

**THE IMPACT OF USING GENERATIVE AI ON
SELECTED COGNITIVE SKILLS OF IT
PROFESSIONALS IN SRI LANKA**

R.M.I.S. Ranatunga

198624M

Master of Science in Business Statistics

Department of Mathematics

Faculty of Engineering

University of Moratuwa

Sri Lanka

August 2024

**THE IMPACT OF USING GENERATIVE AI ON
SELECTED COGNITIVE SKILLS OF IT
PROFESSIONALS IN SRI LANKA**

R.M.I.S. Ranatunga

198624M

This dissertation is submitted in partial fulfillment of the requirements for the degree
Master of Science in Business Statistics

Department of Mathematics

Faculty of Engineering

University of Moratuwa

Sri Lanka

August 2024

DECLARATION

I declare that this is my own work and this thesis/dissertation 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. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date:

The above candidate has carried out research for the Master's thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Ms. D. R. T. Jayasundara

Signature of the Supervisor:

Date:

DEDICATION

This research study is dedicated to my research supervisor, Ms. D. R. T. Jayasundara. Your guidance from the very beginning has been instrumental in shaping the direction and quality of this study. Your expertise, patience, and encouragement have been invaluable, and I am profoundly grateful for your mentorship.

To all the IT professionals in Sri Lanka who tirelessly drive innovation and progress in the technology sector, your relentless pursuit of knowledge and excellence inspires the exploration of new frontiers, such as the impact of Generative AI on cognitive skills. I extend my heartfelt gratitude to my family, especially my husband, whose unwavering support and encouragement have been my pillars of strength throughout this journey. Your belief in me has been the foundation upon which I have built this academic endeavor.

To my mentors and colleagues, your insights have greatly enriched this research. You have not only imparted knowledge but also instilled in me the values of perseverance and intellectual curiosity. Special thanks to the VIVA board members whose feedback has significantly contributed to this work.

I also dedicate this work to my friends and peers who have provided moral support and constructive discussions that have enhanced my research experience. Your camaraderie has made this journey both fulfilling and enjoyable.

Lastly, this work is dedicated to future researchers and professionals who will continue to explore the transformative potential of AI in our society. May this study serve as a steppingstone for further inquiry and innovation in understanding the profound impacts of technology on human cognition and professional practice.

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to all those who have supported and guided me throughout the course of this research study on the impact of Generative AI on the cognitive skills of IT professionals in Sri Lanka.

First and foremost, I am profoundly grateful to my research supervisor, Ms. D. R. T. Jayasundara, for her unwavering support, invaluable guidance, and insightful feedback. Her expertise and encouragement from the inception of this study to its completion have been instrumental in shaping this work.

I am also thankful to the faculty and staff of Department of Mathematics, Faculty of Engineering/University of Moratuwa, whose resources and academic environment have significantly contributed to the success of this research. Special thanks to VIVA board members for their constructive criticism and suggestions.

My heartfelt appreciation goes to my family, especially my husband, for their continuous encouragement and understanding. Your unwavering support has been a source of strength and motivation for me.

I extend my gratitude to my colleagues and friends for their moral support and engaging discussions, which have enriched my research experience. Your camaraderie has made this journey both enjoyable and fulfilling.

I would also like to acknowledge the IT professionals in Sri Lanka who participated in this study. Your cooperation and insights were invaluable and greatly appreciated.

Lastly, I thank the future researchers and scholars who will build upon this work. May this study serve as a foundation for further exploration into the transformative effects of AI on human cognition and professional practices.

Thank you all for your contributions and support.

ABSTRACT

This study explores the influence of Generative AI on the cognitive abilities of IT professionals in Sri Lanka. As AI technologies rapidly become integrated across various sectors, it is vital to understand their impact on critical cognitive competencies. This research specifically investigates how Generative AI tools affect problem solving, critical thinking, analytical skills, and attention to detail among IT professionals. Primary data was gathered by designing a structured questionnaire with the support of both the literature and expertise perceptions. A combination of Snowball and Stratified sampling was used to obtain a representative sample of IT professionals in Sri Lanka from the IT companies centered in Colombo. The research methodology encompassed reliability analysis, exploratory factor analysis, and multiple linear regression and paired t-test to reach the study objectives. The results revealed that Generative AI has significantly contributed to improve problem solving and analytical capabilities of professionals as they work closely with the automated routine tasks while providing sophisticated data insights. This automation has allowed IT professionals to focus on more complex cognitive tasks, thereby promoting innovation and efficiency. The difference between computed average overall impact on cognitive skills and the self-estimated average overall impact on cognitive skills by using Generative AI are found revealed that there is 22% more improvement among those who improved while 70% more deteriorated among those whose cognitive skills have been declined than they have self-estimated. Nevertheless, the study has highlighted potential drawbacks, such as over-reliance on AI for critical thinking, which may hinder the development of independent cognitive abilities and decrease attention to detail. The study underscores the importance of continuous learning and adaptability for IT professionals to remain important in an AI-augmented work environment. It advocates for a balanced approach where AI technologies augment but do not totally replace essential human cognitive skills. The research provides valuable insights for IT professionals, educators, and policymakers, suggesting guidelines for integrating AI technologies while maintaining cognitive skill development. It recommends targeted training programs and ethical standards to maximize the benefits of AI while mitigating its risks. This research adds to the wider conversation about how AI influences the future of employment, especially in the IT industry.

Keywords: Artificial Intelligence, IT specialists, Problem Solving, Critical Thinking

TABLE OF CONTENTS

1	CHAPTER ONE: INTRODUCTION	1
1.1	What is Generative AI?.....	1
1.2	How Generative AI has been benefitted to IT professionals?.....	2
1.3	Focused cognitive skills of IT professionals	3
1.4	Problem statement.....	5
1.5	Research objectives.....	7
1.6	Significance of the study	7
1.7	Chapter organization	9
2	CHAPTER TWO: LITERATURE REVIEW	11
2.1	Introduction.....	11
2.2	Generative AI technologies in global context.....	11
2.3	Generative AI technologies and IT professionals	15
2.4	The impact of Generative AI on cognitive skills	17
2.5	Research gap	21
3	CHAPTER THREE: DESIGN OF SURVEY TOOL AND DATA PROCESSING	22
3.1	Introduction.....	22
3.2	Questionnaire format	22
3.2.1	Administration procedures.....	23
3.2.2	Structured demographic section.....	23
3.2.3	Level of engagement in different types of tasks	24
3.2.4	Exposure to Generative AI.....	25
3.2.5	In-depth evaluation of usage of Generative AI and its cognitive impact.....	25
3.2.6	Self-summarization and reflection	28
3.3	Pilot testing	29
3.4	Reliability and validity testing	29
3.5	Computation of variables	30
4	CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION	32
4.1	Introduction.....	32

4.2	Research design and strategy	32
4.3	Data collection	33
4.4	Data analysis methods.....	34
4.4.1	Reliability analysis.....	34
4.4.2	Descriptive statistics for demographic variables.....	35
4.4.3	Explanatory factor analysis.....	35
4.4.4	Chi-square analysis	37
4.4.5	Multiple linear regression	38
4.4.6	Analysis of gap between self-awareness and computed cognitive skills	39
5	CHAPTER FIVE: ANALYSIS AND FINDINGS.....	40
5.1	Introduction.....	40
5.2	Reliability analysis.....	40
5.3	Univariate descriptive statistics for demographic variables.....	42
5.4	The level of engagement in day-to-day work tasks by IT professionals.....	48
5.4.1	Factor analysis for the level of engagement of the day-to-day tasks	49
5.4.2	Regression on overall impact on the selected cognitive skills	58
5.5	Usage of Generative AI for work related tasks in a typical week.....	67
5.5.1	Factor analysis for the usage of Generative AI in a typical week.....	68
5.6	Level of replacement of cognitive skills by Generative AI	74
5.6.1	Impact of using Generative AI on cognitive skills.....	74
5.6.2	Chi-square analysis	79
5.6.3	Regression on overall impact on the selected cognitive skills vs. level of replacement of cognitive skills by Generative AI	82
5.7	Analysis of gap between self-awareness and computed impact on cognitive skills	92
6	CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS	95
6.1	Introduction.....	95
6.2	Level of engagement in day-to-day work tasks	95
6.3	Usage of Generative AI in work-related tasks	97

6.4	Impact on the selected cognitive skills by using Generative AI with respect to the level of engagement in different types of tasks performed by IT professionals	99
6.5	Impact of using Generative AI on cognitive skills with reference to the usage of Generative AI in replacement of cognitive skills at their official work	101
6.6	Analysis of gap between self-awareness and computed impact on cognitive skills 102	
7	REFERENCES.....	103

LIST OF TABLES

Table 3.1:Variables capturing the level of engagement in different types of tasks	24
Table 3.2:Variables capturing the level of replacement of cognitive skills by Generative AI	26
Table 3.3:Variables capturing the impact of Generative AI on cognitive skills	27
Table 5.1:Reliability analysis of usage of Generative AI and its impact on cognitive skills.	40
Table 5.2:KMO and Bartlett’s test of the sphericity concerning engagement tasks	49
Table 5.3:Measure of Sampling Adequacy (MSA) for each engagement task.....	50
Table 5.4:Factor loadings and variance explained.....	51
Table 5.5:Descriptive statistics of the observed variables	58
Table 5.6:ANOVA table for the fitted model	59
Table 5.7:Coefficient table.....	60
Table 5.8:Durbin Watson test for randomness.....	63
Table 5.9:Breusch-Pagan test for Homoscedasticity	63
Table 5.10:Shapiro Wilk test	66
Table 5.11:Multicollinearity	66
Table 5.12:KMO and the Bartlett’s test of Sphericity of the usage of Generative AI in a typical week for work related tasks	68
Table 5.13:Measure of Sampling Adequacy (MSA) of usage of Generative AI in a typical week for work related tasks	69
Table 5.14:Factor loadings and variance explained.....	70
Table 5.15:Chi-square test results for the association between age and cognitive skills.....	79
Table 5.16:Chi-square test results for the association between gender and cognitive skills..	80
Table 5.17:Chi-square test results for the association between level of education and cognitive skills	81
Table 5.18:Chi-square test results for the association between years of experience in the current position and cognitive Skills.....	81
Table 5.19:Descriptive statistics of the observed variables	82
Table 5.20:ANOVA table for the fitted model	83
Table 5.21:Coefficient table.....	85
Table 5.22:Durbin Watson test for randomness.....	88
Table 5.23:Breusch-Pagan test for Homoscedasticity	89
Table 5.24:Shapiro Wilk test	91
Table 5.25:Multicollinearity	91
Table 5.26:Results of the paired t-test performed for the gap between computed average overall impact and the self-estimated average overall impact	93

Table 5.27:Results of the paired t-test performed for the gap between computed average overall impact and the self-estimated average overall impact (positive)	93
Table 5.28:Results of the paired t-test performed for the gap between computed average overall impact and the self-estimated average overall impact (negative)	93

LIST OF FIGURES

Figure 5.1:Distribution of the age group of IT professionals.....	42
Figure 5.2:Distribution of the gender of IT professionals.....	43
Figure 5.3:Distribution of the level of education of IT professionals.....	44
Figure 5.4:Distribution of years of experience in the IT industry of IT professionals.....	45
Figure 5.5:Distribution of years of experience in the current position of IT professionals ...	46
Figure 5.6:Distribution of the primary domain of IT professionals.....	47
Figure 5.7:Mean distribution of the day-to-day task engagement by IT professionals.....	48
Figure 5.8:Scree plot for the Factor/Component number	52
Figure 5.9:Mean exposure by age group.....	53
Figure 5.10:Mean exposure by gender.....	54
Figure 5.11:Mean exposure by level of education.....	55
Figure 5.12:Mean exposure by years of experience in the current position	56
Figure 5.13:Mean exposure by primary domain.....	57
Figure 5.14:Residual vs. fitted plot.....	62
Figure 5.15:Normal Q/Q plot.....	65
Figure 5.16:Pie chart for the usage of Generative AI in day-to-day tasks	67
Figure 5.17:Scree plot for the Factor/Component number	71
Figure 5.18:Usage of Generative AI in typical week for work-related tasks.....	73
Figure 5.19:Impact of using Generative AI for work related tasks on cognitive skills by age	74
Figure 5.20:Impact of using Generative AI for work related tasks on cognitive skills by gender	75
Figure 5.21:Impact of using Generative AI for work related tasks on cognitive skills by education.....	76
Figure 5.22:Impact of using Generative AI for work related tasks on cognitive skills by years of experience	77
Figure 5.23:Impact of using Generative AI for work related tasks on cognitive skills by years of experience in the current position.....	78
Figure 5.24:Residual vs. fitted plot.....	87
Figure 5.25:Normal Q/Q plot.....	90

LIST OF ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
GPT	Generative Pre-trained Transformer
GANs	Generative Adversarial Networks
IT	Information Technology
RND	Research and Development
UX	User Experience
UI	User Interface
EFA	Exploratory Factor Analysis
KMO	Kaiser-Meyer-Olkin
MSA	Measure of Sampling Adequacy
DW	Durbin-Watson
BP	Breusch-Pagan
VIF	Variance Inflation Factor
DF	Degrees of Freedom

LIST OF APPENDICES

Appendix	Description	Page
Appendix – A :	Questionnaire	106