

UNIVERSITI TEKNOLOGI MARA

**THE EFFECTIVENESS OF AN AGILE
SOFTWARE METHODOLOGY: EMPIRICAL
EVIDENCE ON HUMANISTIC ASPECTS**

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Agile methodology emerged in response to the recognition of the importance of humanistic aspects in software engineering (SE). However, there is lack of empirical evidence that supports its effectiveness in SE. The lack of empirical evidence demands more research in this field to generate more empirical data. Therefore, the first aim of this research is to investigate empirically the effect of agile methodology on the members of software development teams. To achieve this goal, a series of longitudinal empirical studies were carried out in both academic and industrial settings. For the academic setting, Universiti Utara Malaysia (UUM) was chosen because participants are representative sample enrolled in a project-based course that requires them to develop an application in a team. Three replicated experiments and two case studies were carried out. To generalize findings, an empirical inquiry in the form of a case study was carried out in a computer centre in Malaysia. The case study focused on four software development teams working on different applications in an organization. Both quantitative and qualitative analyses were used to triangulate and strengthen the empirical results. The humanistic aspect in SE that was addressed was the impact of an agile methodology on work-related well-being and positive affectivity of team members. The study findings indicate that, the agile methodology does not have a statistically significant effect on both aspects. However, it does have a significant impact on software quality. To further understand the humanistic issues, a follow up study on the personality type composition was carried out. It was observed that the presence of certain personality types amongst team members did contribute to the success of a software development team. Understanding human potential in teams is crucial because having the right people in a team can impact team performance. However, to date, there is no consensus on the right composition of team members because team dynamism and its interrelated factors are complex to uncover. Therefore, findings from these empirical studies were further used to design a team performance prediction model (eTiPs). A knowledge discovery in databases (KDD) approach was used as a guide to establish the prediction model. Four predictor variables—prior academic achievement, personality types, team personality diversity, and software methodology—were used to train, test, and validate the prediction model. Three data mining techniques—a classical logistic regression, decision trees, and rough set—were compared to determine the best technique for identifying association patterns in the data and to achieve optimal classification accuracy. The rough set technique was proved to be the most suitable technique for designing the prediction model. The designed model was further cross-validated using an area under receiver operating characteristic (ROC) curve and new data sets. Results show that the eTiPs prediction model has the potential to become a useful tool for decision-makers. This research contributes by providing additional empirical evidence that addresses the humanistic aspects in software engineering. The outcome of this research is a team performance prediction model that can assist decision makers in determining the effective team composition.

TABLE OF CONTENTS

AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	x
LIST OF FIGURES	xv
LIST OF ABBREVIATIONS	xviii
CHAPTER ONE : INTRODUCTION	1
1.1 Background of Study	1
1.2 Research Motivation	4
1.3 Problem Statement	6
1.4 Research Questions	8
1.5 Research Objectives	8
1.6 Operational Definitions	9
1.7 Research Framework	10
1.8 Research Scope	12
1.9 Significance of the Research	13
1.10 Limitation of the Research	15
1.11 Thesis Structure	16
CHAPTER TWO : LITERATURE REVIEW	19
2.1 Introduction	19
2.2 Empirical Studies in Software Engineering (SE)	20
2.3 Replication in Software Engineering (SE)	24
2.4 Human Factors in Software Engineering (SE)	26
2.5 Software Development Methodology	28
2.5.1 Agile Methodology	29
2.5.2 Formal Methodology	33

2.6	Cognitive Learning in Agile Practices	34
2.7	The Socio-Technical Perspectives in Agile Practices	38
2.8	Agile Methodology in Software Engineering (SE) Education	42
2.9	Agile Methodology in Software Industry	43
2.10	Work-Related Well-Being	46
2.11	Positive Affectivity	47
2.12	Software Quality	49
2.13	Team Performance Prediction Model	52
2.14	Prior Academic Achievements	54
2.15	Personality Types	56
	2.15.1 Personality Types Composition and Team Performance	60
2.16	Data Mining Techniques	62
	2.16.1 Regression	65
	2.16.2 Decision Tree	67
	2.16.3 Rough Set	70
2.17	Summary	74
CHAPTER THREE : RESEARCH METHODOLOGY		76
3.1	Introduction	76
3.2	Research Design	76
3.3	Participant Selection	79
	3.3.1 Ethical Consideration	83
3.4	Controlled Experiments – Academic Setting	83
	3.4.1 Experiment Goals	85
	3.4.2 Hypothesis Formulation	87
	3.4.3 Experimental Design	87
	3.4.4 Experiments Procedures	95
3.5	Case Study - Industrial Setting	103
	3.5.1 Background of the Case Study	104
	3.5.2 Agile Workshops	105
3.6	Data Collection	106
	3.6.1 Questionnaires	106
	3.6.2 Interviews	109