

**A STUDY ON FACTORS ENDEMIC TO SOFTWARE
PROJECT LIFECYCLE MANAGEMENT
IN SRILANKA**

Warnapriya Wijesundara

119075M



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

Degree of
Master of Business Administration

Department of Computer Science and Engineering

University of Moratuwa
Sri Lanka
2013

**A STUDY ON FACTORS ENDEMIC TO SOFTWARE
PROJECT LIFECYCLE MANAGEMENT
IN SRILANKA**

Warnapriya Wijesundara

119075M



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

Thesis submitted in partial fulfillment of the requirements for the degree
Master of Business Administration in Information Technology

Department of Computer Science and Engineering

University of Moratuwa
Sri Lanka

2013

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 partion future works (such as articles or books).

Signature:

Date:



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

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

Signature of the supervisor:

Date

ABSTRACT

In the software industry, the project manager faces a challenge to control the software development life cycle (SDLC) while looking into project management activities, which implies that the management of the project life cycle needs close attention. If project managers can identify the important factors that have a serious impact on the Sri Lankan software industry, it will be very helpful in managing the SDLC. Main research problem is “how the software development life cycle can be managed while considering the endemic factors specific to the Sri Lankan software context.”

There are different kinds of software development life cycle models being used in the Sri Lankan software industry. Due to the number of models it is difficult to directly identify the endemic factors for management effectiveness in the models. Therefore, the approach the research has taken is to develop a common framework encompassing all the SDLC models to manage the endemic factors in the Sri Lankan software industry. This common framework is identified from the literature survey and a preliminary survey.



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations

www.lib.mrt.ac.lk

Based on the initial preliminary survey and literature survey, this research identifies the most important categories related to the SDLC management, such as consideration of the suitable life cycle, consideration of IT project factors, applicability of organizational context and customer satisfaction. Based on these categories the research focused on identifying the endemic factors related to the Sri Lankan software industry. Accordingly, the theoretical framework was built considering the main factors related to the SDLC. Based on the survey, the research identifies the factors which have an impact on the effectiveness of the SDLC management. Then the analysis phase filters out the endemic factors via statistical tests. Finally, this research proposes a software development lifecycle management framework based on the endemic factors specific to the Sri Lankan software industry. Based on this framework, project managers can consider the important factors related to managing the SDLC on endemic factors. In the future, researchers can consider related elements of endemic factors such as quality comparison.

ACKNOWLEDGEMENT

I would like to acknowledge the valuable comments and viewpoints expressed by the following persons.

Dr. Shantha Fernando, the supervisor of this project for the great support by giving advice, comments and courage throughout the research.

Dr. Chandana Gamage, the head of Computer Science and Engineering, who provided advice, especially by evaluating the project over and over again and at the progress, reviews presentations.

Tilina of University of Moratuwa too helped me greatly. Special thanks to Greshani and Koshi for assisting to review and prepare the documentation.

Special thanks to the support of data collection time who contributed to my survey by submitting their responses on, and all the project managers and team leaders for giving help to establish contacts to do the survey. Finally, all my friends, family and colleagues for giving me support to make my project a success.



University of Moratuwa, Sri Lanka
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

TABLE OF CONTENTS

| | | |
|----------|---|----------|
| 1 | CHAPTER: INTRODUCTION | 1 |
| 1.1 | Background | 1 |
| 1.1.1 | Endemic factors in SDLC | 1 |
| 1.1.2 | Defining endemic factors based on research..... | 2 |
| 1.2 | Problem Statement | 2 |
| 1.3 | Research Objectives | 3 |
| 1.4 | Scope of the Research | 4 |
| 1.5 | Summary | 5 |
| 1.6 | Guide to the Report..... | 7 |
| 2 | CHAPTER: LITERATURE REVIEW | 8 |
| 2.1 | Introduction..... | 8 |
| 2.2 | Software Lifecycle and SDLC and its Importance | 8 |
| 2.3 | What is SDLC | 9 |
| 2.3.1 | General model | 10 |
| 2.3.2 | Waterfall Life Cycle Model | 10 |
| 2.3.3 | Incremental model | 11 |
| 2.3.4 | RAD (Rapid Application Development)..... | 11 |
| 2.3.5 | Spiral model | 12 |
| 2.3.6 | Agile /Extreme | 13 |
| 2.3.7 | Generic model of life cycle..... | 14 |
| 2.3.8 | Choosing the right Project Life cycle Model..... | 16 |
| 2.4 | Important Factors that are Effective to the Life Cycle..... | 17 |
| 2.5 | Comparison of the Life Cycle Models | 19 |
| 2.6 | How to Measure the Project Management Life Cycle Activities | 20 |
| 2.6.1 | The Nature of Information Technology Projects | 20 |
| 2.6.2 | Characteristics of Information Technology Project Team Members..... | 21 |
| 2.6.3 | Diverse Technologies..... | 22 |
| 2.7 | Professional Project Management Guidelines | 23 |

| | | |
|----------|--|-----------|
| 2.7.1 | PMBOK (Project Management Body of Knowledge)..... | 23 |
| 2.7.2 | PRINCE 2 (Projects IN Controlled Environments)..... | 24 |
| 2.7.3 | ITIL (Information Technology Infrastructure Library) | 24 |
| 2.7.4 | CMMI (Capability Maturity Model Integration) | 25 |
| 2.7.5 | RUP (Rational Unified Process) | 25 |
| 2.7.6 | MSF (Microsoft Solution Framework) | 26 |
| 2.8 | Employees in Sri Lanka, Relating to Project Life Cycle Management | 27 |
| 2.9 | Project Life Cycle Related Initial Findings on the Sri Lankan Software Industry | 28 |
| 2.10 | Analyzing the Software Industry Environment Factors and Identify the Relationship between Management Activities and the Life Cycle..... | 29 |
| 3 | CHAPTER: METHODOLOGY | 32 |
| 3.1 | Introduction..... | 32 |
| 3.2 | Theoretical Framework | 32 |
| 3.3 | Conceptual Framework | 36 |
| 3.4 | Research Design Strategy | 38 |
| 3.4.1 | Data collection/Sampling | 38 |
| 3.4.2 | Sample selection | 39 |
| 3.5 | Research Hypothesis | 39 |
| 3.6 | Questions for the Survey..... | 41 |
| 3.6.1 | Process of data collection..... | 41 |
| 3.6.2 | Method of data collection | 42 |
| 3.7 | Variable/Question Map | 42 |
| 3.8 | Summary | 43 |
| 4 | CHAPTER: DATA ANALYSIS..... | 44 |
| 4.1 | Introduction..... | 44 |
| 4.2 | Data Preparation..... | 44 |
| 4.3 | Used Life Cycle Model:..... | 45 |
| 4.4 | Reliability Analysis..... | 45 |

| | | |
|----------|--|------------|
| 4.5 | Statistical Analysis | 46 |
| 4.5.1 | Pearson correlation test: Filter endemic factors | 47 |
| 4.5.2 | Pearson correlation test: SDLC factors with management factors | 85 |
| 4.6 | Summary of Hypothesis Test | 100 |
| 4.6.1 | Hypothesis 1: | 100 |
| 4.6.2 | Hypothesis 2: | 101 |
| 4.6.3 | Hypothesis 3 | 103 |
| 4.6.4 | Hypothesis 4 | 105 |
| 5 | CHAPTER: RECOMMENDATIONS AND CONCLUTION..... | 108 |
| 5.1 | Introduction | 108 |
| 5.2 | Recommendations | 108 |
| 5.2.1 | Measure the endemic factors related to life cycle management | 108 |
| 5.2.2 | Awareness with management in SDLC factors | 110 |
| 5.2.3 | Development of Life Cycle Management Framework based on Endemic Factors | 112 |
| 5.2.4 | Development of Framework | 112 |
| 5.3 | Research Limitations | 116 |
| 5.4 | Future Work | 116 |
| 5.5 | Conclusion | 117 |
| | REFERENCES..... | 119 |
| | APPENDIX: | 122 |
| | Appendix 1: Show the research questionnaire | 122 |
| | Appendix 2: Data analysis map | 125 |



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

LIST OF FIGURES

| | |
|---|----|
| Figure 2.1: The simple staged model..... | 9 |
| Figure 2.2: General Life Cycle Model..... | 10 |
| Figure 2.3: Waterfall model..... | 10 |
| Figure 2.4: Iterative Developments..... | 11 |
| Figure 2.5: RAD Model..... | 12 |
| Figure 2.6: Spiral model Developments..... | 13 |
| Figure 2.7: Spiral Model Developments..... | 14 |
| Figure 2.8: A generic software development lifecycle model..... | 15 |
| Figure 2.9: D3 Cube..... | 16 |
| Figure 2.10: Theoretical framework for successful agile methods..... | 17 |
| Figure 3.1: Conceptual Framework..... | 37 |
| Figure 3.2: Overall IT workforce by job Category (ICTA Survey, 2011)..... | 38 |
| Figure 3.3: Consolidated variable Summary..... | 39 |
| Figure 3.4: Each and Every Questions wise response analysis..... | 41 |
| Figure 4.2: Summary of the lifecycle usage..... | 45 |
| Figure 4.3: Data distribution frequency – well defined requirement..... | 48 |
| Figure 4.4: Data distribution frequency –domain knowledge of team members..... | 50 |
| Figure 4.5: Data distribution frequency – Expertise of users in problem domain.... | 52 |
| Figure 4.6: Data distribution frequency – Availability of reusable components..... | 54 |
| Figure 4.7: Data distribution frequency – User involvement in each SDLC Phases | 56 |
| Figure 4.8: Data distribution frequency – complexity of the system..... | 58 |
| Figure 4.9: Data distribution frequency – nature of project..... | 60 |
| Figure 4.10: Data distribution frequency – characteristics of team members..... | 61 |
| Figure 4.11: Data distribution frequency – diverse technologies..... | 63 |
| Figure 4.12: Data distribution frequency – outsourcing..... | 65 |
| Figure 4.13: Data distribution frequency – virtual teams..... | 67 |
| Figure 4.14: Data distribution frequency – culture..... | 69 |

| | |
|---|----|
| Figure 4.15: Data distribution frequency – financial stability | 70 |
| Figure 4.16: Data distribution frequency – organization of work..... | 72 |
| Figure 4.17: Data distribution frequency – usage of management best practices..... | 74 |
| Figure 4.18: Data distribution frequency – Usage of process & Standards | 76 |
| Figure 4.19: Data distribution frequency – quality expectation..... | 78 |
| Figure 4.20: Data distribution frequency – knowledge of the project domain | 80 |
| Figure 4.21: Data distribution frequency – knowledge of scope and limitation..... | 82 |
| Figure 4.22: Data distribution frequency – technology expertise | 84 |



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

LIST OF TABLES

| | |
|--|----|
| Table 1.1: Summary of Chapter Description | 7 |
| Table 2.1: Comparison of the Various Process Model | 19 |
| Table 2.2: Summary of Pilot survey | 28 |
| Table 3.1: Measuring table..... | 33 |
| Table 3.2: Variable Question MAP..... | 43 |
| Table 4.1: Chronbach Alfa test output | 46 |
| Table 4.2: Data distribution test-well defined requirement | 47 |
| Table 4.3: Pearson correlation test – Well defined requirement and level of Applicability of variation of lifecycle model | 49 |
| Table 4.4: Data distribution test- Domain knowledge of team members | 49 |
| Table 4.5: Pearson correlation test – Domain knowledge of team members with applicability of variation of lifecycle model | 51 |
| Table 4.6: Data distribution test- expertise of users in problem domain | 51 |
| Table 4.7: Pearson correlation test expertise of users in problem domain with applicability of variation of lifecycle model | 53 |
| Table 4.8: Data distribution test- Availability of reusable components..... | 53 |
| Table 4.9: Pearson correlation test- availability of reusable components with applicability of variation of lifecycle model | 55 |
| Table 4.10: Data distribution test- User involvement in each SDLC phase | 55 |
| Table 4.11: Pearson correlation test – User involvement in each SDLC Phase and level of applicability of variation of lifecycle model..... | 57 |
| Table 4.12: Data distribution test- Complexity of the system | 57 |
| Table 4.13: Pearson correlation test – complexity of the system and level of applicability of variation of lifecycle model | 58 |
| Table 4.14: Data distribution test- nature of project | 59 |
| Table 4.15: Pearson correlation test – nature of project and applicability of Infrastructure of IT Project | 60 |

| | |
|--|----|
| Table 4.16: Data distribution test- Characteristics of team members | 61 |
| Table 4.17: Pearson correlation test – characteristics of team members and level of applicability of infrastructure of IT Project | 62 |
| Table 4.18: Data distribution test- Diverse technologies | 62 |
| Table 4.19: Pearson correlation test – diverse technologies and level of Applicability of Infrastructure of IT Project | 64 |
| Table 4.20: Data distribution test- outsourcing..... | 64 |
| Table 4.21: Pearson correlation test – outsourcing and level of applicability of infrastructure of IT project..... | 65 |
| Table 4.22: Data distribution test- virtual teams | 66 |
| Table 4.23: Pearson correlation test –Virtual teams and level of applicability of infrastructure of IT Project..... | 67 |
| Table 4.24: Data distribution test- culture..... | 68 |
| Table 4.25: Pearson correlation test – culture and level of applicability of organization context..... | 69 |
| Table 4.26: Data distribution test- financial stability..... | 70 |
| Table 4.27: Pearson correlation test – financial stability and level of Applicability of organization Context..... | 71 |
| Table 4.28: Data distribution test- Organizations of work..... | 71 |
| Table 4.29: Pearson correlation test – organization of work and level of Applicability of organization Context..... | 73 |
| Table 4.30: Data distribution test- usage of management best practices | 73 |
| Table 4.31: Pearson correlation test – usage of management best practices and level of applicability of organization context | 75 |
| Table 4.32: Data distribution test- Usage of process & standards | 75 |
| Table 4.33: Pearson correlation test – usage of process & standards and level of applicability of organization context..... | 76 |
| Table 4.34: Data distribution test- Quality expectation | 77 |
| Table 4.35: Pearson correlation test – quality expectation and level of Applicability of satisfaction of customer needs | 78 |

| | |
|--|----|
| Table 4.36: Data distribution test- Knowledge of the project domain..... | 79 |
| Table 4.37: Pearson correlation test – knowledge of the project domain and level of applicability of satisfaction of customer needs | 80 |
| Table 4.38: Data distribution test- knowledge of scope and limitation | 81 |
| Table 4.39: Pearson correlation test – knowledge of scope and limitation and level of applicability of satisfaction of customer needs | 82 |
| Table 4.40: Data distribution test- Technology expertise | 83 |
| Table 4.41: Pearson correlation test – technology expertise and level of applicability of satisfaction of customer needs | 84 |
| Table 4.42: Pearson correlation test – time management factors and level of applicability of variation of life cycle model | 86 |
| Table 4.43: Pearson correlation test – cost management factors and level of applicability of Variation of life cycle model | 87 |
| Table 4.44: Pearson correlation test – scope management factors and level of applicability of variation of life cycle model | 88 |
| Table 4.45: Pearson correlation test – quality management factors and level of applicability of variation of life cycle model | 89 |
| Table 4.46: Pearson correlation test – Time management factors and level of applicability of infrastructure of IT project..... | 90 |
| Table 4.47: Pearson correlation test – Cost management factors and level of applicability of infrastructure of IT project..... | 91 |
| Table 4.48: Pearson correlation test – Scope management factors and level of applicability of infrastructure of IT project..... | 91 |
| Table 4.49: Pearson correlation test – quality management factors and level of applicability of infrastructure of IT project..... | 92 |
| Table 4.50: Pearson correlation test – Time management factors and level of applicability of organization context..... | 93 |
| Table 4.51: Pearson correlation test – cost management factors and level of applicability of organization context..... | 94 |
| Table 4.52: Pearson correlation test – scope management factors and level of Applicability of organization Context..... | 95 |

| | |
|---|-----|
| Table 4.53: Pearson correlation test – quality management factors and level of applicability of organization context..... | 96 |
| Table 4.54: Pearson correlation test – time management factors and level of applicability of satisfaction of customer needs | 97 |
| Table 4.55: Pearson correlation test – Cost management factors and level of applicability of satisfaction of customer needs | 97 |
| Table 4.56: Pearson correlation test – scope management factors and level of applicability of Satisfaction of customer needs | 98 |
| Table 4.57: Pearson correlation test – quality management factors and level of applicability of satisfaction of customer needs | 99 |
| Table 4.58: Summary of the Hypothesis test 1 | 101 |
| Table 4.59: Hypothesis 1 Test Result | 101 |
| Table 4.60: Summary of the Hypothesis test 2 | 102 |
| Table 4.61: Hypothesis 2 Test Result | 102 |
| Table 4.62: Summary of the Hypothesis test 3 | 104 |
| Table 4.63: Hypothesis 3 Test Result | 104 |
| Table 4.64: Summary of the Hypothesis test 4 | 106 |
| Table 4.65: Hypothesis 4 Test Result | 106 |
| Table 5.1: Summary of the Pearson test result..... | 109 |
| Table 5.2: Summary of the results of the tests conducted above | 111 |
| Table 5.3: Awareness with management factors with analyzed endemic factors ... | 113 |

LIST OF ABBREVIATIONS

| | |
|-------|--|
| CMMI | : Capability Maturity Model Integration |
| IT | : Information Technology |
| ISO | : International Organization for Standardization |
| ICTA | : Information and Communication Agency |
| ITIL | : Information Technology Infrastructure Library |
| MS | : Microsoft |
| MSF | : Microsoft Solutions Framework |
| PM | : Project Management |
| PMBOK | : Project Management Body of Knowledge |
| QA | : Quality Assurance |
| RAD | : Rapid Application Development |
| RUP | : Rational Unified Process |
| SDLC | : Software Development Lifecycle |
| XML | : Extensible Markup Language |



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk