and training adopts two ways: the theoretics teaching in classroom and the computer-based application operation in e-business simulation environment which is like as e-business web site(but not same as). Here, We will introduce examination system that is for checking the examinee's ability of e-business application operation. This system has some characters as follows:

I. Checking the ability to e-business application operation of the students or the examinees.

The ESBAO system gives marks for the students according to whether their operations which include the key operation steps and the operational results are correct or not under the e-business simulation environment. For example, if the question is buying commodity A by the searching way, you can do the correct answer as following workflow: *start up searching engine -> select commodity A -> start up purchasing engine -> make orders -> finish*. Your answer also can be completed through the other workflow. This system gives marks for you just according to whether starting up searching engineer and successfully purchasing A or not.

II. Intelligence.

The intelligence of ESBAO is embodied mostly with the intelligence of building examination paper subsystem and scoring examination paper subsystem in Teacher site. For example, the teacher can building the examination paper by himself through GUI, also he can only start up the Building Paper Agent (BPA) which can build examination paper automatically. When the teacher scores the examination papers, he only needs to star up scoring paper engine through GUI, then the system would check and mark the examination papers and record the examinees' scores in the database.

The rest of the paper is organized as follows: In section 2 we introduce the design of the ESBAO system architecture. In section 3 discuss the system

design and implementation essential. In section 4, we discuss the key technologies for system implementation. Finally it is the conclusion of this paper.

2 System Architecture

We use the XML technology[1], the Component technology[2], the Database Trigger and Stored Procedure technology[3] and other information technology to design and realize the ESBAO. This system mainly comprises Paper Database, Paper Creator, Building Paper Agent, Monitor for monitoring application operations of the examinees, Answer Generator and Scoring Paper Generator. The Fig.1 depicts the system architecture and the workflow.
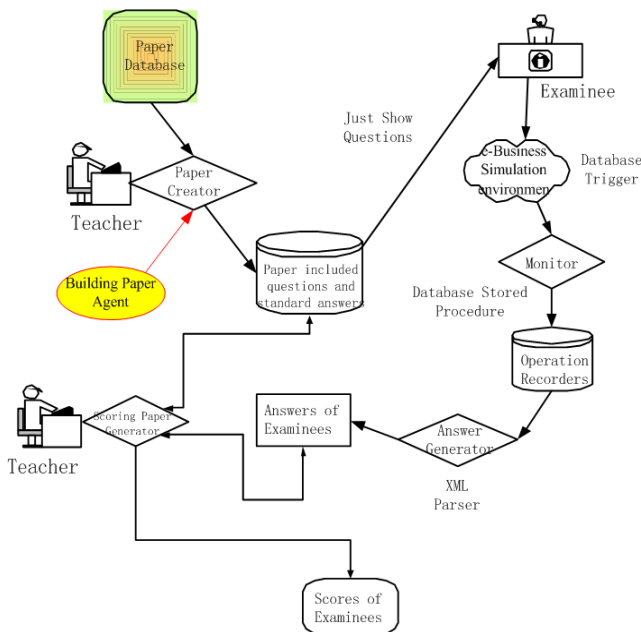

Fig.1 System Architecture and Workflow of the ESBAO

In Fig.1, the Paper Database is collector of examination questions described by XML document style. The teacher can simply and quickly creates a new XML document paper, only need to start up Paper Creator component engine that can work automatically. The Paper Creator is very expediently for the teacher to parser XML document paper to automatically analyze and deal the paper's structure, attributes, scores, contents etc. When the teacher finishes building paper, the corresponding standard answers are automatically created. These building paper procedures also can work automatically by Building Paper Agent, after the teacher start up the agent.

When the examinees answer the questions of the paper, it is necessary to operating in the e-business

simulation environment which is like but not same as the e-business web site. The main difference is that e-business simulation environment sets a monitor program in some main operation steps to capture who and whenever and however to operating. The monitor program is oriented special operation workflow, and it is sequential and discretely in workflow and in work time, so as to the system records the operations which are the some key operation steps or result in database. When scoring the papers, we can use Answer Generator to transfer the recorders of the database to XML formatted answer sheets. In this system, all of documents are XML-based format.

When the teacher starts up the Scoring Paper Generator which can score papers automatically, it can compare examinees' answers with the standard answer to give marks. Because the all document are uniform XML format, it only needs to judge the data identity, then to mark the scores.

3 Discuss the System Design and Implementation Essentials

The ESBAO system can check the examinee's application operation procedures and results under the e-business simulation environment. Its designing goal is to test e-business application operation ability. It is necessary to solve some important questions as follows:

> ➤ *capturing and analyzing the operations*
> ➤ *concurrency of many operations*
> ➤ *building paper and scoring paper automatically*

3.1 Capturing and Analyzing the Operations

The most methods to recording the operation procedures are relative with the structure of the e-business simulation environment. If it is Client/Server structure, the ESBAO system can set monitor program in client and server together. If it is Browser/Server structure (this system uses this structure in fact), the system can only set monitor program focused in server to search and capture the operations of the client. As the above mentioned, this monitor methods are discretely in the business workflow. So before building monitor program centralized in server, we must firstly be confirmed the monitored objects. That means we need to confirm which operation steps and results need to be monitored.

The simply solution is to add triggers in database to monitor add, delete and update operations. These data changing often be from the activity and the operation in business environment. Furthermore, because the system design is based on server

component program, we can add log records in component to capture operations. We can add an examination monitor switcher for all components. When beginning the examination, the system open this switcher, then the operations and activities can request these components to create some fixed format records which can reflect the operation types.

Furthermore, if some contexts of simulation environment has used middleware or middleware platform[4], we can set a series of monitor program to realize the operation capturing and analyzing.

3.2 Concurrency of Many Operations

At current, the concurrency is not very difficult to implement contrasted to past time, because the most of commerce software and the system program developing architecture provide responding solution. But in the ESBAO system, because there are many examinees to take part in examination together in a server e-business simulation environment, so there are some questions to solve as follows. For example:

➢ When we operate a certain defined resource, if the resource is not database (the database can balance the concurrent operation) but data file, media or print device, Once the resource be locked by one student's operations, the other students can not use that resource to finish the operation. Besides the later operation could overlap the previous operation, so some different meanings are arose.

➢ In some typical e-business application workflow, some enterprise entity application, especially the application come down to financing, auction, sale or paying etc., often be sensitive to the activity entity. For example, auditing the order, the auditing order can not be looked through by other people. The kind of operations, such as the above operation of auditing order, can not fit as the examination questions.

Besides some e-business application workflows often need at least two aspects to finish. For example, the online auction in which there are some business entity which often affect and restrict each other. So, to check many people cooperation operation is an interesting approach issue.

In this system, we can adopt the following ways to solve the above concurrent questions.

➢ *Adopt memory database and data view.*

In the common situation, the data of the examinee operation often distribute in temp data cache and view but not operate directly in the center database. Then the data of examinee operation can not be interfered each other.

➢ *Isolate the public data and private data.*

In some typical workflow, the system can create some backups of used data and resource. Different examinees can use different backups. It is not need to backup the data which is not relative with these operations.

➢ *Using programs to simulate many people cooperation operation.*

For example, in the contesting auction, the system adds the dummy contest rival to contest with the examinee.

➢ *Data restore.*

After the examination, in order to keep the stability and standardization, the system provided toolkits which can restore the data and the resource to the primal status.

3.3 Manage Papers and Score Papers Automatically

In order to manage the papers, using the paper database is a good solution. In the database, all examination questions have been test to be sure the correctness in the examination procedure. To the examination in simulation environment based on the components and comprised of some work units, the teacher can use the papermaking toolkit to build the questions and do parameter setting in operation units of the integrate workflow to form a series of operation rules. The component and the work units can judge the mark referring those rules, so those methods can make the questions type and formal to be more diversified.

In the ESBAO system, besides the checking paper automatically based on XML documents compared, we add the personality requirement and evaluating guidelines, which make the marking automatically to be more impersonality. In most situations, e-business operations can not record and weight by estimated way. For example, using the searching engine, we can search one commodity through various ways. In that procedure, it is difficult to judge the operation is correct or not. Those lead to the process-typed questions and result-typed questions appeared. The called process-typed question means to emphasize the sequence of a series of operations, but the result-typed questions only emphasize the final result.

For those two different questions types, we need use different judging standards to deal. So in the process-typed questions, we can set some monitor points in the operation procedure, also we can divide the integrated workflow to many sub objects. The system not stickle to the real application workflow, but add more require and evaluation guidelines artificially. This mark based on the subdivision workflows is apparently more correct.

4 Key Technologies for System Implementation

On the above discussion, we analyzed the system design requirement. Because of the characters of testing contexts and the intelligence requirement, we adopt some technologies to implement the system as follows:

> *Component technology*

Considered the characters of the operation mode, the design based on components gives priority of business- oriented or procedure- oriented. In order to combine conveniently the script language of simulation environment (in this system, our simulation environment adopted the ASP script), we use the C++ and VB to compile the COM we needs. For example, in order to record the examinees' answers, we need to set monitor program to monitor that operation procedure. In ESBAO system , we use the component technology to enclose most functions to strengthen the software reused.

> *XML technology*

In this system, we use XML-based documents to store the data of the papers, and use XML technology, such as XML DOM ,XML SAX and ADO, to realize the dynamically mapping from the XML documents to database recorders, transferring information and maintaining information etc.

> *Database technology*

One hand the database is the carrier of the data storage, the other hand the system can use the database triggers and/or the component events to stimulate the database stored procedures to record the operations of the examinees.

> *Agent technology*[5]

In this system, the Building Paper Agent is an automatic component in fact, in which we add the message mechanism to realize the autonomy of the agent. We use C++ to implement the agent.

5 Conclusion

In this paper, we discuss an operation-oriented intelligence examination system, which is for e-business application operation examination, and present a novel system architecture for the Examination System for e-Business Application Operation (ESBAO). The ESBAO system mainly include an answering paper subsystem for examinees in the Student site, paper management subsystem in Teacher site for managing paper database, a building paper subsystem in Teacher site for building a new paper, and a scoring paper subsystem in Teacher site for scoring the paper of the examinees. In this paper, we detailedly discuss the system structure, some key questions and the corresponding solution.

Acknowledgement

References:
[1] Blex,udC, *XML Technology,* Beijing: Tsinghua University Press, 2003
[2] Mary Kirtland, *Application Program Based on COM ,*Beijing: Peking University Press, 1999
[3] Lucian Popa，Yannis Velegrakis, *Translating Web Data,* Proceeding of the 28th VLDB Conference,HongKong China, 2002
[4] Maurizio Lenzerini, *Data integration: A theoretical perspective,* In PODS, 2002, pp. 233-246
[5] Zhongzhi Shi, *Intelligent Agent and Application:* Beijing: Science Technology Press, 2001