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A PATH FOR HORIZING YOUR INNOVATIVE WORK

THE SELECTION OF BEST SOFTWARE TESTING TECHNIQUE

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Abstract: The problem of identifying the set of test cases to test the software is the big issue in software testing. Even though there are many number of testing techniques are available for generating the test cases, the testers will having the difficulty about it. The testers should give the assurance to software with high quality with the least number of test cases. Software Quality Assurance team have some little information about the available techniques. This lack of information will lead to make a decision that on which testing technique to be followed. The classification scheme will help the testers to make the decisions on which testing technique to be selected rather than the basic knowledge and their experience. In this paper, the technique about how to select the good testing technique is proposed.

Keywords: Software Quality, Software Testing, Test Cases.

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INTRODUCTION

1. Problem of selecting software testing technique

Sometimes testing process exceeding 50% of total development cost [7]. Software companies losses some amount of cost from defective software each year [3]. The testing cost is based on the number of test cases used. If we test the software with all possible input values and test cases generated, the cost spending for testing will be increased. Therefore, the test should be run on small set of test cases, that should be carefully chosen from the all system inputs. The testing or evaluation is highly important process, hence it is ensure the quality of the software [5]. Testing techniques are used to find the suitable test cases. There are lot of testing techniques are available. So we should able to differentiate them. So to evaluate the system, the best suitable technique should be selected [3].

2. Existing System

Hence the testers are facing the question of which are the best suitable testing technique to test the system. The reasons for testers getting confusion to select the testing technique are, the information available about the techniques is usually distributed across different sources of information and the developers do not have much more idea about the testing techniques. They have no access to pragmatic information regarding the testing techniques. The Developers do not sharing the knowledge of testing technique with others. So solving this problem can help the testers to choose the best testing technique. The proposed work or solution is called as classification scheme. This classification scheme is used to identify the selection criteria, but provide the infrastructure to store the information identified for each technique. The classification scheme is used to describe the properties of all the testing techniques.

3. Related works

In this testing area, the classification of testing technique has been studied. Many research have been made to classify the different testing techniques. The classification scheme is used for selecting the best suited software testing technique. Prieto et al and kontio et al [9] have proposed the classification of testing schemes. Basili et al [1] proposed the technique for classifying the software element types. Henninger [6] made a aresearch on, to capture the knowledge of software programmers. Birk et al [4] proposes a general classification scheme for software testing techniques. It is not used for selecting the testing technique but used to specify the characteristics. Maiden [10] proposed a research for selecting the requirements for testing techniques.

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4. Developing the classification scheme for testing technique

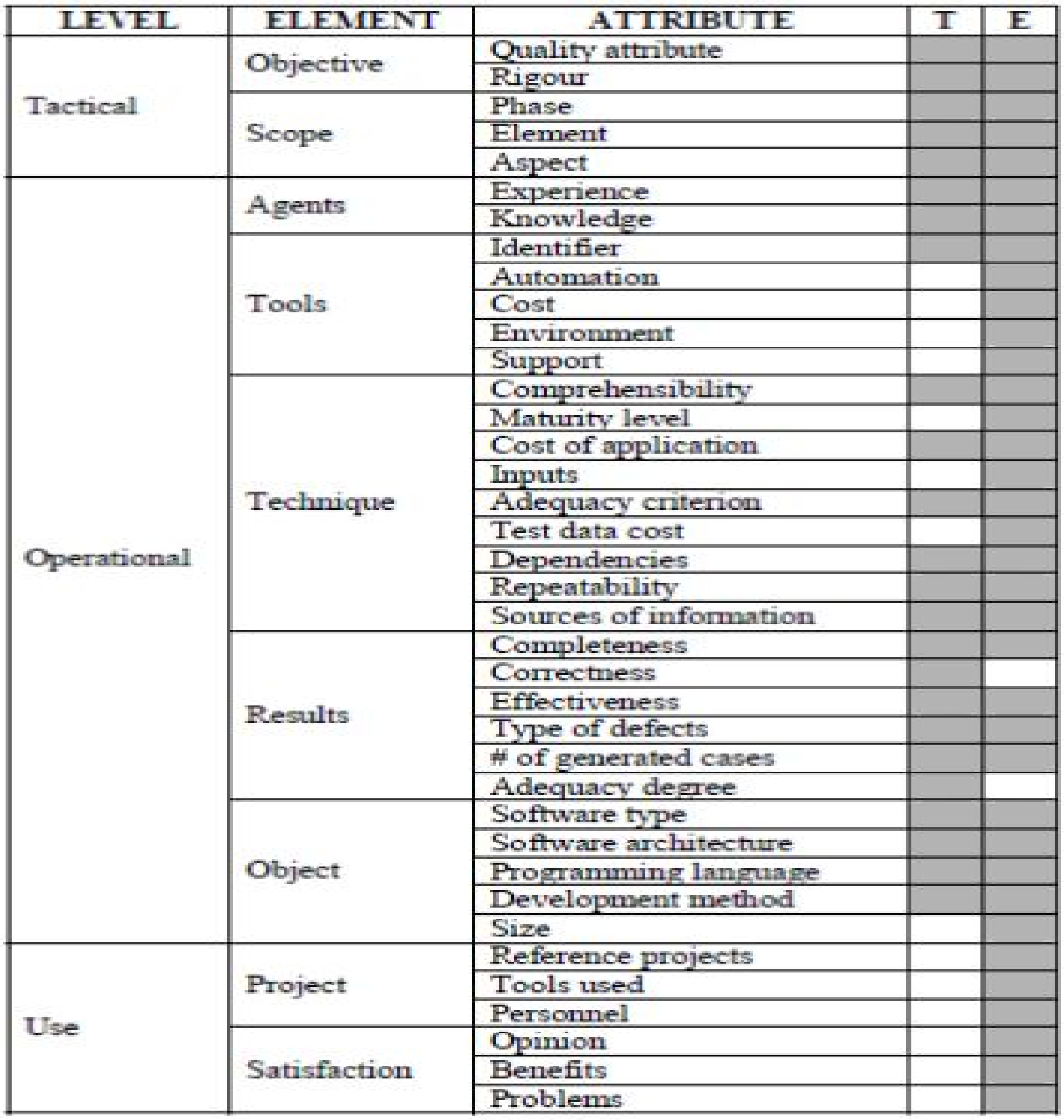
From the information obtained, we could decide that which testing technique should be used. But based on the theoretical information collected only, we can not decide the selection process. So following steps should be followed. First, the process of developing the scheme, second, that scheme should be validated, third, the testing experts should inspect that scheme.

First Step: Theoretical Scheme

The first step is building the classification scheme which is used to generate the scheme. So we compiled and analyzed the different testing techniques to find the difference between them. To improve the information of this scheme, we classify the information according to the different level of testing process. There are two important steps during the software system testing process should be followed. First, identification of software system quality attributes or metrics. Second, identify the performance of each test which involves generating, executing and analyzing the test cases. The first step is processed by SQA team and followed the second step is processed by testing team.

Based on the testing process, the classification scheme contains two levels namely tactical level and operational level. In tactical level, the selection of testing technique is based on test cases. The test cases are used to evaluate and ensure the security, reliability and algorithm efficiency. So in this level we decide which test cases can be used and the test cases are determined by purpose or objective of the test and scope of the test. In the operational level, based on the knowledge and experience level we can decide which test cases can be used and which testing technique or tools are suitable. It is used to relate the conditions of testing technique cooperativeness. It describes the information about the testing technique. The theoretical scheme is shown in Table:1, column labeled T.

Table 1. Synthesized scheme



LEVEL	ELEMENT	ATTRIBUTE	T	E
Tactical	Objective	Quality attribute	▨	▨
		Rigour	▨	▨
	Scope	Phase	▨	▨
		Element	▨	▨
		Aspect	▨	▨
Operational	Agents	Experience	▨	▨
		Knowledge	▨	▨
	Tools	Identifier	▨	▨
		Automation		▨
		Cost		▨
		Environment		▨
		Support		▨
	Technique	Comprehensibility	▨	▨
		Maturity level		▨
		Cost of application	▨	▨
		Inputs		▨
		Adequacy criterion	▨	▨
		Test data cost		▨
		Dependencies	▨	▨
		Repeatability	▨	▨
		Sources of information	▨	▨
	Results	Completeness	▨	▨
		Correctness	▨	
		Effectiveness	▨	▨
		Type of defects	▨	▨
		# of generated cases	▨	▨
		Adequacy degree	▨	
	Object	Software type	▨	▨
		Software architecture	▨	▨
		Programming language	▨	▨
		Development method	▨	▨
		Size	▨	▨
Use	Project	Reference projects		▨
		Tools used		▨
		Personnel		▨
	Satisfaction	Opinion		▨
		Benefits		▨
		Problems		▨

Second step: Empirical scheme

Based on the opinion of researchers and testers, who use the scheme, they fully describing the properties for selecting the testing technique. The researchers and testers are collecting and gathering the information. The important query is how to decide when to stop gathering information. So at the same time of information gathering, the scheme is analyzed. Table 1,

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column labeled E, shows the contents of the empirical scheme. This empirical scheme is used to provide some information that did not appear in theoretical scheme. Because the practitioners are well expert than theoreticians.

The use level is used to specify the subjects earlier experience of technique use. It has two elements namely project and satisfaction. The project specifies the information regarding earlier projects in which the technique was used. The satisfaction specifies that what opinion the technique merits among people.

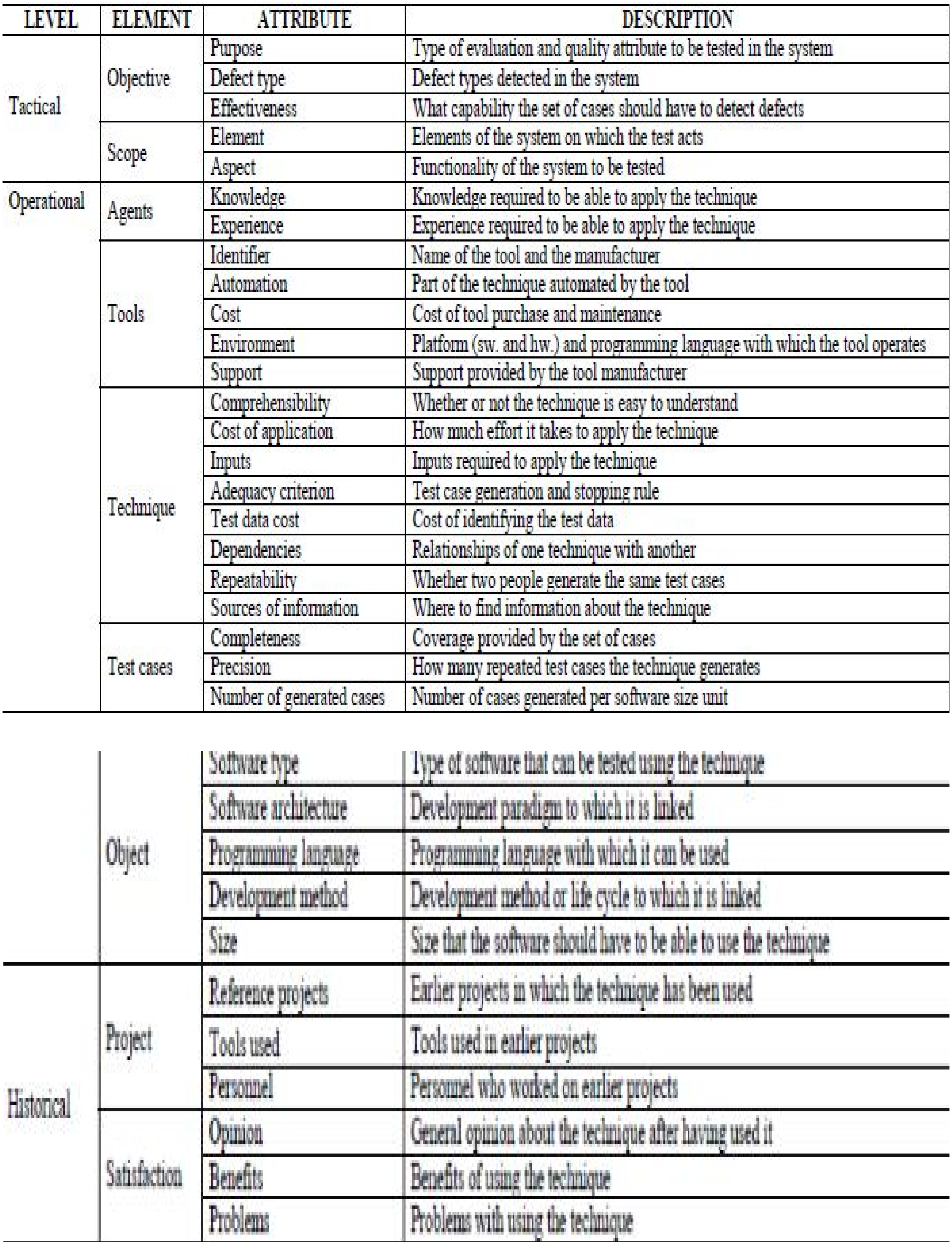
Third step: Basic Scheme

The goal is to create the single scheme that integrates the theoretical and empirical schemes. The rules followed are: 1) The levels and elements of the synthesized scheme will be the union of the levels and elements of the original two schemes. 2) Any attributes that appear in just one of the characterization scheme will appear unchanged in the synthesized scheme. 3) Any attributes that appear in both schemes and are equal1 will appear unchanged in the synthesized scheme. 4) Any attributes that appear in the two schemes and are similar will be studied to decide whether they are used to generate one or several attributes. 5) In no case will information be deleted from the characterization scheme.

Table 1 shows the synthesis that is the combination of specifying the source of each scheme attribute. T indicates the attributes of theoretical scheme. E indicates the attributes of empirical scheme. 14 of the attributes present in the preliminary scheme did not appear in the theoretical scheme. 2 of the attributes present in the preliminary scheme did not appear in the empirical scheme. 58% of attributes of the preliminary scheme are common to original two schemes. In 42%, theoretical scheme has 5% and empirical scheme has 37%. So empirical scheme is the best opinion of 16 individuals. The major omissions of theoretical scheme are use level and tool element. The minor omissions are technique element. The empirical scheme has two omissions in result element.

Fourth step: Expert Review Scheme

Table 2. Final Scheme



LEVEL	ELEMENT	ATTRIBUTE	DESCRIPTION
Tactical	Objective	Purpose	Type of evaluation and quality attribute to be tested in the system
		Defect type	Defect types detected in the system
		Effectiveness	What capability the set of cases should have to detect defects
	Scope	Element	Elements of the system on which the test acts
		Aspect	Functionality of the system to be tested
Operational	Agents	Knowledge	Knowledge required to be able to apply the technique
		Experience	Experience required to be able to apply the technique
	Tools	Identifier	Name of the tool and the manufacturer
		Automation	Part of the technique automated by the tool
		Cost	Cost of tool purchase and maintenance
		Environment	Platform (sw. and hw.) and programming language with which the tool operates
		Support	Support provided by the tool manufacturer
	Technique	Comprehensibility	Whether or not the technique is easy to understand
		Cost of application	How much effort it takes to apply the technique
		Inputs	Inputs required to apply the technique
		Adequacy criterion	Test case generation and stopping rule
		Test data cost	Cost of identifying the test data
		Dependencies	Relationships of one technique with another
		Repeatability	Whether two people generate the same test cases
		Sources of information	Where to find information about the technique
	Test cases	Completeness	Coverage provided by the set of cases
		Precision	How many repeated test cases the technique generates
		Number of generated cases	Number of cases generated per software size unit
	Object	Software type	Type of software that can be tested using the technique
		Software architecture	Development paradigm to which it is linked
		Programming language	Programming language with which it can be used
		Development method	Development method or life cycle to which it is linked
		Size	Size that the software should have to be able to use the technique
Historical	Project	Reference projects	Earlier projects in which the technique has been used
		Tools used	Tools used in earlier projects
		Personnel	Personnel who worked on earlier projects
	Satisfaction	Opinion	General opinion about the technique after having used it
		Benefits	Benefits of using the technique
		Problems	Problems with using the technique

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After synthesizing the scheme, it was taken along with questions to the experts for their opinions and judgments. The opinion on contents includes issuing the judgments about the existence of possible redundancies and missed data. The rules followed to decide whether or not to accept the expert suggestions are: 1) If the experts disagree, the majority view will be respected. 2) If more than one expert recommends a given change, the recommendation will be taken into account. 3) If only one expert recommends a change, this change will be accepted provided the proposed change is not due to a misinterpretation of the scheme, its logic or its content.

Table 2 shows the results of expert peer review. The changes are made based on the expert's suggestions are given below. 1)Five attributes have been deleted: three from the tactical level (quality attribute, rigour and phase) and two from the operational level (maturity level and adequacy degree), since the experts found they were redundant. 2) The correctness attribute of the operational level was replaced by another named precision , which was more meaningful according to the experts. 3) Two attributes were moved from the operational level to the tactical level (effectiveness and defect type), since, according to the experts, these attributes refer to information that should be known as soon as possible in the selection process. 4) A new attribute, termed purpose, was created and placed in the tactical level, since the experts agreed that this information was necessary, and missing from the scheme. 5) The results element was renamed as test cases, which, according to the experts was more meaningful. 6) The use level was renamed as historical level, again, with the aim of making it more meaningful.

1. Selecting the testing technique from proposed scheme

The producers and consumers are using the repository directly. The producer provides the new information to the repository. The consumer will be able to select the testing technique. The repository provides the information about the set of testing techniques. Two concepts need to be introduced to be able to explain this process: Bounded variables are schema attributes whose value is imposed by the project and cannot be changed during selection. For example, the project development method, the type of software under development, etc. Free variables are schema attributes whose value can be changed depending on the current selection needs and/or preferences. For example, the characteristics of the people who are to apply the testing techniques or the tools to be used are not necessarily pre-established by the project in question.

The steps for scheme use by consumers for selection purposes are: 1) Determination of bounded variables. Identify the desired technique values for the attributes that belong to the

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tactical level and the object element of the schema. Also, identify whether there are other attributes that could impose any sort of constraint on the technique to be chosen (for example, whether given personnel should be used). 2) Pre selection of an initial set of techniques .Compare the desired values of the attributes with the values of each technique the repository contains. Preselect the techniques whose values match the specified values.

3) If the set of preselected techniques is empty, relax one of the constraints and return to step 3. 4) Examine the remaining attribute values of the preselected techniques, paying special attention to the dependencies attribute.

2. CONCLUSION

The validation of this proposed solution is done by heuristic evaluation and experimental evaluation. The validation is done by using functional, control-flow, data-flow and mutation techniques. Thus the process of selecting the suitable testing technique was implemented by this work.

3. ACKNOWLEDGMENT

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