Chapter 7: Deployment and Testing

7.1 Introduction

In this chapter, the OODA System for Microsoft Excel Files is deployed in order to perform an overall system testing. This is done after the successful testing process on each of the object components that has been developed. Unified Approach has proposed an iterative way of executing the testing process. Once an illegal performance or exception has occurred in any part of the system, it should be solved and tested again. Tracking among the classes of the objects could be referred easily by looking at the class diagrams which are developed during Object-Oriented design stage.

Furthermore, an explanation of the final system functionality and features will be included in this chapter. An explanation of the procedures involved in executing the testing process will also be provided in this chapter.

7.2 Deployment to Web Server

The constructed java classes have to be placed in a proper directory inside the Tomcat web server folder for the execution of the whole OODA System for the Microsoft Excel Files. The process of placing the java class (*.class) files and configuring the Tomcat Web Server's server.xml file are called as the system deployment process.

The second activity involved in the system deployment process is configuring a file called server.xml. Basically, this file stores the information of all applications provided by a host machine. All virtual paths to access the Java Servlet pages / Java Scripting pages (JSP) must be clearly defined in this file. The server.xml file could be located in the c:\tomcat\conf folder. It could be edited using any word processor program or the notepad application as well. After the server.xml file is edited, save it and start the Tomcat Web Server service. The OODA System for the Microsoft Excel Files is deployed and the testing process shall begin.

Figure 7.2 shows a graphical representation of the process flow involved in the preparation of system deployment process.

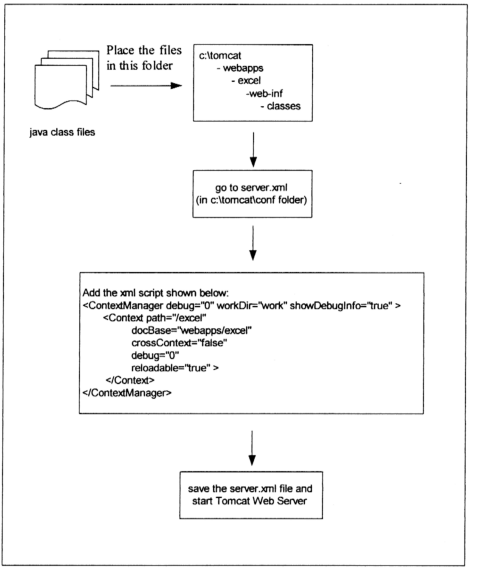

Figure 7.2 Process Flow for System Deployment Process

7.3 System Functionality

Upon performing a successful deployment process of the OODA System for the Microsoft Excel Files (with Tomcat Web Server as the deployment platform), the system is now ready to be tested. Nevertheless, it is important to first identify what are the system functionality provided in this project and what are the fields that have to be validated and verified in order to perform a correct system test.

A clear description on the system functionality provided in this project will be presented later. The main reason for preparing this is to identify and correct the weaknesses found in the developed system. Hence, the objectives of this project can be achieved.

There will be two main system functions that have to be described for system verification and validation. These functions are segregating Microsoft Excel document and combining Microsoft Excel documents.

7.3.1 Segregating Microsoft Excel Document

The main purpose of this system function is to create an interface for users to automatically segregate a Microsoft Excel file document. A Microsoft Excel file document could be segregated into several parts by letting the users to enter the exact phrases/words found in the document. Besides that, users could also enter the name of starting cell and ending cell as well to indicate the range of data found in an Excel document. The exact phrases/words could be located by the system and hence represent

the starting point and the ending point of the portion of data that need to be segregated out from the original Excel document.

The screen for the users to enter the phrases/words or the starting cells and the ending cells is shown in Figure 7.3. Users can use the browse button to specify the Excel source file. Besides that, there is a folder icon that could be clicked to specify the destination path of where to store the segregated Excel files.

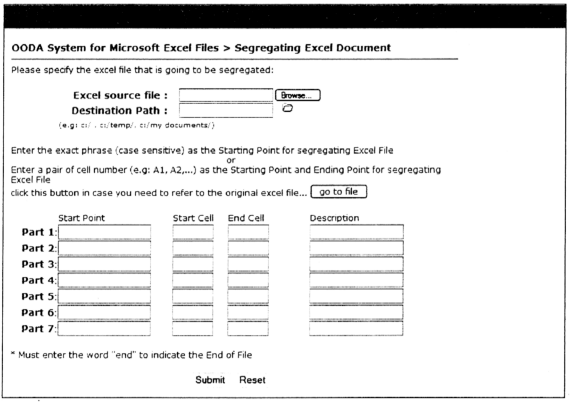

Figure 7.3 Screen for Segregating an Excel File Document

Tentatively, the maximum number of data portion that an Excel file could be segregated is seven. This limitation could be configured or adjusted according to the user's requirements. For each word/phrase entered by the users, the OODA System for Microsoft Excel Files must be able to locate the Excel data cell location that contains the given words/phrases. If the system fails to locate the words/phrases an error message must be displayed to users indicating that the system couldn't proceed the segregation process unless users provide the exact words/phrases that exist in the original Excel file. However, if there are more than one Excel cell contain the same words/phrases, users can choose to enter values for starting cell and ending cell for segregate the Excel file.

For the scenario where users choose to enter values for starting cell and ending cell, the OODA System for Microsoft Excel Files will first determine whether the given pair of starting and ending cell is valid in the Excel source file. If the given pair of starting and ending cell is invalid, an error message will be displayed to users indicating that the segregating process has failed.

The OODA System for the Microsoft Excel Files could segregate an Excel file document up to seven portions and saved each portion with a randomly generated file name (in .xls format). These generated Excel files are stored under the destination path which has been provided by the users.

Table 7.1 describes the validation needed for this system function.

Table 7.1 Validation Involved in System Function – Segregating Microsoft Excel Document

No.	System Field	Validation Process	Correctly Validated	Incorrectly Validated
1.	Excel Source File (original document)	Validate the file extension (*.xls)	Proceed to validation process no.2	Display an error message: Incorrect File format
2.	Destination path	Validate whether the destination path is an existing physical file folder	Proceed to validation process no. 3	Display an error message: Invalid destination path
3.	Part1 – Part7 header	Locate the exact string in every Excel data cell (start from the first data cell until the end data cell)	Proceed to segregation process	Display an error message: Unable to locate the header in the original Excel document
4.	Part1 – Part7 starting and ending cells (if provided)	Validate whether the starting and ending cells are valid data cell in the Excel source file	Proceed to segregation process	Display an error message: Invalidate starting/ending cell

7.3.2 Combining Microsoft Excel Documents

The process of combining the Microsoft Excel documents is another system functionality provided in the OODA System for the Microsoft Excel Files. This function provides an interface for the system users to combine several Microsoft Excel documents (*.xls format) and save the documents under one filename. The users are given two options to combine the Microsoft Excel documents. These two options are vertically combine and horizontally combine.

The OODA System for the Microsoft Excel Files requires inputs of the Microsoft Excel files that need to be combined. In this project, the number of Microsoft Excel files is set to five. This limitation could be increased and reconfigured based on the requirements gathered from the users. Users have to browse and search for the Microsoft Excel files that they wish to combine. Besides that, users could also specify the start cell and end cell to indicate a range of data to be copied and combined with other Excel files. Figure 7.4 shown below displays the user interface for combining Microsoft Excel documents.

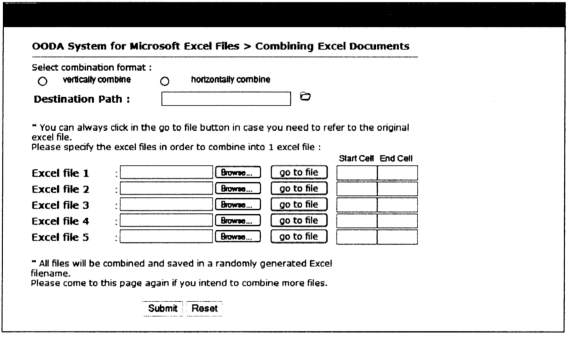

Figure 7.4 Screen for Combining Microsoft Excel Documents

If the vertically combine option is chosen, all the data contained in the Microsoft Excel files will be extracted and combined one after another row of data vertically. Whereas, if the horizontally combine option is chosen, all data will be combined horizontally by placing all data in different columns of the same row.

Table 7.2 Validation Involved in System Function – Combining Microsoft Excel Documents

No.	System Field	Validation Process	Correctly Validated	Incorrectly Validated
1.	Combination format	Check whether the users select at least a combination format: vertically combine or horizontally combine	Proceed to validation process no.2	Display an error message: Please choose an option to combine the Microsoft Excel files
2.	Excel file 1 – Excel file 5	Validate the file extension (*.xls)	Proceed to combining process	Display an error message: Invalid Excel file format
3.	Excel file 1 – Excel file 5 starting and ending cells (if provided)	Validate whether the starting and ending cells are valid data cell in the Excel file	Proceed to combining process	Display an error message: Invalidate starting/ending cell

Table 7.2 explains the validation required for performing the system functionality – combining Microsoft Excel documents. Once the validation processes are completed, all the Excel files would be combined and saved in one file.

7.4 Testing Procedures

While the validation processes involved in determining the right system functionality provided in the OODA System for Microsoft Excel Files are explained in section 7.3, it is important as well to implement a complete system testing. The testing procedures need to be designed and followed in order to verify this project.

First of all, the Tomcat Server application has to be started in order to access to the screens of the OODA System for Microsoft Excel Files. Then, once the Tomcat Server

application is started, a browser needs to be activated and type http://localhost/excel/servlet/svtSeparateExcel at location bar to access the segregating Microsoft Excel document page. The URL for accessing the combining Microsoft Excel documents page is http://localhost/excel/servlet/svtCombineExcel.

After that, users will have to test and try to use the pages to perform either Microsoft Excel file segregation or combining the Excel files provided in this system. Two types of form are used to record the results of the testing process. Figure 7.5 shows the form for recording the testing results for segregating Microsoft Excel document whereas Figure 7.6 shows the form for recording the testing results for combining Microsoft Excel documents. Figure 7.7 shows the form for recording overall comments of the system tester on the OODA System for Microsoft Excel Files. Besides that, any suggestion from the system tester is also recorded in this form. This information is very much valuable when reaching the stage of system improvement and enhancement.

Date: _____

System Functionality: **Segregating Excel document**

Tested by: _____

Job Function / Position: _____

Feature	Expected Result	Comments
Enter the exact words/ phrases found in a data cell of the Excel source file.	The exact words/phrases are found and locate the data cell that contains it	
Enter any words/phrases (words that cannot be found in the Excel source file) as any of the part1-part7 headers.	Display an error message: Can't locate the words, please enter the exact words found in the excel source file	
Enter value for starting cell and ending cell (format: A1)	The range of data specified from the start cell until the end cell is copied and saved in a new Excel file	
Press the submit button	A screen display a success message (Figure 7.5)	
Click on the segregated Microsoft Excel file links	A clear view of each of the Excel files separated according to the given part1-part7 headers or the pairs of starting cell and ending cell (if provided)	

Figure 7.5 The Form for Recording the Testing Result for Segregating Microsoft Excel Files

Date: _____

System Functionality: **Combining Excel documents**

Tested by: _____

Job Function / Position: _____

Feature	Expected Result	Comments
Select the option vertically combine, fill up two or more Excel files and press submit button	All Excel files are combined vertically	
Select the option horizontally combine, fill up two or more Excel files and press submit button	All Excel files are combined horizontally	
Select either the option horizontally or vertically, browse and fill up two or more Excel files and specify the starting cell, ending cell. Press submit button.	All the Excel files are combined properly (based on the range specified by the starting and ending cell)	
Do not select any option and press submit button	Display an error message: Please choose an option to combine all the Excel files	
Click on the combined Microsoft Excel file link	View on the Microsoft Excel file which has combined all the Excel files successfully	

Figure 7.6 The Form for Recording the Testing Result for Combining Microsoft Excel Files

Date: _____

Title: **Overall Comments and Suggestions**

Tested by: _____

Job Function / Position: _____

Feature	Comments

Suggestions: _____

_____

_____

_____

Figure 7.7 The Form for Recording the Comments and Suggestions from System Tester for the OODA System for Microsoft Excel Files

Date: _____

System Functionality: **Combining Excel documents**

Tested by: _____

Job Function / Position: _____

Feature	Expected Result	Comments
Select the option vertically combine, fill up two or more Excel files and press submit button	All Excel files are combined vertically	
Select the option horizontally combine, fill up two or more Excel files and press submit button	All Excel files are combined horizontally	
Select either the option horizontally or vertically, browse and fill up two or more Excel files and specify the starting cell, ending cell. Press submit button.	All the Excel files are combined properly (based on the range specified by the starting and ending cell)	
Do not select any option and press submit button	Display an error message: Please choose an option to combine all the Excel files	
Click on the combined Microsoft Excel file link	View on the Microsoft Excel file which has combined all the Excel files successfully	

Figure 7.6 The Form for Recording the Testing Result for Combining Microsoft Excel Files

Date: _____

Title: **Overall Comments and Suggestions**

Tested by: _____

Job Function / Position: _____

Feature	Comments

Suggestions: _____

Figure 7.7 The Form for Recording the Comments and Suggestions from System Tester for the OODA System for Microsoft Excel Files

All forms (shown in Figures 7.5, 7.6 and 7.7) require the testers to record down their comments / things that happen upon the execution of each feature listed in the forms. It is a good way to collect the feedback from them and a review session has to be carried out for correcting and enhancing the weaknesses of this project.

These forms have been distributed to 14 users and only 10 of them manage to use the OODA System for Microsoft Excel Files and completed the testing forms. All users come from different industries (project contracting, property management, real estate valuation, information technology, business administration and project management). Table 7.3 shows the demography analysis of the participants that have successfully completed testing process.

Table 7.3 Demography Analysis of System Tester

Criteria	Range / Fields	Percentage (%)
Age	<=25 years old	20
	26-35 years old	70
	36-45 years old	10
	46-55 years old	0
	>55 years old	0
Computer usage	<1 year	0
	1-3 years	10
	4-5 years	10
	6-9 years	40
	>10 years	40
Microsoft Excel usage	<1 year	0
	1-3 years	10
	4-5 years	10
	6-9 years	70
	>10 years	10
Nature of works	Building Construction	20
	Property/Real Estate	10
	IT	40
	Business Administration	10
	Audit	10
	Project Management	10

The overall feedback from the testers is very positive and they think that the system could help them to speed up their work in manipulating large volume of Excel files. The details of testing results are presented in Appendix D. Table 7.4, 7.5 and 7.6 show the analysis of testing result.

Table 7.4 Testing Results – Segregating Excel Document

Feature	Expected Result	Result Gathered from 10 users	Discussion based on the result gathered
Enter the exact words/ phrases found in a data cell of the Excel source file.	The exact words/phrases are found and locate the data cell that contains it.	90% of the users feel dissatisfied. 10% of the users feel satisfied.	Most users think that it's hard to memorise the exact words/phrases found in the Excel file. There might be scenario that the same words/phrases appear in more than one Excel data cell.
Enter any words/phrases (words that cannot be found in the Excel source file) as any of the part1-part7 headers.	Display an error message: Can't locate the words, please enter the exact words found in the excel source file.	40% of the users feel dissatisfied. 60% of the users feel satisfied.	4 users feel that the system shall provide a pop-up window to show the worksheets of the Excel file. This might help them to find words/phrases appear in the file.
Enter value for starting cell and ending cell (format: A1)	The range of data specified from the start cell until the end cell is copied and saved in a new Excel file.	70% of the users feel dissatisfied. 30% of the users feel satisfied.	3 users feel that it's not user-friendly to enter values for starting cell and ending cell.
Press the submit button	A screen display a success message (Figure 7.5).	All users feel satisfied.	The success message appears clear to the users.
Click on the segregated Microsoft Excel file links	A clear view of each of the Excel files separated according to the given part1-part7 headers or the pairs of starting cell and ending cell (if provided).	All users feel satisfied.	No broken links.

Table 7.5 Testing Results – Combining Excel Documents

Feature	Expected Result	Result Gathered from 10 users	Discussion based on the result gathered
Select the option vertically combine, fill up two or more Excel files and press submit button	All Excel files are combined vertically	30% of the users feel dissatisfied. 70% of the users feel satisfied.	3 users feel that this system does not provide an easy way to combine more than 5 Excel files at one time.
Select the option horizontally combine, fill up two or more Excel files and press submit button	All Excel files are combined horizontally	30% of the users feel dissatisfied. 70% of the users feel satisfied.	The reason for some users feel dissatisfied is the same as the reason given in above feature.
Select either the option horizontally or vertically, browse and fill up two or more Excel files and specify the starting cell, ending cell. Press submit button.	All the Excel files are combined properly (based on the range specified by the starting and ending cell)	70% of the users feel dissatisfied. 30% of the users feel satisfied.	Most users think that it's hard to memorise and enter the Excel data cell name.
Do not select any option and press submit button	Display an error message: Please choose an option to combine all the Excel files	All users feel satisfied.	This checking step helps the users in remembering to choose a combine option (horizontally combine or vertically combine).
Click on the combined Microsoft Excel file link	View on the Microsoft Excel file which has combined all the Excel files successfully	All users feel satisfied.	No broken links.

Table 7.6 Overall Testing Results

Functionality	Comments & Conclusion Derived from Testing Results
Segregating an Excel Document	Users expect the system to present a pop-up window (display the content of Excel document) instead of just prompting an error message: Can't locate the words, please enter the exact words found in the Excel source file. The pop-up window will help users to search for words that are needed for segregation. Users find it difficult to remember Excel cell name.
Combining Excel Documents	Three users expect that the system will produce a combined Excel document which preserves the formatting / layout design in each Excel document. Users expect every single formatting feature / layout design is preserved in the combined Excel document. Users find it difficult to remember the start cell and end cell in each Excel document that they want to combine.
Overall	Users may wish that the OODA System for Microsoft Excel Files could be extended to support Microsoft Words files as well. Using Microsoft Internet Explorer as the platform of this system creates an easier way for users to use it for their Excel documents manipulation. It is suggested by users that any parts in an Excel document that is combined or segregated should have a comment to indicate the source of where the data is obtained.

At the end of the testing procedures, the OODA System for Microsoft Excel Files will be reviewed. Re-development and re-testing should be carried out until the system met up with the system objectives and the user requirements. This should follow the rules set

by Unified Approach (UA). Figure 7.8 illustrates the system testing procedures for this project.

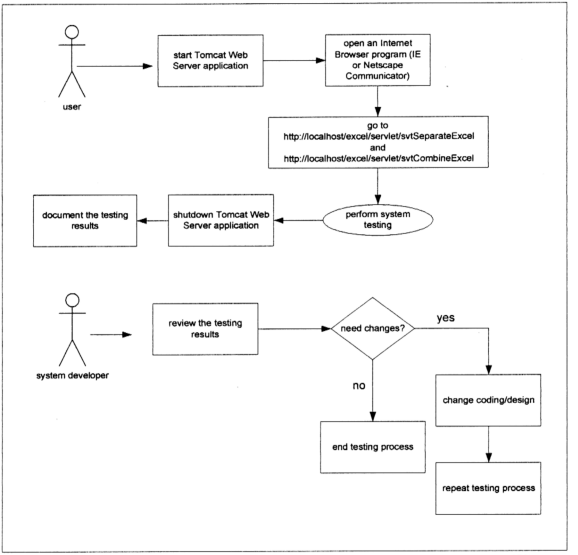

Figure 7.8 Testing Procedures for the OODA System for Microsoft Excel Files

7.5 Summary

As the summary of this chapter, the OODA System for Microsoft Excel Files could now be used and implemented with the minimum level of errors or incorrectness. The system deployment process and the system testing process are an iterative process. Whenever the user requirements change or new feature is added to the system, it has to be deployed and tested again in order to ensure that the system is developed according to its objectives set earlier.