

Development and Assessment of Multi-Powered Tricycle

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Abstract: The impacts of COVID-19 on travel demand, traffic congestion, and traffic safety are attracting heated attention that commuters and motorists in the Philippines were also among the hardest hit this year. There were months when the entire country's transportation system came to a halt, resulting in stagnant automobiles and people, and thus a weak economy.

In this case, using of bicycles get recognition because of no cars, no trains, and no cabs. One bright side to the COVID-19 lockdown was that local governments, after seeing a severe shortage in transportation alternatives, finally started giving the local cycling scene the attention it deserves.

This study dealt with the development and assessment of multi-powered bicycle as instructional material in automotive technology.

The study revealed that the multi-powered hybrid tricycle was successfully developed by adhering to the processes of planning, designing, manufacturing, and testing. The electric motorcycle projects on the platform are purely theoretical. In the technological world, the vehicle is very important, but it also has problems with pollution and emissions. To get around these problems, the researcher employed a variety of methods. Half- bike hybrids are one of the options and a source that are easily accessible. The MPHT constantly seeks out high levels of productivity in the future.

Keywords: bicycle, commuters, hybrid, transportation, tricycle

Introduction

The impacts of COVID-19 on travel demand, traffic congestion, and traffic safety are attracting heated attention that commuters and motorists in the Philippines were also among the hardest hit this year. There were months when the entire country's transportation system came to a halt, resulting in stagnant automobiles and people, and thus a weak economy.

In this case, using of bicycles get recognition because of no cars, no trains, and no cabs. One bright side to the COVID-19 lockdown was that local governments, after seeing a severe shortage in transportation alternatives, finally started giving the local cycling scene the attention it deserves. Bike lanes were put up, and it appears future infrastructure projects and budgets will begin taking cyclists into account during planning while Metro Manila still has a long way to go before one can consider it bike-friendly.

In response to the rapid increase of electric bicycle (e-bike) usage, a questionnaire survey on e-bike users was conducted in Shanghai. Travel characteristics and traffic mode transferring features of e-bike users were analyzed. The main results are as follows: e-bike users are mostly in middle and low level income brackets; users of different ages or genders have no significant differences in terms of trip characteristics; e-bikes are mostly used for commuting, during which the travel time is generally less than 40 minutes; “more labor-saving than bike and more convenient and faster than bus” are the main reasons why users choose e-bikes; if the use of e-bike was prohibited, 55% of users would transfer their commuting mode to bus and 33% would choose bike as commuting mode. Findings in this survey are of good value for the function orientation of e-bike and policy-making (Sciedirect.com, 2013).

The surroundings are continuously changing nowadays. In fact, pollution is already putting lives in jeopardy. However, as the environment evolves, so does the need to become more conscious of the issues that exist in it. Global warming is a serious issue, but it is by no means the end of the planet. With the advancement of the economy, the usage of fossil fuels such as coal and oil has a long-term negative impact on our planet. Not only do they pollute the air, but they also deplete the ozone layer and contribute to the greenhouse effect, which causes global warming. They have a huge impact on the ecosystem.

This research focuses on harnessing nature's power, specifically the sun's power, which eliminates the need for electricity in multi-powered e-bike operation. Researchers create the multi-powered e-bike to reduce pollution in the environment by using solar energy to generate electricity, making it a green machine and environmentally beneficial equipment. Its design is based on the idea of greening the environment for future generations to dwell in. The modernization of this equipment will be implemented for the greater good of humanity.

Conceptual Framework

The concept of Input-Process-Output (IPO) model will be used in this study. The IPO model is a functional graph that identifies the inputs, outputs, and processing activities necessary to convert inputs into outputs. The model is sometimes set to incorporate any storage that may occur during the procedure.

The input box contains the initial design and materials to be used for the proposed product. The researcher determined the design of the multi-powered bicycle that will use in transportation. The process box contains the parameters to be followed during development and assessment of multi-powered bicycle.

The finalizing and evaluation of the multi-powered bicycle based on the result of the assessment is housed in the output box.

Statement of the Problem

This study dealt with the development and assessment of multi-powered bicycle as instructional material in automotive technology.

Specifically, the study aimed to describe the following:

1. How may the Multi Powered Bicycle be developed in terms of the following phases:
 - 1.1 Planning,
 - 1.2 Designing,
 - 1.3 Assembly, and
 - 1.4 Testing?
2. How may the technical characteristics of the Multi Powered Bicycle be assessed by bicycle owners in terms of:
 - 2.1 Functionality;
 - 2.2 Reliability;
 - 2.3 Efficiency; and
 - 2.4 Maintainability?
3. How may the technical characteristics of the Multi Powered Bicycle be assessed by bicycle seller in terms of its:
 - 3.1 Functionality;
 - 3.2 Reliability;
 - 3.3 Efficiency; and
 - 3.4 Maintainability?
4. How may the technical characteristics of the Multi Powered Bicycle be assessed by commuters in terms of its:
 - 4.1 Functionality;
 - 4.2 Reliability;
 - 4.3 Efficiency; and
 - 4.4 Maintainability?
5. How may the technical characteristics of the Multi Powered Bicycle be assessed by industry experts in terms of its:

- 5.1 Functionality;
 - 5.2 Reliability;
 - 5.3 Efficiency; and
 - 5.4 Maintainability?
6. What is the level of effectiveness of the implementation of the developed multi-powered bicycle?

Scope and Delimitation

This study focused on the development of the multi-powered hybrid bicycle an alternative and innovative velocipede vehicle. It was assessed by four (4) group of respondents such as bicycle owners, sellers, commuters and industry experts. The built-in battery of the bicycle was powered by solar panel and direct current, which utilized to power the hybrid bicycle motor. The solar panel is limited to 150watts/57v and 48v battery.

METHODS AND PROCEDURE

This chapter discusses the research design, locale of the study, respondents, population and sampling, research instruments, data gathering procedure, and the data analysis techniques.

Research Design

This study utilized the developmental method techniques for gathering data (information) about individuals that enable the researcher to see how individuals vary or change with age because the researcher developed a prototype of multi-powered bicycle as instructional material in automotive technology. According to Richey and Nelson (2001), it is the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet internal consistency and effectiveness criteria.

Sampling Technique

Purposive sampling utilized in selecting the bicycle sellers and owner respondents of the study. It is also known as judgment, selective or subjective sampling. It is a sampling technique in which researcher relies on his or her own judgment when choosing members of population to participate in the study (Research-methodology.net, 2012).

On the other hand, convenience sampling will be used in selecting the commuter respondents. Convenience sampling is defined as a method adopted by researchers where they collect market research data from a conveniently available pool of respondents. It is the most commonly used sampling technique as it is incredibly prompt, uncomplicated, and economical.

Data Gathering Instruments

The two sets of research questionnaires for bicycle sellers, bicycle owners and commuters that will be used in this study are self-made by the researcher.

The first survey instrument was used by the respondents to assess the technical characteristics of the proposed multi-powered with respect to functionality, efficiency, reliability, and maintainability.

The second instrument was used by the respondents to assess the level of effectiveness of the proposed device based on its operation and accuracy.

Research Procedures

Data collection activities in this study are described as follows:

1. Development Phase

In the development phase, the researcher will seek advice and suggestions from thesis adviser and experts to collect information needed in analyzing the blueprint design and materials.

The researcher will then determine the intended design of the multi-powered bicycle based on the recommendations and suggestions of the thesis adviser and experts.

In the assembly phase, the researcher will create the proposed multi-powered bicycle based on its blueprint design and materials specification.

The multi-powered bicycle will be subjected to several tests during the testing phase.

2. Assessment Phase

The researcher will ask three groups of respondents, namely bicycle sellers, commuters, and bicycle owners, to rate the multi-powered bicycle technical characteristics based on ISO 9126 quality standards such as functionality, efficiency, reliability, and maintainability. After the assessment, data will be analyzed and interpreted.

Data Analysis Techniques

The data gathered will be analyzed using the appropriate technique and statistical tools to give substantial descriptive interpretation of the results and findings of the study.

1. The development phases of the proposed multi-powered bicycle will be presented and discussed textually based on planning, designing, assembly and testing phases.
2. Weighted mean and percentage will be used to analyze the data gathered as to how the device is assessed in terms of technical attributes based on the ISO 9126 criteria on functionality, efficiency, reliability, and maintainability. The weighted mean from each statement in the questionnaire will be scored and interpreted using the four-point Likert scale.
3. To determine the level of effectiveness of the implementation of the developed device, it will be analyzed using weighted mean and interpreted using a scoring guide.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The synopsis of the study focused on the development and assessment of the MPHT. The results of the study are briefly described as follows:

1. The stages of planning, designing, assembly, and testing were used to develop the MPHT. Under the planning stage. In his design, instead of using gas, the researcher utilized a lead acid battery to run his trike which can be charged using electric current or through solar photovoltaic energy. Likewise, it can be manually treadled in case the battery is in its low power mode. During the assembly stage, the researcher carefully performed the construction of his trike to avoid mistakes. Also, the researcher used the intended materials, and required tools and equipment during this stage. Under the testing stage, the researcher cautiously tested all the functionalities his developed velocipede before deploying into its intended users to avoid inconvenience. In general, the development of the multi-powered hybrid tricycle was performed efficiently. A new product's requirements are conceptualized by the researcher. Product concepts define a scope and have a direct impact on cost and completion date. The following are the most crucial factors to take into account: requirements, life expectancy, prototype cost, execution, materials used, and production testing. To complete the perfect prototype, researchers have created each of these.
2. The Multi-powered Hybrid Tricycle the MPH very functional, very reliable, very efficient, and very maintainable.
3. In terms of level of effectiveness of the Multi-powered Hybrid Tricycle, all the respondents approved this particular niche Highly Effective as a normal private or public service vehicle.

Conclusions

Based on the results of the study, the following conclusions were drawn:

1. The multi-powered hybrid tricycle was successfully developed by adhering to the processes of planning, designing, manufacturing, and testing. The electric motorcycle projects on the platform are purely theoretical. The ideal tricycle of some platform designers becomes a reality as a result of their ideologies.
2. The designed hybrid tricycle was scored well by the four group of respondents for its functionality, reliability, efficiency, and maintainability. In the technological world, the vehicle is very important, but it also has problems with pollution and emissions. To get around these problems, the researcher employed a variety of methods. Half-bike hybrids are one of the options and a source that are easily accessible. A hybrid is a system that combines two or more different energy sources. Consequently, the researcher created the MPHT to fit into its intended users.
3. The four groups of respondents agreed that the developed multi-powered hybrid tricycle is highly effective during its implementation. They agreed that the MPHT constantly seeks out high levels of productivity in the future.

Recommendations

Based on the results of the study and the conclusions drawn, the following recommendations are offered:

1. To make the side car of the multi-powered hybrid tricycle lightweight and aesthetically presentable, it is recommended to utilize stainless steel.
2. The built-in lead acid 12ah battery of the developed hybrid tricycle is suggested to upgrade into lithium-ion batteries for fast charging capability.
3. To make the multi-powered hybrid tricycle gain more speed, it is advised to change the default e-bike controller installed into a larger piece.
4. It is commended to utilize LED lights to lower the depletion of the built-in battery.
5. To safeguard the researcher's developed multi-powered hybrid tricycle, it must be endorsed immediately for patenting.
6. That further research commences to assess the acceptability of the developed hybrid tricycle for possible commercialization.

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