

**UNIVERSITI TEKNOLOGI MARA**

**ANALYTICAL FRAMEWORK FOR  
PREDICTING ONLINE  
PURCHASING BEHAVIOR IN  
MALAYSIA USING A MACHINE  
LEARNING APPROACH**

**NURUL AIN BINTI MUSTAKIM**

Thesis submitted in fulfillment  
of the requirements for the degree of  
**Doctor of Philosophy  
(Computer Science)**

**College of Computing Informatics and Mathematics**

**March 2025**

## ABSTRACT

In the fast-changing world of digital commerce, predicting online purchasing behavior is essential for improving e-commerce strategies. This study presents a post-pandemic machine learning-based analytical framework specifically designed for Malaysia's e-commerce market. The framework addresses a gap in predictive analytics by combining computational techniques, consumer behavior theories, and demographic data to better understand and forecast purchasing trends. The framework uses machine learning methods, including classification, clustering, feature selection, and parameter tuning, to improve accuracy and reliability. It is organized into three phases: preliminary investigation, implementation and analysis, and validation. The descriptive analysis examines purchasing behavior through correlation and regression analyses, while the predictive model uses decision trees (J48, Random Tree, REPTree), rule-based algorithms (JRip, OneR, PART), and clustering (K-Means) to identify patterns and predict trends. Feature selection techniques, such as WrapperSubsetEval, were used to improve focus on key attributes, and parameter tuning further optimized performance. Among the three datasets analyzed (D1, D2, and D3), Dataset 3, which emphasizes psychological and emotional factors, achieved the highest accuracy and predictive performance. Validation included both machine learning evaluation and expert feedback. Machine learning results showed strong performance, with Random Tree and PART delivering the most reliable predictions. Adjustments, such as tuning K-Values and binary splits, further enhanced results. Expert feedback validated the framework's alignment with the Howard-Sheth consumer behavior model and suggested improvements, such as including additional behavior related factors and refining segment categories. Key findings highlight the growing participation of female consumers in online shopping, signaling changing trends in Malaysia's e-commerce landscape. This study also introduces a unique dataset on Malaysian online consumer behavior, filling a critical gap and providing valuable insights for businesses. The framework aligns with Malaysia's Science, Technology, Innovation, and Economic (MySTIE) framework and supports SDG 8 and KEGA 2 (Digital Economy) goals. By integrating classification, clustering, and consumer behavior models, this framework offers practical tools for understanding and predicting consumer behavior. Its validation, including evaluation and expert feedback, ensures reliability and adaptability, making it a valuable resource for improving e-commerce strategies in Malaysia.

## ACKNOWLEDGEMENT

Praise be to Allah for answering my prayers and granting me the strength and perseverance to complete this thesis. I am deeply grateful to my family, especially my husband Mohd Jefri Hamid, for his unwavering support throughout every challenge of this journey. To my beloved daughters, Nureen Ummairah and Nureen Atthirah, and my son, Muhammad Wahyu Ilham, thank you for your patience, understanding, and love that have been my source of inspiration. A special thank you to my mother

for her constant love, prayers, and unwavering belief in me, which have been a source of strength and comfort throughout this journey. To my dad, Hj Mustakim Omar, thank you for your support and prayers. I am also grateful to my extended family for their love, prayers, and encouragement.

I would like to sincerely thank my supervisors, Associate Professor Dr. Shuzlina Abdul Rahman, Dr. Maslina Aziz, and Dr. Zuhairah Hassan, for their guidance, support, and valuable advice throughout my PhD journey. Dr. Shuzlina, your support and confidence in my abilities have been a great motivation. Dr. Maslina, your feedback and insights have greatly improved my research, and Dr. Zuhairah, your positive advice has helped me overcome challenges. Your collective support has been essential in shaping this thesis, and I am truly grateful for all that I have learned from you. Thank you for the invaluable knowledge that had been shared with me in all the phases of this PhD journey.

Finally, I would like to express my appreciation to everyone who has directly or indirectly contributed to this research. To my friends, colleagues, and peers, thank you so much for your encouragement, discussions, and support throughout this journey. I am also thankful to the administrative staff and technical teams for their assistance with resources and logistics, as well as to the participants who provided valuable input that helped shape this study. Every contribution, no matter how small, has been important in completing this research. Thank you all for your support.

# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR’S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xiii</b>
<b>LIST OF FIGURES</b>	<b>xvii</b>
<b>CHAPTER 1: INTRODUCTION</b>	<b>1</b>
1.1 Preamble	1
1.2 Research Background	1
1.3 Problem Statement	5
1.4 Research Questions	7
1.5 Research Objectives	8
1.6 Significance of the Study	8
1.7 Research Scope	9
1.8 Organization of Thesis Chapters	10
<b>CHAPTER 2: LITERATURE REVIEW</b>	<b>13</b>
2.1 Introduction	13
2.2 E-commerce and post-COVID 19 transformations of Online Shopping Behavior	13
2.2.1 Impact of post-COVID 19 and AI on Consumer Behaviour in E-Commerce	17
2.2.2 Rapid Growth in Online Purchasing in Malaysia	20
2.3 Conceptual Framework	22
2.3.1 Review of Existing Models in Online Purchasing Behavior	22
2.3.1.1 <i>Technology Acceptance Model (TAM)</i>	23
2.3.1.2 <i>Theory of Planned Behavior (TPB)</i>	24

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Preamble**

This chapter introduces the study by presenting the background of the research. It then highlighting the critical issues through the problem statement, followed by the research question, objectives, the scope of study and significance. Lastly, a summary of the structure of the whole thesis is presented.

### **1.2 Research Background**

In the late 1990s and early 2000s, the advent of e-commerce marked a pivotal period in the business arena. During this time, businesses were predominantly focused on establishing a digital presence and guaranteeing the security of online transactions, signifying a noteworthy departure from traditional in-store shopping models. Due to the novelty of e-commerce, the reliability of operations played a crucial role in fostering consumer trust (Yuliarto & Gusti, 2022). This phase witnessed the implementation of secure payment methods and data protection protocols, laying the foundation for the security standards prevalent in contemporary online transactions. Additionally, there was a significant emphasis on enhancing website usability. Early e-commerce platforms also prioritized user-friendly interfaces, highlighting clear navigation, easily accessible product information, and streamlined checkout processes to ensure that online shopping was as intuitive and convenient as possible. This assertion is corroborated by Patrada and Andajani (2021), who determined that e-customer satisfaction is influenced by factors such as security, convenience, and website design. Furthermore, during this era, analytics served as an initial and investigative tool in the rapidly evolving digital landscape. The primary focus of analytics was on guaranteeing website functionality and transaction security. This emphasis stemmed from the fact that both individuals and companies were still adjusting to the concept of e-commerce, emphasizing the crucial importance of establishing a secure and reliable online environment.