

The Role of AI in Higher Education, Teacher Training, and Professional Development: Teacher's Perspective

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DOI Link: <http://dx.doi.org/10.6007/IJARPED/v15-i1/27522>

Published Online: 20 January 2026

Abstract

The study aimed to evaluate the role of AI in higher education teacher training and professional development from the teachers' perspective. Based on this, suitable objectives have been developed, which helped to analyse and evaluate the benefit and significance of AI in teacher training and professional development. The variables chosen for this study are attributable to the theoretical frameworks deemed adequate for this research and have been beneficial in the identification of key constructs: "Teacher training programme", "Teacher's attitude towards AI", "Teacher's compatibility", and "Teacher's relative advantage" and their impact on the "Professional Development" of the teachers. 367 teachers of Beijing Normal University will be included as the sample and the collected data will be analysed through IBM SPSS software. It is expected that relationships between the variables can be supported, and the outcome can be helpful to gain new insights. The outcome is generated with the help of quantitative data after testing its reliability. However, the study is conducted only considering specific regions; therefore, it is suggested that future researchers will be able to conduct the study considering various regions of China.

Keywords: Online Education, Ai-Powered Learning, Personalized Learning, Digital Literacy, Pedagogical Knowledge

Introduction

Research Background

A study by Haleem et al. (2022) revealed that responses and services are the two primary forms of *artificial intelligence (AI)* in educational components. Artificial intelligence is used by AI solutions as elements to automate, support, or personalise operations by forecasting results based on user environment or requirements. They are implemented both within the premises and cloud architecture, and they make use of machine learning and *natural language processing (NLP)* technologies. The future rise of *artificial intelligence (AI)* in the education sector is anticipated to be driven by the growing popularity of online learning (Chaudhry & Kazim, 2021). Online education, often known as e-learning or virtual learning, is

the process of delivering teaching and educational materials over a computer network or other digital tools.

The market for AI in education has expanded rapidly in the last several years. At a *compound annual growth rate (CAGR)* of 38.4%, it will increase from \$5.47 billion in 2024 to \$7.57 billion in 2025. *Big data and analytics, personalised education systems, online educational resources, personalised learning campaigns, and preliminary AI tutoring techniques* are all responsible for the increase over the historic time (thebusinessresearchcompany.com, 2025). Moreover, Boretti (2024) claimed that in the upcoming years, market demand for AI in education is anticipated to develop at an exponential rate. It will increase at a *compound annual growth rate (CAGR)* of 41.4% to \$30.28 billion in 2029. Virtual and blended learning, AI-enabled instruments for evaluation, rising *Edtech* investments, and teacher assistance mechanisms are all responsible for the rise throughout the predicted period (thebusinessresearchcompany.com, 2025).

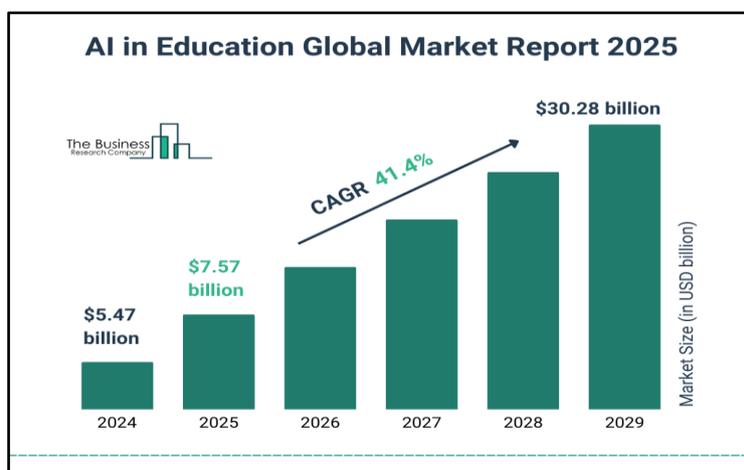


Fig. 1 The Global Market Report of AI in Education
(Source: thebusinessresearchcompany.com, 2025)

According to Khan et al. (2022), through this investment, the educational institutions hope to increase their market share in the education sector, improve their AI-powered teacher and student learning remedies, broaden their audience, and use cutting-edge technology to improve learning results.

Research Issues

Along with the benefits of using AI for teaching, training, and professional development, some challenges affect the teachers during the training period. The major issues are lack of training, maintenance of the use of technology, teacher resistance, and focusing on pedagogy. The teachers required adequate training and professional development for integrating the AI tools which they can do during their practices where understanding the potential challenge is beneficial (education.illinois.edu 2024). The rapid evolution of AI technologies highlights the ongoing training requirement and the support for the teachers to stay present with the latest advancements. In most Universities, teachers are resistant to the adoption of new technology by implementing supportive strategies. According to Xia & Li (2022), many instructors lack access to sufficient educational opportunities that may help them stay up to date with the latest teaching methods and

materials, especially in remote areas. This lack of preparation for teachers affects the general quality of education that kids get. Here, the provided information in the analysis in the further study can be effective in solving the problems appropriately. The researcher also developed some research questions to bridge this gap-

RQ1: What is the impact of a teacher training program on the professional development of teachers?

RQ2: What are the benefits of teachers' attitudes towards AI on their professional development?

RQ3: What is the role of teacher compatibility in the professional development of teachers?

RQ4: What is the impact of teacher relative advantage on their professional development?

Significance of the Study

The study is significant because it provides an opportunity for teachers to learn how to integrate AI tools into their training practices for developing their profession. It also empowers teachers to use advanced technology for efficient task management, personalised learning, and improved student outcomes. AI can help teachers in recognising the needs of individual students by providing proper instructions for improving their learning experience and performance. It is beneficial for the teachers to use AI tools for analysing the progress of the teachers for understanding their strengths and weaknesses, which allows them to identify the learning growth and gaps of the students. The teachers can fulfil this by providing proper guidance and support. It also streamlines the administrative tasks for the teachers by reducing their workload and preparing them for a better future.

Literature Review

Theoretical Framework

The study includes Diffusion of Innovations (DOI) Theory and Technological and Pedagogical Content Knowledge (TPACK) for assessing the relevance of the factors in this study. Based on the Diffusion of Innovation Theory, the term relative advantage relates to the perceived benefits of using AI as opposed to the traditional methods. This perceived benefit is often escalated in the context of traditional methods being constrained by time, scalability and personalisation. On the contrary, AI systems often offer adaptive learning pathways, scalable feedback mechanisms and real-time analytics, which traditional models can struggle to replicate. Through these automated and research-derived assignments, teachers can allocate their time toward helping students and implementing pedagogical strategies.

A study performed by Li, Liu & Su (2022) clarified that understanding of technology, including how to use and think about tools, resources, and technology, and understanding of pedagogy, which includes instructional strategies and techniques. Thus, TPACK provides educators with a framework for integrating their expertise in pedagogy, material, and technology to create a fresh approach to education and instruction. The TPACK framework outlines the key types of knowledge teachers need and is considered essential for effectively using technology in teaching. In a similar vein, Chaipidech et al. (2021) have demonstrated that the framework is imperative to andragogy, and to ensure successful improvement, teachers should actively engage in professional development rather than passively receive information.

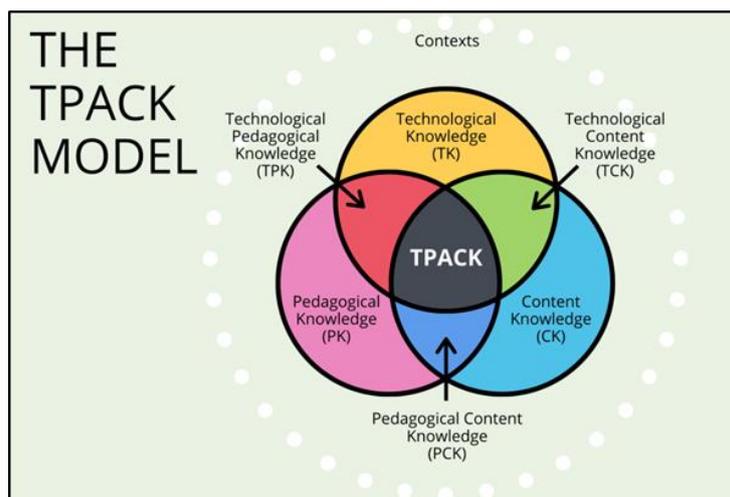


Fig. 2 Technological and Pedagogical Content Knowledge (TPACK)
(Source: edtech-class.com, 2021)

Furthermore, TPACK is built on seven elements and describes the seven areas of teacher knowledge that serve as the heart of good teaching, which are “pedagogical knowledge”, “technology knowledge”, “content knowledge”, “pedagogical content knowledge”, “technological pedagogical knowledge”, “technological content knowledge” and “technological Pedagogical Content Knowledge (TPACK)” (Santos & Castro, 2021). Thus, it can be concluded that the integration of the TPACK framework can enable a nuanced understanding of how AI is perceived in educational contexts, accepted, and applied by teachers in higher education.

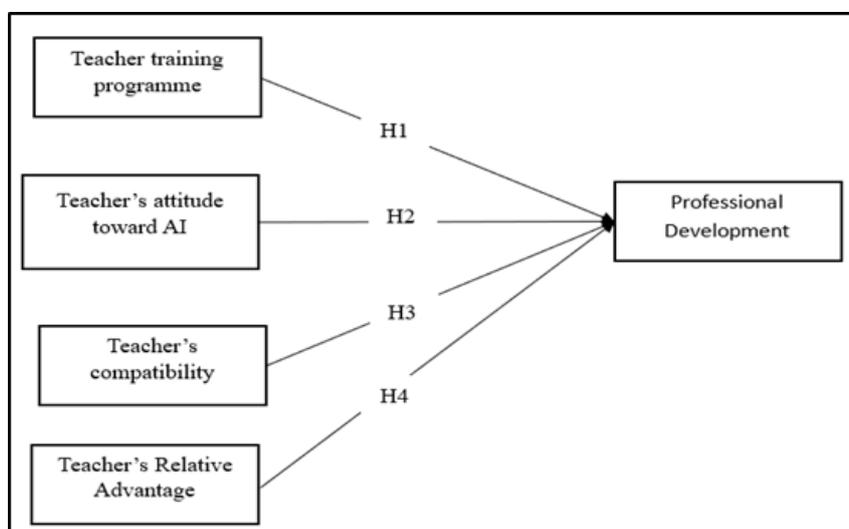


Fig. 3 Framework of the Research

According to the views of Qaisra & Haider (2023), teacher training emphasises methods, skills, and practices that equip teachers with the skills, knowledge, and emotional intelligence to think, plan, and work with children, youth, and other teachers. Furthermore, training fosters reflective practices, encourages collaboration among peers, and supports career advancement (Ramos et al., 2022). Kim (2024) believed that the teaching training programs are important to foster professional growth in the context of higher education. Well-designed training initiatives provide educators with the necessary knowledge, pedagogical approaches,

and skills to integrate innovative teaching strategies, including AI-enabled tools, into their practice. Without a structured training process, Ramos et al. (2022) explained that educators may face challenges in adopting new technologies, leading to limited innovation in teaching. Thus, it is hypothesised that a well-designed teacher training program can significantly contribute to the professional development of educators by preparing them to integrate AI effectively in higher education.

H1: Teacher's Training Program has a significant impact on professional development.

As per the views of Pietsch & Mah (2024), the rapid advancement of artificial intelligence (AI) demands that education systems adapt quickly and undergo a structured digital transformation to integrate emerging technologies in a timely and sustainable way. This, in turn, puts the teachers at the forefront of change, requiring them to continuously update their skills, embrace new teaching methodologies, and develop digital literacy to effectively integrate AI and other technologies into their classrooms. Thus, it can be assumed that teachers' attitudes towards AI significantly influence their professional development, affecting both their readiness to adopt new technologies and their overall growth as educators in the digital age. Ding et al. (2024) indicated that a negative attitude towards AI is often driven by a lack of trust in technology, fear of replacement, and limited digital literacy can affect professional development. Thus, teachers' attitudes toward AI emerge as a key determinant of how effectively professional development initiatives translate into improved teaching practices in higher education.

H2: Teachers' attitude towards AI has a significant impact on professional development.

According to reports published by Statista, the AI penetration rate in China in the education sector is approximately 13% as of 2022. Likewise, Kim (2024) has established that the implementation of AI in education is projected to grow significantly, impacting areas such as teacher-AI interaction, curriculum, learning environment, teacher-AI collaboration (TAC), and so on. It has been highlighted by Akram et al. (2022) that when there is congruence between the knowledge and skills of the teachers with the technological advancements, they are more likely to utilise it. This alignment helps reduce the learning curve, increases the propensity of repeated usage, and helps with their professional development. Furthermore, Akram et al. (2022) indicated that compatibility implements collaborative learning among educators. Teachers who think AI is beneficial are inclined to share knowledge, contribute to institutional innovation, and participate in workshops, enriching both collective and individual professional growth.

H3: Teacher's Compatibility has a significant impact on professional development.

According to the views of Al-Zyoud (2020), the gradual integration of information technology and teaching and education, alongside the innovative application of education informatisation, has ushered in new opportunities for the professional development of educators. Finally, the relative advantage of AI can shape the motivation and willingness of teachers to improve their skills by aligning professional development with the evolving requirements of the digital learning environment. Therefore, teachers' perception of AI's benefits plays a pivotal role in advancing their competence, effectiveness, and long-term career development in higher education.

H4: Teacher's Relative advantage has a significant impact on professional development.

There is a lack of research on how curricular design can integrate AI into higher education teacher training and teacher professional development. There is limited exploration about the role of AI in shaping pedagogical identity and instructional agency. The past studies also have insufficient analysis of the competencies of AI within teacher education curricula. They have rarely addressed the specific digital and AI-related competencies that educators need for developing an AI based curriculum.

Methodology

The quantitative research design is considered the suitable research design for the study because of its objectivity, as well as the specificity of the outcome can be observed in this case. This is a crucial objective for educational research, which involves emerging technologies like AI, as in the current study. The research design is focused towards answering the “What” questions, and the specific study consists of research questions belonging to that category. The current study is using the descriptive research design as well, which enables in developing the different hypotheses. The same is suitable for the current study because it is attempting to understand and conduct subjective interpretations of measurable constructs. Quantitative methods are also helpful for isolating the impact of AI tools on professional development outcomes, which ensures clarity and replicability. It is identified that many variables are determined in the study; hence, incorporating a quantitative research design will be helpful for identifying the causal relationship between them (Williams 2021). In this context, causal relationships may involve how attitudes of educators towards AI can influence their engagement in professional development. Quantitative analysis helps the testing of such directional hypotheses with statistical rigour.

It is identified that teachers belonging to the higher education sector in China can be the most effective respondents for the study. However, regions like Beijing are chosen in the study and the population of teachers at a famous university in Beijing, “Beijing Normal University” is selected in this context (gtes.org.cn. 2023). The total number of teachers at “Beijing Normal University” is 8000. Hence, a sample size will be determined considering the population to get a desirable number of teachers for survey purposes. The sample size is drawn in the study with the help of the “Krejcie & Morgan” table in terms of getting an optimised size of respondents for the research. As per the table, it can be stated that a sample size of 367 can be helpful for the study in terms of gaining a significant number of ideas from their responses (Muchai & Ng’asike, 2021). In primary data collection, the researcher of the study collects all the first-hand information from all the chosen sample members (Taherdoost 2021). This ensures that the data of the current study reflects current realities, specifically in fast-evolving domains such as educational technology. It further allows for the inclusion of contextual variables like digital infrastructure, institutional support as well as prior experience with using AI tools.

The research instrument for this study comprises a self-administered questionnaire that has been developed with the help of a five-point Likert scale, where respondents are required to respond to the closed-ended questions based on the variables chosen for the study. The first section consists of demographic questions, and the next section consists of questions relevant to variables. The responses are to be collected across 1- Strongly Disagree to 5- Strongly Agree, which is expected to be efficacious in quantifying the viewpoints of the participants. The questionnaire has been adapted from various past literature that have

introduced similar instruments for their studies and have proven the reliability and validity of the items. It is recognised that the study will be conducted by collecting primary data through a survey method; hence, a quantitative data analysis method should be applied in this case. Quantitative analysis in the current study also helps to operationalise different theoretical constructs which are derived from the theories used in the current study. This further improves the empirical grounding of the study and also facilitates hypothesis testing with statistical precision.

Tools like IBM SPSS will be used in this study for the analysis of data, and it can be helpful to represent the outcome through tables, charts and graphs. Tests like multiple regression and descriptive statistical analysis can be done effectively with the help of these tools (Mizumoto, 2023). According to Husband (2020), ethical guidelines need to be embedded in the research design and implementation to ensure the integrity of the study. Given that the study is being conducted in the context of China, this research is therefore carried out in compliance with the Personal Information Protection Law (PIPL). The participants of the study will also be allowed to make necessary changes after up to 21 days of submitting the data. The guidelines also ensure that the participants have an understanding that they can withdraw their participation at any given point of time.

Results of Analysis

Sample Characteristics and Data Distribution

The demographic profiling test helps the researcher to know a detailed background about the selected respondents. It explains how these can have an impact on the attitudes of educators towards AI and their readiness to adopt new technologies. 367 respondents participated in the survey, and all of them participated in the survey.

Table 1

Profile of factors characterising the demographic of the sample

		Count	Column N %
Age	Below 30 years	133	36.2%
	31 to 41 years	209	56.9%
	42 to 52 years	11	3.0%
	Above 52 years	14	3.8%
Gender	Female	174	47.4%
	Male	193	52.6%
Professional Experience	0 to 10 years	84	22.9%
	11 to 20 years	119	32.4%
	Above 20 years	164	44.7%

As per the result of Table 1, it has been figured out that the majority of respondents, 209 (56.9%), are between 31 to 41 years. On the other hand, 133 (36.2%) belong from below 30 years, while only 11 (3.0%) are from 42 to 52 years. There are also 14 (3.8%) participants who are above 52 years. On the other hand, 193 (52.6%) are male, while only 174 (47.4%) are female. It has also been pointed out that 164 (44.7%) have a professional experience of above 20 years, while only 84 (22.9%) have between 0 to 10 years. It has also been found that 119 (32.4%) have professional experience between 11 to 20 years.

Measurement of Model Evaluation

Reliability and Validity

It has been found that the value for Cronbach's alpha is .903. It falls between the acceptable range of reliability and refers to the implemented five-point Likert scale as significant for this research. The Cronbach alpha value for standardized items is also .908 means that if the value for any variable is changed, the reliability also remains the same. This stability across the standardised items used in the current study shows that the scale is robust against minor variations in item phrasing or order.

Table 2

Cronbach's Alpha

Reliability Statistics

	Cronbach's Alpha	Based on
Cronbach's Alpha	.903	N of Items
	.908	5

Validity Analysis

As per the result of Table 2, it has been identified that all correlations are significant at the 0.01 level (two-tailed method). It means all of the variables have a strong and positive relationship with each other. The highest correlation value is observed between RA and PD, which is .803; it refers to a strong correlation. This strong correlation between RA and PD indicates that educators who perceive AI as beneficial are better able to engage in professional development activities.

Table 3

Distinguishing Validity- Pearson's Correlation Coefficient Test

Correlations		TT	A	C	RA	PD
TT	Pearson Correlation	1	.761**	.656**	.560**	.634**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	367	367	367	367	367
A	Pearson Correlation	.761**	1	.685**	.552**	.495**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	367	367	367	367	367
C	Pearson Correlation	.656**	.685**	1	.764**	.719**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	367	367	367	367	367
RA	Pearson Correlation	.560**	.552**	.764**	1	.803**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	367	367	367	367	367
PD	Pearson Correlation	.634**	.495**	.719**	.803**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	367	367	367	367	367

****.** Correlation is significant at the 0.01 level (2-tailed).

Multiple Linear Regression Analysis

As per the result of Table 3, it has been understood that all four variables, TT, A, C, and RA, have a significant impact on the PD. The sig value for all of the variables is .000, which is

lower than 0.05 and makes a significant and positive impact in this research. The positive significance values for TT, C and RA show that the increase in these variables is associated with higher levels of professional development engagement.

Table 4

Multiple Linear Regression Test

Coefficients ^a							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	-.336	.138		-2.430	.016	-.607	-.064
TT	.390	.049	.354	7.872	.000	.292	.487
A	-.317	.063	-.233	-5.035	.000	-.441	-.193
C	.248	.060	.206	4.107	.000	.129	.366
RA	.783	.059	.576	13.268	.000	.667	.899

a. Dependent Variable: PD

The sig value for both Teacher's Compatibility (C) and Teacher's Relative Advantage (RA) is also less than 0.05, that is, .000. It means teacher's compatibility helps teachers to integrate relevant AI tools to cope with compatibility issues. Compatibility showcases the alignment between AI tools and existing teaching practices. The beta value of 0.206 shows that when educators perceive AI as congruent with their instructional style, they are better able to engage in different professional development as well as adopt new technologies better too.

The quantitative data analysis is conducted based on the data collected from the 367 teachers belonging to the higher education sectors of Beijing, China, who are pursuing their jobs under "Beijing Normal University". A maximum of these teachers have an age between 30 and 40 years and have a teaching experience of more or less than 10 years. Furthermore, the median value obtained in this case ranges between 3.0000 and 3.3333. In addition, the range obtained after the calculation of the mode value is between 2.83 to 3.33. Therefore, it is identified that from the mean, median, and mode value outcome, the values are not highly extreme and the chances of the presence of outliers is very less as identified from the outcome gained in this study. The validity testing is conducted by investigating the correlations between the variables. Thus, a "Pearson's Correlation Test" is conducted under the study. Thus, the developed predictive statements proved correct from the results gained after the quantitative data analysis test. Previous researchers like Akram et al. (2022) have identified that the conscience between knowledge and skills of teachers is very important, which indicates their professional development. From the outcome generated through quantitative data analysis, it can be stated that the support of training is very crucial for the teachers to upgrade their skills and collaborate more effectively with their students.

Conclusion

The outcome gained from the research helps in recognising that importance of training support provided to teachers, attitude towards AI use, compatibility of teachers as well as professional development plays an important role in the improvement or professional development of them. Studies help in recognising a relative advantage of using the AI

technology plays an important role in the professional development of learners. It also helps in addressing the gaps identified from the previous research, which shows that understanding about the relative advantages of using AI and educational institutions should take necessary initiatives for improving the compatibility of teachers for the improvement of their performances as well as mitigation of the level of resistance observed within them.

Apart from this, it should also be discussed in this matter; the outcome gained in this study adds value or improves understanding about the theoretical concept, which are incorporated in this study. Based on the incorporated theories (diffusion of innovation theory and TPACK). It can be stated that the outcome obtained in this study helps in enhancing or identifying the factors (for example, attitude or perception about relative advantage of using AI) that insist in accepting innovative solutions. The research outcomes have significant practical implications for the management of higher educational institutions and teachers. As identified from the previous studies, incorporation of digitalised as well as AI-based learning activities are increasing in the higher education sector of China.

The data analysis conducted here is based on collecting data from the teachers of a specific university of Beijing, China. Thus, it should be mentioned in this context the outcome may not have equal implication for other regions of China, especially where the access of digital technology is comparatively poor. The identified limitations can be managed properly by the future researchers, which may be helpful for the mitigation of the existing gaps. For example, they can emphasize more on the barriers that may higher educational institutions face in improving the access of digitalised or AI-based education especially for teachers. Conducting a mixed-method study based on the specific context can be beneficial to gain more in-depth insights for accomplishing research. Apart from this, the study can be done by considering multiple regions of China to gain a more critical idea or overview in this case.

Ethical Statements

This study was conducted in accordance with institutional ethical guidelines, and no harm was caused to any participants.

Statements and Declarations

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

Competing Interests

The authors declare that they have no known competing financial or personal interests that could have influenced this work.

Informed Consent Statement

Informed consent was obtained from all participants prior to their voluntary participation in the study.

Author Contributions

All authors contributed substantially to the conceptualization, data analysis, writing, and final approval of the manuscript.

Artificial Intelligence (AI) Usage

AI tools were used only for language editing and formatting support; no AI was used for data generation or interpretation.

Acknowledgements

First and foremost, I would like to express deepest gratitude to my professor for his guidance, advice and support for my research project. I would also like to thank the research and administration staff at UKM for their technical assistance. A big thank you to all my colleagues for all their assistance and helpful suggestions. I want to convey thanks to Allah the almighty. And finally, to my family especially my parents who supported and encouraged me throughout my endeavour. I would like to thank all post graduate students of UKM power research group for their help, friendship, and creating a pleasant working environment throughout my years in UKM.

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