

Application and Implementation of SMS platform in Project Management Information System Approval Workflow

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Abstract—With the wider application of project management information system (hereinafter referred to as PMIS) in power plants, large number of project documents in power plants infrastructure construction phase can be approved at all levels in the PMIS, such as the start sheets, completion sheets, project change request sheets and so on. However, for a variety of reasons such as relevant approval person's failure to timely log in PMIS, some project documents can't be timely approved, resulting in the standstill of approval process, greatly affecting the work efficiency and processes. This paper introduces a project documents approval SMS alerts function developed by using Short Message Gateway and the interface program provided by mobile corporation, which has positive significance to shorter approval process and improve work efficiency. The uses of this function in power plant infrastructure construction MIS have got constant recognition and praise of the customers, adding highlights for the power plants infrastructure construction project management.

Keywords *PMIS; approval workflow; SMS platform; Gateway Interface*

I. INTRODUCTION

Currently, SMS has already integrated into people's daily lives, forming a unique SMS economic phenomenon. SMS can help customers to capture personalized business information and fashion consume information. It should be a new breakthrough and starting point of SMS application in business to promote, guide and establish a positive, healthy, efficient, high quality modern business information gain approach, and a SMS application which plays the role of convenient consultancy for the modern life services.

Based on the PMIS of some power plant, this paper uses the Short Message Gateway provided by some SMS supplier to develop functions including project documents approval SMS alerts. This paper mainly describes the design and implementation of the approval process SMS alerts in PMIS system.

II. APPROVAL WORKFLOW

Workflow is a concept putted forward for the daily work activities with fixed procedure. By the decomposition of a specific work task into multiple tasks, roles and certain rules

and processes, the execution and monitoring of these tasks can be restricted to improve the management level of production and operation of enterprises. Combined with advanced ERP application system, workflow is being well used. Concept of workflow and BPR have been conjointly studied by almost all the researchers. Enterprises need to constantly change themselves to adapt to the external environment changes. A workflow-based, configurable, reconfigurable ERP system is very important for the BPR.

During the demand research and analysis phase in the course of system implementation, through in-depth investigation of enterprise's business to indentify the requirements of enterprises and existing business process, the user's latest business process pattern is determined. Workflow is the key technology support for business process and system dynamic reconfiguration. workflow technology can support application program to run in accordance with users-defined process or route. According to the development request of business process, the system provides the tools satisfying business process changes modification and fixation.

Whether the goal can be achieved relies on the implementation of the process. Locating the decision point in the place where the business process is executed and establishing control procedures in business process can greatly eliminate the friction between the existing departments, reduce management costs, reduce invalid labor and enhance the speed of response to business processing. For electricity enterprises, work efficiency can be improved through the optimized process configuration and management, ensuring the construction goes efficiently.

PMIS construction is the comprehensive information system construction around the project management within enterprises, covering all kinds of business processes and management processes, the construction of enterprise information system is a process of optimizing process and

improving the management level, the system provides advanced enterprise modeling integration tools for meeting the need of comprehensive business modeling. System configuration and management is carried out based on the workflow, staff of all steps, authority, etc. determined during modeling phase. Various business processes generate the functional data of the next segment from the last one, the responsible persons in corresponding segment can see their tasks while entering the system.

In addition, business process is very likely to change, the implementation staff and customers can flexibly connect various functions of application systems and quickly complete the configuration of business process by the process redefinition, without needing to modify the code. The most direct function of approval workflow is defining the approval relationship between logged-on users and business objects. It is very intuitive and easy to use, the system administrators can easily define various approval processes in each business function form according to various management regulations

Configuration approval process need to put some basic data into the approval management module, such as state group, state information shown in Fig. 1, approval group, approval information shown in Fig. 2, what kind of approval process each business document needs is associated by approval association table, each approval process corresponds to a state group. For example, the approval of contract change documents in contract module corresponds to contract change approval process (state group 43) configured in approval management module. Simply by opening the approval related program interface and writing the basic information and state group number corresponding to contract change documents

into the same record, the connection of business documents with some approval process can be achieved.

While opening some business document, such as starting construction management in quality management, the state and state group in the upper right corner show the state information of current document, i.e. which step this document lies in the approval process. When adding a new document, the system will automatically display the initial state of the document approval process in accordance with recorded information in approval association. In the course of the document approval circulation, approval operation can be performed by clicking the right mouse button, when approval is completed, a process automatically go to the next person to complete the next approval.

III. SMS PLATFORM APPLICATION SOLUTION

A. Introduction of Short Message Gateway connection pattern

Short Message Gateway is a standard module developed based on the SMS platform of four networks—Mobile, Unicom, Telecom, Netcom, it can be conveniently and comprehensively embedded existing software or application program, easily implement mobile ERP, CRM, OA, SCM informatization, etc.

According to actual customer demands, gateway connection mainly consists of the gateway interface software, API function.

Gateway interface software usually provides three connection ways (database, TCP/IP, serial port), its basic principle is that connecting customers through the software and

开始状态	结束状态	审核办法	审核组	状态改变描述
0	1	0	82	送审
1	2	0	13	通过
1	8	0	13	不通过
2	3	0	15	通过
2	8	0	15	不通过
3	4	0	12	通过
3	8	0	12	不通过
4	5	0	2	通过
4	8	0	2	不通过
5	6	0	3	通过
5	8	0	3	不通过
6	7	0	1	审批完毕
6	8	0	1	不通过

Figure 1. Details of state group



Figure 2. Details of approval group

submitting information to send in format, and at the same time connecting to SMS platforms to sent customer information.

The most common method used in the software is the connection to the database, mainly by accessing to the database to send and receive. Simply speaking, only if the customers create database tables provided by SMS suppliers at the customer's database, and write to the database on request, will the gateway interface software scan the database and submit the information to the SMS platform, doing this can reduce the difficulty of connection and development amount during the process of connection, so that the connection work can be efficiently completed because of the simplicity of operation on database.

"API Functions" is a connection way provided by SMS suppliers for some customers engaged in software development, namely connecting a standard DLL file provided by SMS suppliers to the customer's systems, the DLL provides many functions, such as: connect, check fee, send, receive (only exists in two-way development), etc. The operations such as "connect", "send" can be performed on our platform through the use of these functions, although this way is of higher technical demand, the customer's control of the message becomes stronger, achieving the formation of SMS platform.

"API function" supports the most popular programming languages: ASP, C +, DELPHI, JAVA, VB, VC, VF and so on.

B. DB Interface Solution

1) DB Interface Description

a) Gateway interface program

- User program communications with the gateway interface program through a database, the gateway interface program communications with GSM Modem provided by SMS suppliers to achieve the wireless receiving and sending of messages. First of all, a database is needed for exchanging data, the database can be the original system's database, or a SQL Server software can be reinstalled (the database can be any one support for ODBC database interfaces: such as ACCESS, MYSQL, ORACLE, etc.), A table is added in the database for data transmission, additionally another table can be added for sending records. (Note: The two tables can be used alone.) Gateway interface program creates data connection through ODBC and

exchanges data through the following tables (for SQL-Server users, automatically create with the use of Gateway Interface program script file without manual input).

b) Three data tables required by DB interface program

- Table of sending queue

Table name: tb_queue

Fields:

id	int	4	// Automatic ID (1+1)
pno	int	4	//Sending port number, -1 is decided by the system itself, 0 to 7 respects 8 port numbers (the field is valid only when sending through the GSM modem, invalid when sending over the network, add -1 in this case)
spno	char	50	// Mobile port number and parameter set (used in two-way network). Such as: 1200123,00 *****, the front is the port number, followed by the parameters set, separated by commas, the parameter set are described below. If Mobile port number is written to be "0", the system automatically selects the one-way channel to send.
linkid	char	30	// Match code (used in sending over the network, the system automatically processes when adding 0 ,while adding -1 indicates LINKID is forced empty)
phone	text	16	// receiving phone number or number group
msg	char	280	// content of sending message (Note: 70 characters are permitted to send only, both a Chinese character and a Western character are counted as one character)
fee	int	4	// fee code/wap push index
userid	char	11	// sender account (the GSM Modem users can fill in 13123456789)

```
pwd char 6 // Read index (0: not read yet 1: already read)
```

```
sid char 20 // number reserved
```

Primary Key: id

- Table of sending history information
- ...
- Control (receiving) information database
- ...

IV. DEVELOPMENT OF SMS ALERTS FUNCTION

A. Create basic tables and triggers provided by DB interface program

For the reason that PMIS uses ORACLE10G database at the background, so DB interface script provided by SMS suppliers can be directly used to create the tables and triggers necessary for SMS functions. The code is as follows:

```
CREATE TABLE tb_control(
    id number,
    stime date,
    type number,
    detail char(250) ,
    result char(250) ,
    userid char(20),
    pwd char(6) ,
    state number
);
```

B. Development of interface function in the PMIS database Units

The table task_remind_tab in the PMIS database is used to display approval alerts information, because the information of this table comes from more than one tables storing information like approval history, current status, approval group ,etc., interface program is considered to be developed using this table.

1) Write a database function of extracting the name and phone number of approval persons

2) Add codes about inserting the phone number information in the original database storage process with changed approval status

3) Create a trigger to insert records to the basic data table

```
CREATE OR REPLACE TRIGGER tr_approve_remind
```

```

AFTER UPDATE
ON task_remind_tab
FOR EACH ROW
DECLARE
    msg varchar2(280);
    phone varchar2(200);
BEGIN
    msg:='一条 '||:NEW.identity_desc||'单据需您审核,请及时处理./PMIS';
    phone:=:NEW.S2;
    INSERT INTO oaadmin.tb_queue VALUES(1,-1,'0','0',phone,msg,0,'1','1','1');
END;
```

After the above steps, the function of automatically sending messages to the next person in order to remand him/her to approve documents after someone's finishing approval has achieved.

V. CONCLUSION

The communication industry is rapidly developed today, mobile commerce platform is popular applied in the enterprises and increasingly more and more in-depth, and has gradually deepened to all aspects of daily work in the enterprises. With the development of mobile communication services, influenced by popular business philosophy "customer-centric", many enterprises have established a message interactive platform aims at marketing services, significantly improving the customers'satisfaction and loyalty on the basis of shortening distance among customers and enhancing communication and interaction. This marketing pattern gets more and more popularity and the times of SMS marketing and service is coming in the near future. Developing the function of approval SMS alerts in power plant PMIS with the use of gateway and the API interface program provided by SMS suppliers has highly improved the PMIS implementation effect, accelerated the progress of implementation of PMIS, enhanced the employees'enthusiasm to use it, got consistent recognition and praise of the employees and leadership, and further promoted the informatization construction of power plants.

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