

**IMPACT FACTORS OF SOFTWARE TEST
GOVERNANCE IN SRI LANKAN IT INDUSTRY**

Madivilage Thivanka Chathurangi Jayasiri

(189109M)

Degree of Master of Business Administration in Information Technology

Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

June 2021

IMPACT FACTORS OF SOFTWARE TEST GOVERNANCE IN SRI LANKAN IT INDUSTRY

Madivilage Thivanka Chathurangi Jayasiri

(189109M)

The dissertation was submitted to the Department of Computer Science and Engineering of the University of Moratuwa in partial fulfilment of the requirement for the Degree of Master of Business Administration in Information Technology.

Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

June 2021

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis/dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

UOM Verified Signature

M.T.C. Jayasiri
(Candidate)

2021-06-17
.....

Date

The above candidate has carried out research for the Masters thesis under my supervision.

.....
Dr. Dulani Meedeniya
(Supervisor)

2021-06-17
.....
Date:

COPYRIGHT STATEMENT

I hereby grant the University of Moratuwa the right to archive and to make available my thesis or dissertation in whole or part in the University Libraries in all forms of media, subject to the provisions of the current copyright act of Sri Lanka. I retain all proprietary rights, such as patent rights. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

UOM Verified Signature

M. T. C. Jayasiri

2021-06-17

Date

ABSTRACT

In software development, software testing is one of the most important mechanisms for delivering high-quality products. It has been widely used in the software development industry over the last decade, as most software organizations have recognized the importance of testing. However, in most companies testing procedures are not standardized or aligned with their business strategies. Therefore, it is vital to properly govern the software testing processes as it affects the quality of product delivery and, as a result, customer satisfaction.

Software test governance is about establishing rules and processes that organizations should follow, which helps to execute testing activities easier and effectively. It aligns software testing with business goals and objectives and enables the decision-making of the management. Implementation of test governance provides an explicit way of managing the individuals, procedures, and technology involve in the software testing process.

This study aims to identify factors that influence software test governance. To achieve the objective of the study, a broad literature review and preliminary interviews with senior testing professionals were conducted and identified five different factors namely implementation of a clear test policy, defining explicit test strategies in organization-wide and specific program-wide, the establishment of a distinct testing unit, implementation of test training and mentoring programs, and, implementation of software test process auditing and reviews. A conceptual model was developed using identified variables and five hypotheses were built based on the conceptual model. An online survey was distributed among software test practitioners to gather sample data to test the formulated hypotheses which enable to prove whether there are associations between the identified variables and test governance. Statistical analysis was performed for the evaluation. The research findings reveal all these factors have strong relationships with software test governance. When considering the five identified influences, implementation of test process auditing and reviews has the comparatively highest influence, whereas creating a separate unit of test organization has the comparatively lowest influence.

Keywords: Test governance, test policy, test strategy

ACKNOWLEDGMENT

First and foremost, I wish to take this opportunity to thank my supervisor Dr Dulani Meedeniya, Senior Lecturer of the Department of Computer Science and Engineering, University of Moratuwa, for the continuous support, encouragement, and for guiding me in the right direction throughout the research to make it a success.

Further, I would like to thank our project coordinator Dr Kutila Gunasekara for the support and guidance during this research.

Also, I wish to thank everyone who participated in the survey willingly and allocated their valuable time and gave me their valuable insights. Without their input, the survey could not have been successfully conducted.

I also wish to convey my special gratitude to my family for all the support and courage. Finally, I wish to convey my heartfelt thanks to all those who helped me in many ways to make this study successful.

TABLE OF CONTENT

DECLARATION	i
COPYRIGHT STATEMENT	ii
ABSTRACT	iii
ACKNOWLEDGMENT	iv
TABLE OF CONTENT	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xii
1. INTRODUCTION	1
1.1 Background	1
1.2 Motivation	2
1.3 Research Scope.....	3
1.4 Problem Statement	3
1.5 Research Objectives	4
1.6 Research Significance	4
1.7 Conclusion.....	4
2. LITERATURE REVIEW.....	5
2.1 Concept of Governance	5
2.1.1 Types of governance in the software industry	6
2.2 Software Testing Approaches.....	7
2.3 Test Governance	7
2.4 Why is Test Governance needed?	8
2.5 Test Governance Frameworks	8
2.6 Discussion	11
2.6.1 Existing software testing practices	11
2.6.2 Summary of software testing practices	13
2.6.3 Models of test governance structure	13
2.6.4 Summary of elements in software test governance	14
2.7 Factors Influence Software Test Governance.....	15
2.7.1 Test goals / test mission	15
2.7.2 Test policy.....	15

2.7.3 Test strategy/test methodology	16
2.7.4 Test organization.....	17
2.7.5 Test training/test mentoring	18
2.7.6 Testing practices audit process / advanced reviews.....	18
2.7.7 Test management process	19
2.7.8 Test measurement/test metrics	20
2.8 Conclusion.....	20
3. RESEARCH METHODOLOGY	21
3.1 Chapter Introduction.....	21
3.2 Research Approach.....	21
3.3 Data Collection Methods.....	22
3.4 Sample Design.....	23
3.4.1 Population	23
3.4.2 Sample size	24
3.4.3 Research instruments	24
3.5 Conceptual Diagram.....	25
3.5.1 Conducting a preliminary study.....	25
3.5.2 Conceptual model	25
3.5.3 Selection of independent variables	26
3.6 Hypotheses Development.....	29
3.7 Pilot Survey	30
3.7.1 Reliability analysis.....	30
3.8 Questionnaire.....	31
3.9 Conclusion.....	34
4. DATA ANALYSIS	35
4.1 Chapter Introduction.....	35
4.2 Data Collection.....	35
4.3 Descriptive Analysis.....	36
4.3.1 Sample data categorization based on the job role in the software industry.....	36
4.3.2 Sample data categorization based on the years of experience in the software industry.....	36
4.3.3 Sample data classification based on the organization category	37
4.3.4 Sample data classification based on the organization size	38

4.3.5	Frequency analysis of Likert-scale values of the online survey	39
4.4	Reliability Analysis	42
4.4.1	Cronbach’s alpha value for independent variable – Implementation of a clear test policy	42
4.4.2	Cronbach’s alpha value for independent variable – Deployment of explicit test strategy	42
4.4.3	Cronbach’s alpha value for independent variable - Test organization	43
4.4.4	Cronbach’s alpha value for independent variable – Implementation of test training and mentoring program	43
4.4.5	Cronbach’s alpha value for independent variable – Implementation of test process auditing	43
4.4.6	Cronbach’s alpha value for dependent variable – Software test governance	44
4.5	Inferential Statistics	44
4.5.1	Pearson’s Correlation Analysis.....	44
4.5.2	Hypotheses testing	46
4.6	Regression Analysis	50
4.6.1	Regression analysis – Implementation of a clear test policy and successful software test governance.....	50
4.6.2	Regression analysis – Defining explicit test strategy and successful software test governance.....	52
4.6.3	Regression analysis – Test organization and successful software test governance	54
4.6.4	Regression analysis – Implementation of test training and mentoring program and successful software test governance	55
4.6.5	Regression analysis – Implementation of test process auditing and successful software test governance	57
4.7	Summary	58
5.	CONCLUSION AND RECOMMENDATION.....	59
5.1	Chapter Introduction.....	59
5.2	Data Interpretation.....	59
5.2.1	Reliability of data.....	59
5.2.2	Demographic analysis of sample data	59
5.2.3	Research outcome	60
5.2.4	Correlation between independent variables and dependent variable.....	61

5.3 Recommendations	63
5.4 Limitations.....	65
5.5 Future Research Directions	66
5.6 Conclusion.....	66
REFERENCES.....	67
APPENDIX A – PRELIMINARY INTERVIEW QUESTIONS	71
APPENDIX B – FINAL SURVEY	73
APPENDIX C – FINAL SURVEY RESULT SUMMARY	84
APPENDIX D – COMPANY LIST.....	97

LIST OF TABLES

Table 1: Test governance framework roles and responsibilities.....	9
Table 2: Test governance roles in different organization levels	10
Table 3: Test governance impact	10
Table 4: TMMi maturity model	11
Table 5: Discussion of existing literature.....	11
Table 6: Main areas identified from existing literature.....	13
Table 7: Theoretical model	14
Table 8: Summary of factors.....	14
Table 9: Software companies used for the preliminary study.....	25
Table 10: Scores for responses.....	31
Table 11: Summary of Questionnaire	31
Table 12: Distribution of sample data set – Years of Experience.....	37
Table 13: Distribution of sample data set – Organization Category	37
Table 14: Distribution of sample data set – Organization Size.....	38
Table 15: Summary of Reliability Analysis.....	44
Table 16: Interpretation of Correlation Coefficient	45
Table 17: Correlation Analysis	46
Table 18: Summary of the correlations between dependent and independent variables	50

LIST OF FIGURES

Figure 1: Research Methodology	22
Figure 2: ICT Workforce	23
Figure 3: SQA Workforce.....	23
Figure 4: Calculation of sample size.....	24
Figure 5: Conceptual Model.....	26
Figure 6: Illustration of the number of responses over time	35
Figure 7: Sample data classification based on job role	36
Figure 8: Sample data classification based on years of experience	37
Figure 9: Sample data classification based on organization category.....	38
Figure 10: Sample data distribution based on the size of the organization.....	38
Figure 11: Use of test policy in software organizations.....	39
Figure 12: Use of organization-wide test strategy	40
Figure 13: Use of program-wide test strategy.....	40
Figure 14: Existence of distinct test unit.....	41
Figure 15: Existence of Test training programs based on the responses	41
Figure 16: Existence of test audits	42
Figure 17: Cronbach's alpha - test policy implementation	42
Figure 18: Cronbach's alpha - deployment of explicit test strategy	42
Figure 19: Cronbach's alpha - establishing distinct testing unit.....	43
Figure 20: Cronbach's alpha - implementation of test training and mentoring program	43
Figure 21: Cronbach's alpha - implementation of test process auditing.....	43
Figure 22: Cronbach's alpha - software test governance	44
Figure 23: Correlation Analysis– Explicit test policy implementation and software test governance.....	47
Figure 24: Correlation Analysis– Explicit test strategy implementation and software test governance.....	48
Figure 25: Correlation Analysis– Test organization and software test governance... 48	
Figure 26: Correlation Analysis– Test training and mentoring program implementation and software test governance	49
Figure 27: Correlation Analysis– Test process audit implementation and software test governance	49
Figure 28: Scatter plot – Clear test policy implementation and test governance.....	51
Figure 29: Regression model summary – Test policy implementation.....	51
Figure 30: ANOVA - Test policy implementation	52
Figure 31: Coefficients – Test policy implementation.....	52
Figure 32: Scatter plot – Explicit test strategy deployment	52
Figure 33: Regression model summary – Explicit test strategy implementation.....	53
Figure 34: ANOVA –Explicit test strategy implementation.....	53
Figure 35: Coefficients – Explicit test strategy implementation.....	53
Figure 36: Scatter plot - Test Organization.....	54

Figure 37: Regression model summary – Test organization.....	54
Figure 38: ANOVA – Test organization.....	55
Figure 39: Coefficients – Test organization.....	55
Figure 40: Scatter plot – Test training and mentoring program implementation.....	55
Figure 41: Regression model summary – Test training and mentoring program implementation.....	56
Figure 42: ANOVA – Test training and mentoring program implementation.....	56
Figure 43: Coefficients – Test training and mentoring programs implementation....	56
Figure 44: Scatter plot – Test audit implementation.....	57
Figure 45: Regression model summary – Test process audit implementation.....	57
Figure 46: ANOVA – Test process audit implementation.....	58
Figure 47: Coefficients – Test process audit implementation.....	58
Figure 48: Levels of Correlations of Hypotheses	60

LIST OF ABBREVIATIONS

IT	-	Information Technology
QA	-	Quality Assurance
ISTQB	-	International Software Testing and Quality Board
SDLC	-	Software Development Life Cycle
TMMi	-	Test Maturity Model Integration
CMMI	-	Capability Maturity Model Integration
ANOVA	-	Analysis of Variance
ICTA	-	Information and Communication Technology Agency