

APPROVAL

‘I hereby acknowledge that I have read this and in my opinion this work sufficient in terms of scope and quality for the award of a Bachelor Degree in Technology Management and Technopreneurship (Technology Innovation)’

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ELECTRIC BUS ADOPTION FOR SUSTAINABLE PUBLIC TRANSPORT
PLANNING: A CASES STUDY AT PANORAMA MELAKA SDN BHD AND
UNIT PERANCANG EKONOMI NEGERI (UPEN)

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Report submitted in fulfilment of the requirement for the degree of Bachelor of
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DECLARATION

“I hereby, declared that this thesis entitled “Electric Bus Adoption for Sustainable Public Transport Planning: A Cases Study at Panorama Melaka Sdn Bhd and Unit Perancang Ekonomi Negeri (UPEN)” is the results of my own research except as I have been cited in reference.

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Date :

DEDICATION

This Final Year Project is dedicated to my beloved parents, family and friends for their loves, endless support, encouragement, attention and prayers.

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In the name of Allah, the Compassionate, the Merciful, Praise be to Allah, Lord of the Universe, and Peace and Prayers be upon His Prophet and Messenger. With Grace and Blessing from Allah, I am Husnul Laili Binti A Rahman from Faculty of Technology Management and Technopreneurship have succeeded in completing my thesis as a dissertation of my Bachelor Degree in Technology Management (Technology Innovation) with Honours. First and foremost, Alhamdulillah, all praises to Allah for the Strengths and His Blessing, I have succeeded in completing this thesis. Special appreciation goes to my supportive supervisor, Dr. Chew Boon Cheong for his supervision and constant support during performing this thesis. His invaluable help of constructive comments and suggestions throughout this thesis works have contributed a lot to the success of this research. Besides that, special thanks to Mr Albert Feisal @ Mohd Feisal bin Ismail for his insightful comment and encouragement as a panel to make me continuous make improvement and deliver my best during my thesis's journey.

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ABSTRACT

Nowadays, application of green and clean fleet technology on the road meets the need of sustainable public transport planning because the critical level of global greenhouse gases and to build up society to become environmental sensitive towards public transportation. Malacca Government State through its roles supporting the National Policy embarked a roadmap of clean air quality emphasized on transportation for now and future generations. Electric bus is a battery powered vehicles which emit no pollution, quiet and energy efficiency to be adopted as a main public transportation in urban area. Therefore, it is precise on two key concepts as a mechanism of successful implemented this project which focused on factors and strategies in adopting electric bus. Since that, the factors need to be considered in adopting electric bus is environmental, social, technology, political, depletion petroleum resources, battery, charging network, maintenance and cost factor. However, the organizations also arranged the strategies to be involved in adopting electric bus emphasized on government stimulus, charging infrastructure, research and development, venture capital investing and education to society. In this case study, Panorama Melaka Sdn Bhd and Unit Perancangan Ekonomi Negeri (UPEN) were selected as responsible organization to investigate the factor and strategies involved in adopting electric bus. The respondent of this case study will be aim for 30 respondents from middle management and executive through qualitative in-depth interview to ensure the reliability and validity of data collection in this research. As conclusion, the innovative suggestion is recommended for future research significantly as development and dynamic improvement for the next academic research.

Key Words: Technology Adoption, Electric Bus, Sustainability City Transport Planning.

ABSTRAK

Pada masa kini, penggunaan teknologi hijau yang mesra alam di jalan raya memenuhi keperluan rancangan pengangkutan awam yang mampan ekoran tahap gas rumah hijau global yang semakin kritikal disamping memupuk masyarakat menjadi lebih sensitif terhadap alam sekitar melalui penggunaan pengangkutan awam. Kerajaan Negeri Melaka melalui peranannya menyokong Dasar Negara dengan memulakan pelan tindakan kualiti udara bersih menekankan penggunaan pengangkutan untuk masa kini dan generasi akan datang. Bas elektrik adalah kenderaan berkuasa bateri yang tidak mencemarkan alam sekitar, senyap dan memiliki kecekapan tenaga yang boleh diaplikasikan sebagai peneraju utama pengangkutan awam di kawasan bandar. Oleh itu, bertepatan dengan dua konsep utama sebagai mekanisma untuk menjayakan projek ini, ia memberi tumpuan kepada faktor-faktor dan strategi-strategi dalam penggunaan bas elektrik. Maka dengan ini, faktor-faktor yang perlu dititiberatkan dalam penggunaan bas elektrik adalah alam sekitar, sosial, teknologi, politik, kekurangan sumber petroleum, bateri, stesen janakuasa pengecasan, penyelenggaraan dan factor kos. Walau bagaimanapun, organisasi juga mengatur strategi dalam pengambilan bas elektrik yang memberi keutamaan kepada rangsangan kerajaan, infrastruktur pengecasan, penyelidikan dan pembangunan, pelaburan modal teroka dan pendidikan kepada masyarakat. Dalam kajian kes ini, Panorama Melaka Sdn Bhd dan Unit Perancangan Ekonomi Negeri (UPEN) telah dipilih sebagai organisasi yang bertanggungjawab untuk mengetahui faktor-faktor serta strategi yang terlibat dalam penggunaan bas elektrik di Melaka. Kajian ini juga mensasarkan 30 responden yang terdiri daripada bahagian pengurusan dan eksekutif melalui kaedah kualitatif temuduga untuk memastikan kebolehpercayaan dan kesahihan pengumpulan data dalam kajian ini. Kesimpulannya, cadangan yang inovatif juga dikemukakan untuk penyelidikan masa depan bagi tujuan pembangunan dan peningkatan yang dinamik untuk penyelidikan akademik akan datang.

Kata Kunci: Adaptasi Teknologi, Bas Elektrik, Rancangan Pengangkutan Bandar yang Mampan.

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LIST OF ABBREVIATIONS, SYMBOLS & NOMENCLATURE

UPEN	=	Unit Perancang Ekonomi Negeri
TNB	=	Tenaga Nasional Berhad
GHG	=	Greenhouse Gases
ICE	=	Internal Combustion Engine
WPT	=	Wireless Power Technology
DC	=	Direct Current
EEE	=	Environment, Economy and Equity or Inclusive Growth
Sd	=	Standard Deviation
TAM	=	Technology Acceptance Model
PU	=	Perceived Usefulness
PEU	=	Perceived Easy of Use

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

The 9th Malaysia Plan has highlighted, petroleum source in Malaysia has been targeted will deplete on 2024 because of its high usage for transportation, industry power, lubricant and others. The renewable energy will take place over the time to replace the finite resources that will deplete within the estimation year. Since that, to have a sustainable public transport planning, Malacca has chosen to adopt electric bus with two different battery technologies from China. The AMDAC's Principal Officer of Innovation and Solutions, Datuk Rafie Sain in MOTORME.MY's website said that "Malacca is a perfect city for testing electric buses because it is a historic city with 500 year old buildings and we don't want to coat these buildings with soot and sulphuric acid" (Ayisy Yusof, 2015).

Electric Bus is one of the new environmental friendly transportation or clean technology which can boost the appeal of sustainable public transport planning. The

finiteness of petroleum resources and due to the ecological, environmental and economic factors, the usage of electric vehicle in urban transportation becomes more efficient and attractive. Referring to Helmers and Marx (2012) to meet future needs, reduce climate as well as health relevant emission and phase out dependence on petroleum, today's propulsion technologies have to be replaced by more efficient and environmentally friendly alternatives. Hence, it is the first step of both eco-efficiency and eco-effectiveness within the public transport sector.

Therefore, adopting electric bus is also interrelates with sustainable public transport planning. The sustainability public transport planning by means using a public transport as a main transportation in city, provide more efficient vehicles and promote the alternative fuel such as use the electric-based vehicles. The sustainability word itself comes from Robertson (2014) defines the word "sustainability" referring to the systems and processes which are able to persist and operate in public transport planning over a long periods of time. Therefore, low-carbon, sustainable transport reduces short and long term negative impacts on the local and global environment, has economically feasible infrastructure and operation as it provides safe and secure to the community and country (Dalkman and Huizenga in Bongardt et. al, 2011).

Adopting electric bus will encourage clean transportation to sustain public transport planning that gives beneficial impact to the community. This is because electric bus is quiet, exhaust emission-free, less noisy vehicles and more energy-efficient than conventional diesel-powered buses. Therefore, the researcher needs to identify the factors adopting electric bus. Besides that, the researcher need to emphasize the strategies involved in adopting electric bus. Last but not least, this study will provide the innovative solution focused on the local authority and the company to foster the electric bus adoption for sustainable public transport planning in Malacca.

1.2 Problem Statement

In aspect of sustainability of public transport planning, Malaysia is lagging behind the major market in transportation sector of China, South Korea, Germany, Netherlands and US. Pojani and Stead (2015) emphasize that in developed countries often being as leading example of sustainable urban development as cities across the world strive to meet urban sustainability standards by improving public transport, encouraging non-motorized modes, creating pedestrian zones, limiting the use of private cars and trying to undo the transformation of cities caused by automobile dominance. Therefore, there is the problem of gap between developed countries and the developing countries such as Malaysia.

Even though adopting electric bus gives beneficial impact to the citizen, states and environment such as zero emission and noise reduction, cost saving for operation and even it can be a new attraction point for tourism but in terms of adopting clean technology in transportation to sustain public transport planning it should be enlarge to the nation's capital such as Kuala Lumpur which is the highest congested city to reduce carbon emission. The researcher should identify the factor adopting electric bus to sustain public transport planning that existing the technology adoption in developed country in order toward nation 2020, despite of to start adopting electric bus to sustain public transport planning. Thus, Malaysia is necessary to breakthrough the gaps between our nation and developed countries.

1.3 Research Question

Based on the problem arise adopting electric bus, it emphasizes on three research questions that involved the factors, strategies and innovative solutions adopting electric bus to sustain the public transport planning in Malacca.

The research questions arise is:

- i. What are the factors rendered Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) in adopting electric bus?
- ii. What are the strategies involved in adopting electric bus in Malacca by Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN)?
- iii. What are the innovative solutions (for the local authority and the company) to foster the electric bus adoption for sustainable public transport planning in Malacca?

1.4 Research Objective

The objective of this study is to investigate the factor adopting electric bus by Panorama Melaka Sdn Bhd and Unit Perancang Ekonomi Negeri (UPEN) as one of their green project to the Malacca state. Besides that, this study also determined the strategies involved in adopting electric bus in Malacca. In addition, this study to provide the innovation solution focuses on local authority and the company to cultivate the electric bus adoption to sustain the public transport planning in Malacca.

The research objective of this project is:

- i. To examine the factors rendered Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) in adopting electric bus.
- ii. To investigate the strategies involved in adopting electric bus in Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN).
- iii. To suggest the innovative solution (for the local authority and the company) to foster the electric bus adoption for sustainable public transport in Malacca.

1.5 Scope, Limitation and Key Assumption of Study

The research scope of this project is focus in green and sustainable practices. Firstly, researcher needs to identify the factor adopting electric bus to sustain the public transport planning. Secondly, the research scope is focus on the strategies involved in adopting electric bus. Lastly, the research scope emphasize in suggestion of innovation focused on the local authority and the company to foster the electric bus adoption for sustainable public transport planning. The study is conducted in Malacca at the Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) to gain adequate and comprehensive information.

There are two limitations are identified while conducting this study. Firstly, the cases study is conducted in Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) which it can be generalized on the similar industry only. Secondly, the cases study is only assumed respondents gave the honest answer during interview session.

The key assumption is the researcher assumes that Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) have been done the green project adopting electric bus as one of the main public transportation to sustain the public transport planning. Both of the company is successfully adopted two different battery technologies of electric bus as the company is expertise in their field. In future, the researcher assumes that Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN) will adopt more electric bus with different technologies that comes from Germany, South Korea and US who already establish use the electric bus to have a sustainable public transport planning.

1.6 Research Significance

This research is important to the three categories of stakeholders when conducting the cases study at Panorama Melaka Sdn. Bhd and Unit Perancang Ekonomi Negeri (UPEN). There are three categories of people needs to be consider for collecting data and obtain the comprehensive information.

i. Unit Perancang Ekonomi Negeri (UPEN)

The group of respondents is focused on the middle management such as personnel management manager and research and development (R&D) manager. These groups of respondents are responsible for planning, monitoring and coordinating the green project regarding adopting electric bus in Malacca. The researcher is also provides innovative suggestion to the

authority and the company to foster the electric bus in order to have a sustainable public transport planning.

ii. Panorama Melaka Sdn. Bhd.

The group of respondent divided into two departments which are technical and operation management. This is because technical and operation department who responsible with the adoption of electric bus in the road where they need to determine the route should be taken off with the maintenance work along operation of electric bus in Malacca. In addition, the group of respondent is sales and marketing department in Panorama Melaka Sdn. Bhd. This is because they making decision for project launching date, conduct the market research in order to spread the words of green technologies that have been adopted in the electric bus to the community.

iii. Malacca Government's Transportation

This study is important to the Malacca Government's Transportation to have sustainable public transport planning. This is because transportation in Malacca is one of the important components in the provision of public facilities. The researcher provide factors and strategies to adopt electric bus so that it can be used to the Malacca Government's Transportation to have a systematic plan on the public transportation towards environmentally friendly nation.