

## Design and Implementation of Web-based Workflow Form

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**Abstract.** Aimed for the problems of changeable demand for form in workflow management system based on web, a form designer based on Html was designed, which realized the function of custom form. A model of process promotion based on the form is devised, which put forward the method of integration of workflow and custom form, the scalability and flexibility of workflow management system are enhanced, and the requirements to flexibility of form definition are satisfied.

### Introduction

Workflow technology is a core technology to achieve business process modeling, business process simulation, business process optimization, business process management and integration, and ultimately achieve business process automation<sup>[1]</sup>. Workflow technology appeared in the 1970s, the concept originated from the field of office automation. Workflow Management Coalition (WfMC) is widely regarded as the most authoritative consortium which forms to define standards for the interoperability of workflow management systems in the world. WfMC defines workflow management system as a system that completely defines, manages and executes “workflows” through the execution of software whose order of execution is driven by a computer representation of the workflow logic.

With the rapidly development and popularize of the Intranet/Internet technology, web-based workflow management system has become a trend, because web application program is open and span across in different platform. Whole workflow management system mainly includes the following eight parts: workflow engine, visual design, process operation, client, process monitor, form design tools, integration of workflow with form and application. In early workflow, form fixed in workflow management system is simple and easy to achieve, but not flexible and easy to meet user's needs. However, with the increasing changes of user's needs and business logic, the form cannot be adjusted in time because of amending form difficultly, bad scalability, etc. So workflow management system needs a form designer, which supports the function of custom form. Form designer improves the efficiency of system development and maintenance and reduces the complexity of system.

### Form Designer

WfMC defines workflow that the workflow is process of management which can be partly or fully automatically executed. It can make documents, information and tasks to be delivered and executed according to a series of rules. The form in workflow system is the main carrier of information interaction. The form designer is an important part of workflow management system, which implements form content design, style design and automatic generation. Form shows itself as a web page to user that allows user to easily process data and overcomes the defect of interaction with the outside world in previous systems<sup>[2]</sup>. When only one browser is needed on the client, web-based solution brings great convenience to user of the system.

**Storage model.** Storage model is a collection of form items, storage model contains multiple storage fields, and each storage field is a form item. In workflow system, each storage model corresponds to a database table, and its main properties include name, title, founder, category, etc. Each storage field corresponds to a field of the database table, and its main properties include name,

type, length, nullable, default value, etc. Each storage field is bound with an extended html control, the main properties of the control include name, title, type, extended code, width, height, color, default value, displayable, editable, etc.

**Form design.**CKEditor (formerly FCKeditor) is an open source WYSIWYG text editor from CKSource that can be used in web pages. It aims to be lightweight and requires no client-side installation. The first version was released in 2003. Its core code is written in JavaScript, having server side interfaces with Active-FoxPro, ASP, ASP.NET, ColdFusion, Java, JavaScript, Lasso, Perl, PHP and Python <sup>[3]</sup>.

Based on these advantages, we design form by CKEditor. First, create a storage model and use CKEditor to create a new html page, the storage model and this page are bound to form a form model. Second, in the form model, bind each storage field to a specific location of the page and adjust the layout of the page. When all the adjustments are done, the form model is the form for binding to a node of a process.

### Form Processing In Workflow

When a form is completed defined, then the user can use the form in the workflow. Simply, a form only may be used in a process is discussed here. In this case, the user only binds a form in a new process, instead of binds a form for each node. It can be shown that using multiple forms in different nodes can be converted into using one form in all nodes of a process.

Assume that a process contains  $m$  nodes ( $N_1, N_2 \dots N_m$ ), form  $T_i$  that be bound with node  $N_i$  contains  $k_i$  form items ( $U_{i1}, U_{i2} \dots U_{iki}$ ), then we can redefine a form  $T$  which contains form items  $U_{ij}$  ( $i=1, 2 \dots m, j=1, 2 \dots k_i$ ). We create a new process that contains the same nodes with above process. Form  $T$  is bound with each node of the new process and the new process follows the rule that form items ( $U_{i1}, U_{i2} \dots U_{iki}$ ) is just useable on node  $N_i$ . Then the new process is equal to the original.

**Form binding in workflow.**In the case that a form only used in a process, concrete operations of binding a form in a process as follows: first bind a process with a form model. Then set specific permissions for the form on each node of the process. These permissions mainly include read, write, get default value, validate input value, etc.

Through setting permissions for each form item on each node, make a personalized interface for each user, instead of making a same interface for all users. The form instance used by the users is dynamically generated according to the above form model and permissions for each form item on each node.

**Form-based process promotion.**The operation of a process instance actually is all nodes of the process are executed sequentially according to certain logical rules, and execution of a node is mainly the process of processing the form which is binding with the node by the participant of the node. Therefore, when defining a process, a defined form is bound with each node. Process the specific form in these nodes, then promoting the functioning of the overall process.

Form-based process promotion is between form and workflow engine, and provides various kinds of interface for form and workflow engine. The key feature of the process promotion is form data processing mode and the workflow engine is based on form data processing results in selecting route. Therefore, the interaction between form and workflow engine is designed by the key feature of the process promotion <sup>[4]</sup>.

#### 1) Manual node and automatic node

Manual node in workflow is a common node which is bound with a form. This type of node needs many concrete participants, and is a human-computer activity of a process in the process of transfer. In this activity allow user to set desired form content, participants' information and participation method of each participant, etc.

Automatic node in workflow is automatically executed by the system. This type of activity also needs to be bound with a form, but not needs any concrete participants.

#### 2) Form-based promotion rules

In order to meet the different application requirements, a series of operational rules and flow

control rules are introduced in workflow management system. These rules which are based on all form items of the node-bound form include arithmetic operation rules, relational operation rules, logical operation rules and flow control rules, etc.

a) Arithmetic operation rules

- Fur arithmetic operations: achieve addition, subtraction, multiplication and division of two form items of numerical type data.
- Man value operation: compute the average of the multiple form items of numerical type data.
- Etreme operation: for many form items of the same data type, taking their maximum or their minimum.

**The overall framework of the system.**The workflow management system needs a series of modules to serve the form and the rules described above, so that they can work effectively. These systematic modules related to the form and the rules described above, as shown below.

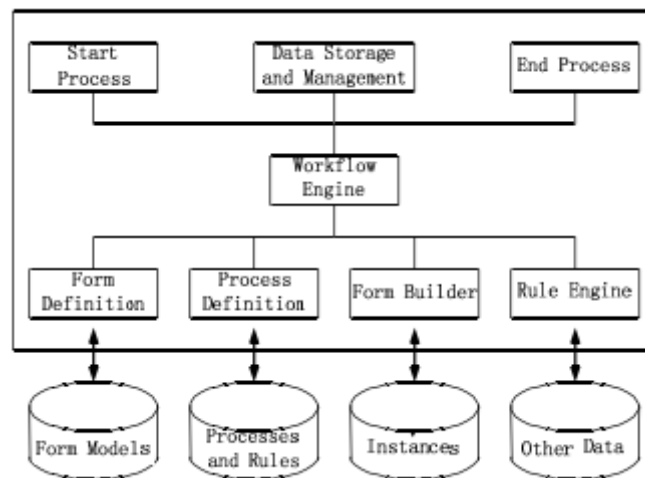


Figure 1. System Framework

- Form definition: define the form described above.
- Process definition: define the process and rule.
- Form builder: generate the form dynamically.
- Rule engine: it mainly includes the interpreter of operational rules and the interpreter of flow control rules. The execution of an automatic node goes like this: first, the interpreter of operational rules<sup>[4]</sup> makes the calculation according to the operational rules of this node and the node-bound form items, then the interpreter of flow control rules handles this node according to the flow control rules of this node.
- Start process: starting process. When starting a process, the system creates a new instance of the form which is bound with the process. When the process is running, the system dynamically generates a form for the user according to the definition of the form and the current node. The execution of a manual node goes like this: first, the user fills out the form completely, then the system verifies the data<sup>[5]</sup> in the form, next it stores the correct data in databases, finally the workflow engine processes the submitted.
- data to determine which node is to execute next. Data storage and management: storage and manage the data which includes definition and instance data, control data, application data and relevant data.
- End process: When a process instance is completely executed, first, the system ends this instance according to predefined rules, then it cleans up temporary data which are generated when the process is running, finally closes the corresponding instance and log records.

## Conclusion

As for the variability of form in workflow, a form designer based on Html was designed, which realized the function of custom form. It provides a rich presentation layer controls, can design form in the browser visually and directly. A model of process promotion based on the form put forward the method of integration of workflow and custom form, enhanced the scalability and flexibility of workflow management system.

## References

- [1]Fan Yushun, Lin Huiping, Luo Haibin, Zhao Hong, "Fundamentals of Workflow Management Technology," Beijing: Tsinghua University Press, 2001.
- [2]Workflow Management Coalition, "The Workflow Reference Model," Technical report WfMC TC-1003, Jan.19, 1995.
- [3]BaiduEncyclopedia, "TheWorkflowForm," <http://baike.baidu.com/view/1242974.htm>, May.23, 2009.
- [4]Wang Ruixia, Sui Hongwei, Liu Hong, "Design and Implementation of Form Designer Component Based on XML," Application Research of Computers, vol. 24, no. 7, July. 2007, pp. 183-185.
- [5]Xiao Yu, Xu Wei, "Workflow management system based on form and relational database," Journal of Huazhong University of Science and Technology (Nature Science Edition), vol. 32, no. 11, Nov. 2004, pp.42-44.