

A workflow approach for a token web application specification

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Abstract

In our third year Web Application Development course, there is a traditional assignment, which requires the students design and develop a token web application in ASP.NET. We have been specifying such a token web application assignment in ordinary English. This way is not concise, intuitive, well organised and accurate. Further, it might be ambiguous, incomplete and repetitive. This study tries to normalise the specification process and the notations for future use. The research methods used in this study are case studies and experimental research. Three case studies were used and a workflow based framework for the token web application specification was proposed. The framework consists of three components: *Description*, *Activities* and *Workflow Chart*. The proposed framework was tested against one assignment. It was planned to be tested against other 7 assignments. The proposed framework seemed able to address some of the issues raised, so that the specification was improved. However, this needs to be confirmed by further testing.

Keywords: Workflow, web application, assignment.

1 Introduction

In our third year Web Application Development course, there is a traditional assignment, which requires the students design and develop a token web application in ASP.NET. The web application is usually a simplified real world web application that preserves all the important features of the real world application. We have been specifying such a token web application assignment in ordinary English. This way is not concise, intuitive, well organised and accurate. Further, it might be ambiguous, incomplete and repetitive.

This study tries to identify the common characteristics from the past assignments, and develop a framework which will normalise the specification process and the specification notations for future use. This new approach will be as simple as possible, so it's easy for students to understand without learning too much about the notations.

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Krug's premise (2000) is that a good program or web site should let users accomplish their mental model. Krug points out that people are good at taking the first available solution to their problem, so design should take advantage of this. Similar, our specification should accomplish our teacher and students mental model as well. Workflow facilitates the accomplishment of human mental model (Esposito and Loia 2000, Dickinson, 2006). So workflow chart was adopted in the proposed framework.

The research methods used in this study are case studies and experimental research. Case studies were used to generate the hypothesis, which is the proposed framework, and experimental research was used to test the generated hypothesis.

The data for this study are 11 past assignments. These assignments were divided into two groups: three of them were used for case studies to generate the proposed framework; the rest of them would be used for testing the proposed framework. Only one assignment testing had been done so far, which is reported in this paper.

The rest of the paper is organised as the followings: the research methods are described in section 2, the past assignments covered are described in section 3, workflow is discussed in section 4, the case studies are discussed in section 5, and the proposed framework is given in section 6 and is tested in section 7. The results and the future work are discussed in the final section.

2 The Research Methods

The research methods used in this study are case studies and experimental research. Case studies were used to generate the hypothesis and experimental research was used to test the generated hypothesis.

In this study, the hypothesis is that the proposed framework can address the issues raised in the first section, so that the proposed framework can improve the assignment specification. The issues are that the past specifications were not concise, intuitive, well organised and accurate. Further, they might be ambiguous, incomplete and repetitive.

Case studies can point researchers to variables that deserve further study and help generate hypotheses (Stanovich, P and Stanovich, K., 2006). Three cases from three different time points were selected for the case studies: the assignment of 2003 Semester 1, the

assignment of 2005 Semester 2 and the assignment of 2008 Semester 1.

Experimental research was used to test the hypothesis. Out of the 11 past assignments, three were used for the case studies, the rest of the assignments were planned to be used to apply the proposed framework. In this paper, the proposed framework was only applied to the assignment of 2006 Semester 1. More testing should be done in the future.

3 The Assignments

3.1 General Requirements

The assignment requires the students to design and implement a token web application. It is intended to assess students' mastery of the web concepts and ASP.NET concepts from the course. The students should demonstrate the state management, interacting with database, authentication and authorisation techniques learned from the course. Each semester, the assignment covers a different business case to meet the similar technique requirements.

3.2 The Assignments Covered

Totally 11 assignments were planned to be used. They were from year 2003 to year 2008. In this section, only the detail information for the four assignments covered in this paper was given. The main descriptions from the original assignment document were duplicated.

The Assignment of 2003 Semester 1. The assignment will involve developing an alumni website for Unitec WAD class. The alumni website provides two services: a poster board and an album. The poster board is the default service. There are two classes of users, a classmate user and a class manager. There is only one class manager for this site. The site allows classmate users to create, edit, post and delete their own posters on the poster board. It also allows classmate users to view all the posters. Similarly, the site allows classmate users to post and delete their own photos on the album. It also allows classmate users to view all the photos. The class manager has all the rights as a classmate user. In addition to that, the class manager can approve or ban a classmate user. The required fields on the page screen for a poster: Author, Title, Time and Content. The required fields on the page screen for a photo: Title, Image and Comment.

The Assignment of 2005 Semester 2. The assignment will involve developing a simplified online survey tool for **Online Survey Maker**, which is a fictional company in Auckland. There are three classes of users, a survey taker, a survey author and an administrator. The application allows survey authors to create/submit a survey and add questions to the survey. A survey author can view all the surveys he/she has submitted. A survey author can also view all the answers to a survey he/she has submitted. A survey taker can view all the available surveys and take any of the available surveys. A survey taker doesn't need an account to take a survey. However, a survey author must have an account to create/submit a survey. An administrator can disable a survey author

account. An administrator can view all the available surveys from all the authors. Each survey has two status: available or unavailable. Initially, a survey is available. An administrator can disable any of the available surveys, so that they won't be visible to the survey takers. The Online Survey Maker home page must include three areas (or a link to each of these areas): the survey area, which displays all the available surveys and allows people take a survey; the registration area, which allows a survey author to create an account; a login area, which allows a survey author to login. When a survey author creates a new survey, he/she should submit a survey name and a description of the survey. After that, an empty survey is created. The author then should be able to add questions to the survey. There are two question types: single answer questions (with radio buttons for options) or multiple answer questions (with check boxes for options). Each question has six options at most. The application must maintain the required information for each survey within the database. This includes the survey ID, survey name, survey description, and a list of questions. The number of questions is unlimited in a survey. Each question includes the question ID, the question number, the question content and a list of options (at most six options). Each option includes the option ID, the option number and the option value. The information for an author includes the author's name, the author's photo, the author's email address and the author's telephone numbers.

The Assignment of 2006 Semester 1. The assignment will involve developing a simplified web-based **Property and Rates Management Tool** for **Sailing City**, which is a fictional city in New Zealand. There are three classes of users, an information searcher, a manager and an administrator. The application allows a manager to create/modify information for a property. A manager can view/modify all the information for all the properties he/she has submitted. An information searcher can search for the information for a particular property and view all the available information about that property. An information searcher doesn't need an account to search for information. However, a manager must have an account to create/modify information. An administrator can view/modify all the information for all the properties submitted by all the managers. Some information for a property is confidential. Only the manager who created the information for that property and the administrator can view that confidential information. An administrator will use an existing account to login. An administrator can disable a manager account. The application home page must include: a Sailing City Logo; a "contact us" link; a search area (or a link to this area), which allows an information searcher to input a street number and a street name, to select a street type, and to submit the input data; a registration area (or a link to this area), which allows a manager to create an account; a login area (or a link to this area), which allows a manager/administrator to login; a selection area (or a link to this area), which allows an information searcher to select one property if there are more than one property at the supplied address, e.g. we have 1/1500 and 2/1500 at 1500 Great North Road, Waterview, or the same street exists in multiple suburbs, e.g. we have Great North Road in Waterview, Avondale

and Grey Lynn. The application must maintain the required information for each property within the database. This includes the property information, the rating information and the values information. The property information includes the property ID number, the manager ID number, the property address (e.g. 21B Birdwood Crescent, Parnell; 15 Cradock Street, Avondale; 2/184 Carrington Road, Mt Albert; where B and 2 are flat numbers), the property owner's name (confidential), the property title number (e.g. CT-1456704), the land area (e.g. 434 square meters; ½ Share of 840 square meters), the property type (Land/Unit/House), and the property year (e.g. 2005). The address includes the flat number, the street number, the street type and the suburb. The street types include: Any (Default), Avenue, Crescent, Drive, Place, Road, Street and Terrace. The rating information includes current annual rates (e.g. \$1472) and last year rates (e.g. \$1234). If the property year is 2006, then last year rates is not applicable. The values information includes land value (e.g. \$300,000), value of improvements (e.g. \$270,000), capital value (e.g. \$570,000) and annual value (e.g. \$28,500). If the property type is land, then value of improvements is not applicable. The information for a manager includes the manager's employee ID number, manager's name, the manager's photo, the manager's email address and the manager's work telephone number.

The Assignment of 2008 Semester 1. The assignment will involve developing a simplified help desk management system for **Auckland Technology Institute**, which is a fictional company in Auckland, New Zealand. The system will **Manage Help Desk Online**. There are three classes of users: a user, a technician and a manager. The system allows a user to create a ticket to report a problem. The system allows a manager to assign a ticket to a technician, modify information for a ticket or for a technician. A manager will use an existing account to login. A technician needs to login, and view tickets assigned to him/her or modify the status of a ticket. A manager can create or disable a technician. After a technician account has been successfully created, an email containing the username and the password is sent to the technician automatically. The system home page must include: an Auckland Technology Institute Logo; a "contact us" link; a submitting area (or a link to this area), which allows a user to create a ticket; a login area (or a link to this area), which allows a manager or a technician to login. The application must maintain the required information for each ticket within the database. This includes the ticket information, the user information and the technician information. The information for a user includes: name, email address, phone number, network login, and department. The ticket information includes status (new, assigned, pending and resolved), date created, importance (high, medium and low), the category (hardware, software, logon and network) and extra comments. The technician information includes employee ID, name, phone, and photo. The relationship between the user and the ticket is one to many; the relationship between the technician and the ticket is one to many.

4 Workflow

4.1 General Description

Workflow originally was used to specify a business process. Now it is mostly used to automate a manual business process. The word "workflow" is etched into our collective consciousness ... the flow of work. We pass documents and forms to each other in support of our daily tasks. Workflow systems structure our document exchanges so that our work has rigor. Such systems let us set out the desirable flows of work and our computers help us with tasks that can be so automated (Smith and Fingar, 2003). Nowadays the handling of the information can be carried out in a manual or automatic form. The processing of this information can be defined in work steps which forms the business process. These business processes can be modelled in an automatic form by workflows (Sifaqui, 1999).

Researchers had proposed frameworks of using workflow for web application modelling (Brambilla, 2003 and Brambilla, 2006). These include workflow notations, models and implementation. The workflow model represents the business process to be executed, in terms of activities, precedence constraints, and actors in charge of executing the activities. Human activity can be described as a hierarchy: activities realised through chains of actions, which are carried out through operations (Sifaqui, 1999). The idea of activities was used in our case studies. However, the workflow notations they proposed are too complicated for our purposes.

4.2 Existing Workflow Charts

There are many different styles of the existing workflow charts (University of Florida, 2007, Childs, 2007). We discuss three examples here.

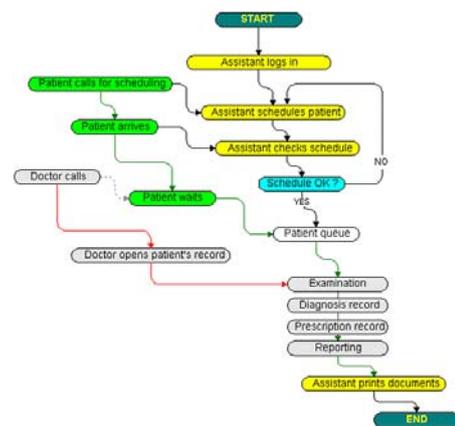


Figure 1: A workflow chart omitted multiple roles.

In the first example (Integrated Healthcare Environment, Practice Management, 2004), there is only one type of nodes. Start node, end node, decision node and process node are identified by the node labels, rather than node shapes. In some of the nodes, role is identified, e.g. "Patient waits". In some of the nodes, roles are omitted, particularly when multiple roles were involved, e.g. "Examination". No arc labels are used except *yes* and *no*. This style is simple, concise and intuitive. However,

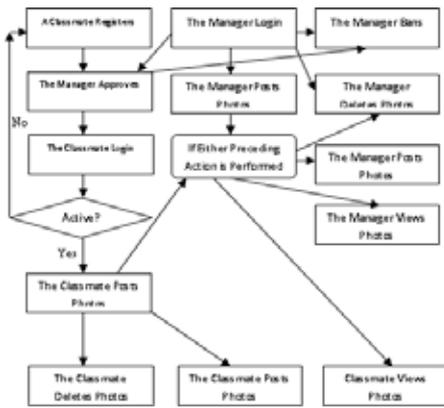


Figure 5: A workflow chart for 2003 Semester 1 Assignment, Album Service.

In this case, two type of roles and two services were involved. Some of the activities are common for both of the services. If the classmate nodes and manager nodes were combined for the same action, it's hard to specify that for a manager can perform the action for all the posters/photos; however, a classmate can only perform the same action for their own posters/photos. There is no explicit start/end point. An alternative process node was introduced to specify that if either preceding action is performed then the control flow should proceed.

5.2 2005 Semester 2

Owner: Online Survey Maker.

Services: Online survey tool.

Roles: A survey taker, a survey author and an administrator. There is only one administrator.

Home page: Three areas (or a link to each of these areas): the survey area, which displays all the available surveys and allows people take a survey; the registration area, which allows a survey author to create an account; a login area, which allows a survey author or an administrator to login.

Data:

- Survey - survey ID, survey name, survey description, a list of questions. The number of questions is unlimited in a survey.
- Question - the question ID, the question number, the question content and a list of options (at most six options).
- Author - author's name, author's photo, author's email address and author's telephone numbers.
- Each survey has two status: available or unavailable. Default status: available.
- Each question has a question type: single answer questions (radio buttons for options) or multiple answer questions (check boxes for options). Each question has six options at most.

Activities:

Online survey tool

- Survey takers: view all the available surveys and take any of the available surveys.
- Survey authors: create/submit a survey and add questions to the survey, view all the surveys he/she has submitted, view all the answers to a survey he/she has submitted, register, login.
- Administrator: approve or ban a survey author, view all the surveys from all the authors, change survey status and login.

Workflow chart:



Figure 6: A workflow chart for 2005 Semester 2 Assignment.

The English descriptions of the activities only describe what actions a role can perform; they don't specify the required order. However, workflow chart does. The status changes are implied by the required sequences. Changing status can be described by different actions. For example, available to unavailable can be described as withdraw survey; unavailable to available can be described as resubmit survey. There are three types of roles and one service. Home page requirements were added in this assignment. There is no explicit start/end point.

5.3 2008 Semester 1

Owner: Auckland Technology Institute.

Services: Manage Help Desk Online.

Roles: A user, a technician and a manager. There is only one manager.

Home page: An Auckland Technology Institute Logo; a "contact us" link; a submitting area (or a link to this area), which allows a user to create a ticket; a login area (or a link to this area), which allows a manager or a technician to login.

Data:

- User - name, email address, phone number, network login, and department.
- Ticket - status (new, assigned, pending and resolved), date created, importance (high, medium

- Values - land value, value of improvements, capital value, and annual value. If the property type is land, then value of improvements is not applicable.
- Manager - employee ID, name, photo, email address and work telephone number
- Confidential – Some information for a property is confidential. Only the manager who created the information for that property and the administrator can view that confidential information.

Activities:

Property and Rates Management

- Information searcher: search the available information for a particular property and select a property if there are multiple results.
- Manager: create/modify information for a property, view/modify all the information for all the properties he/she has submitted, login and register.
- Administrator: view/modify all the information for all the properties submitted by all the managers, login, and disable a manager account.

Workflow chart:

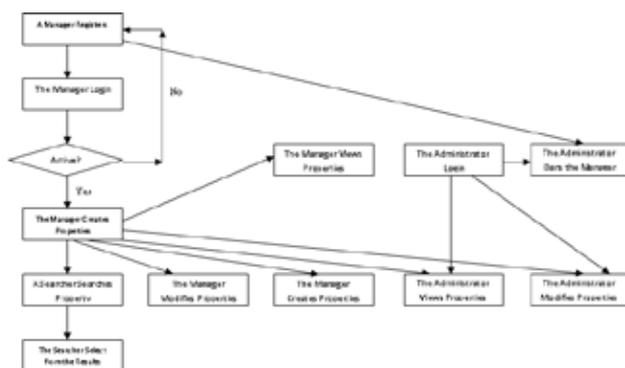


Figure 8: A workflow chart for 2006 Semester 1 Assignment.

The proposed framework is sufficient to specify this assignment.

8 Discussion and the Future Work

Workflow chart could describe the sequential activities explicitly. For example, a manager must login and register a technician first to ban the technician. This is intuitive and unambiguous.

The clear structure of the framework makes it easy to check if all the required functionalities are covered. This is helpful to improve incomplete specification. And this is also helpful to identify repetitive information.

The proposed framework seemed be able to address some of the raised issues, so that the specification was improved. Further testing is needed to confirm this.

In all the cases covered in this paper, there are no multiple roles performing the same action. More testings are required to determine how to specify such a situation. The framework chart structure might be helpful to check

the complexity and hence the workload of each assignment. The proposed framework did not cover how to specify data example. This should be addressed in the future.

The proposed framework should be tested against the other 7 assignments. And then the framework should be evaluated practically. Initially this framework can be used as a complementary for the conventional specification and then replace the conventional specification gradually.

Further research can be done on integrating the proposed framework with Visual Studio .NET, so that the Windows Workflow Foundation can be used to design the workflow graphically. Further, the workflow can be converted into the Workflow Patterns for implementation (Kitta 2008, Allen 2007, Brambilla 2003 and 2006).

Is it possible to extend such a framework for a real world application? It could be used to specify the key features of a real world application. Again, this needs to be confirmed by further research.

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