Chapter 7

Evaluation

7.1 Introduction

This chapter will firstly discuss the importance of continuing an evaluation procedure to compare already developed project with the earlier designed project to see whether objectives have been achieved. This measures the percentage of successfulness and completeness of the project development. The evaluation procedure consists of experimental setup, control experiments, selection of participants, obtaining responses and report of evaluation results.

7.2 Experimental Setup

The Experimental setup is to assess all aspects of the project to test whether the objectives of the project were achieved. The first objective of the project as defined in the chapter 1 is to do a detailed study on basic concepts of locating urban public services. This was done from the beginning of the project and the author has gained a large amount of knowledge in the domain area of locating public services. Second objective of the project was to analyze the current approaches to locate urban public services to find out the issues behind them. This objective was achieved during the whole duration of the project to get to know the latest developments in the problem domain and to understand the problem domain clearly and precisely. The next objective of the project which is to make a comparison between various techniques of structural programming and Artificial Intelligence (AI) techniques were achieved during the course work of the project. As a result, the author was able to find multi agent technology as the suitable technology to solve the problem of the project. The next objective was to build a hypothesis to solve the problem using the selected technology. This was achieved by proposing a multi agent based solution to the problem of maintaining dependencies and complex interactions between public service agents when locating these public services in the city environment. Then the author achieved the next objective of the project by designing the proposed solution as a top level architecture diagram. Thereafter, the author has implemented the models that were identified during the design using java and the agent framework. The next objective of the project was to test the system for valid and invalid parameters. This was through the prototype evaluation and the results got from these tests were compared with each other. The prototype, problem and the solution were

evaluated after gathering user feedbacks through questionnaires (Appendix C). The question number 5, 6, 7 in evaluation questionnaire (Appendix C) covered the problem, question numbers 8,9 covered the technology, question numbers 10,11 covered the proposed solution, question numbers 12,13 covered the design and question numbers in 14,15 covered the implementation area. Finally, the project was documented by completing the final objective that needs to be achieved.

The implementation was evaluated through the prototype evaluation. This was to ascertain the concurrence of the users for the features developed. The prototype was evaluated by giving the user to build a city environment on the prototype and through the control experiments, user can create a public service agent in virtual environment and may observe the interactions between the public service agents. The user responses were gathered through questionnaires (Appendix C) to indicate the successfulness and completeness of the prototype. Here, the main focus was given to evaluate whether the development served all the requirements defined in the problem.

7.3 Selection of Participants

Before starting the evaluation, the evaluators of the project were to be identified. The project was evaluated to see whether it covered the domain specific knowledge, technical aspects and general procedure. Hence, target evaluators are chosen randomly among technical expertise, domain specific expertise and general users. The evaluators are listed as follows.

Domain specific users

- Civil Engineers/Architects/City Planners/Surveyors
- Professionals from Road Development Authority
- Civil Engineering / Architecture /Transportation planning students

Technical users

- Academic professionals
- Software Engineers/Programmers/Systems Analysts
- Computing/IT students

General users

- Software Users
- Government bodies
- City rulers
- General Public

7.4 Obtaining Responses

After the evaluation, the user responses are analyzed to identify deficiencies pertaining to the problem, technology, proposed solution, design and implementation evaluation.

- Problem Evaluation

  During the problem evaluation, most of the evaluators appreciated the selection of this sort of problem.

- Technology Evaluation

  Most of the users have shown positive response during technology evaluation of the project.

- Proposed Solution Evaluation

  Some of the evaluators have proposed to add different types of public services to the solution and requested to add more features to the solution such as a printable paper output.

- Design Evaluation

  Average amount of positive responses were received about the design part of the project.

- Implementation Evaluation

  Some of the evaluators proposed to add scaling, zooming options for the GUI module to adjust the virtual environment.

7.5 Test Results

The results obtained though the evaluation of problem, technology, proposed solution, design and implementation were illustrated as in the Appendix D and to ease the analysis of the Test Results, the above are shown in Table 7.2 here. Here the results are converted into statistical figures by assigning values behalf of the options selected by the participants when answering for the questionnaire (Appendix C). The standard values assigned for the user options are as per Table 7.1.

Response	Value Assigned
No	1
Yes	2
Not a Good Idea	1
Good	2
Satisfactory	3
Excelllent	4
Average	1
Moderate	2
High	3

Table 7.1: Standard Values Assigned

The table of test results after converting is shown in Table 7.2.

Problem no	**Participant1**	**Participant2**	**Participant3**	**Participant4**	**Participant5**	**Participant6**	**Participant7**	**Participant8**	**Participant9**	**Participant10**
5	2	2	2	1	2	1	2	2	2	1
6	2	3	2	1	1	3	3	1	1	1
7	2	2	2	1	2	2	2	2	1	1
8	1	1	1	1	1	2	1	2	2	2
9	3	2	2	3	3	2	3	1	2	2
10	2	1	2	2	2	1	1	2	1	1
11	2	1	1	2	2	2	2	2	2	1
12	3	2	3	3	2	2	2	2	2	3
13	2	1	2	2	2	2	2	2	2	1
14	1	1	1	1	1	1	2	2	2	1
15	2	1	1	1	2	2	2	1	1	2
16	2	2	2	2	2	1	1	2	2	2
18	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2

Table 7.2: Statistics of evaluation results

The Problems in the Table 7.2 are summarized in Table 7.3 for easy reference. For full description please refer Appendix D.

Problem No	Brief Description
5	Need for the software
6	Overall understanding of the problem
7	Worthwhileness of addressing the problem
8	Familiarity with the Multi Agent Technology
9	Suitability of using Multi Agent Technology
10	Overall understanding of the proposed solution
11	Whether the solution is Ideal
12	Opinion on the overall design
13	Coverage of overall features by top level design
14	Level of customizability and flexibility
15	Accurateness of the prototype output
16	Appeal of concept behind the project
18	Complexity of the proposed solution

Table 7.3: Summarized Problem descriptions

The table of statistics in Table 7.2 is then further categorized according to problem, technology, proposed solution, design and implementation. The summarize table of data is shown in Table 7.4. Here, the compound responses are shown as a fraction of maximum possible values of the responses for each category of problems.

Category	**Participant1**	**Participant2**	**Participant3**	**Participant4**	**Participant5**	**Participant6**	**Participant7**	**Participant8**	**Participant9**	**Participant10**
Problem	6/7	7/7	6/7	3/7	5/7	6/7	7/7	5/7	4/7	3/7
Technology	4/7	3/7	3/7	4/7	4/7	4/7	4/7	3/7	4/7	4/7
Solution	4/5	2/5	3/5	4/5	4/5	3/5	3/5	4/5	3/5	2/5
Design	5/8	3/8	5/8	5/8	4/8	4/8	4/8	4/8	4/8	4/8
Implementation	3/6	2/6	2/6	2/6	3/6	3/6	4/6	3/6	3/6	3/6

Table 7.4: Summarized test results

The results are further averaged across participants and shown in Table 7.5.

Category	**Percentage Affirmation**	
	Fraction	**percentage**
Problem	52/70	74.2
Technology	37/70	52.8
Solution	32/50	64.0
Design	42/80	52.5
Implementation	28/60	46.7

Table 7.5: Summarized test results averaged

According to Table 7.5, a percentage of 74.2% of the participants were in affirmative about the goodness of the need, understanding and worthiness of the problem. Hence, this shows that the problem identification and handling of it is worthwhile.

A percentage of 52.8% of the participants were in affirmative about the suitability of the technology to address the problem. Hence this shows that the technology chosen is suitable.

In the case of Solution category, a percentage of 64% have said yes. Hence this shows that Suitability and Appropriateness of the solution chosen is approved by the participants.

For the Design category 52.5% of the participants have voted. Thus coverage of design over all the features of the solution had been found as satisfactory by the participants.

A percentage of 46.7% of the participants are happy about the implementation. This shows that Accurateness and the reflection of the output in implementation is fair.

7.6 Summary

The evaluation chapter started with a discussion to check whether the objectives of the project have been achieved. How the evaluation procedures were preceded with experimental setup, control experiments, selection of participants and obtaining responses were discussed.