DESIGN, DEVELOPMENT AND MANAGEMENT OF UNIMAP'S GREEN TRANSPORTATION SYSTEM

by

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بسم الله الرحمن الرحيم

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I dedicate this study

For Children in all the world

Vulnerable People Who Need Our helps

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LIST OF ABBREVIATIONS

PERT	Program Evaluation Review Technique
PM	Project Manager/ Project Management
WBS	Work break down structure
UGTDDP	UniMAP's Green Transportation Design and Development Project
GPM	Green Project management
EMS	Environmental management system
IGEM	Eco Items Presentation and Gathering Malaysia
GT	Green Transport
IT	Information Technology
ICT	Information and Communication Technology
WG	Work gatherings
PDCA	Plan-do-check-act
ETTAR	Environmental Technologies Training and Awareness Rising
EU	European Union
PEST	Political, economic, social, and technological
SLEPT	Social, legal, economic, political, and technological
TWQ	Teamwork Quality
TWM	Team Work Model
MTM	Member Task Model
CPM	Critical path method
RM	Risk model
QC	Quality control
ISO	International standards organization
AHP	Analytic Hierarchy Process

Merekabentuk, Pembangunan dan Pengurusan Sistem bagi Sistem Pengangkutan Hijau Unimap

ABSTRAK

Kajian ini bertujuan untuk menerapkan Pengurusan Projek yang tepat (PM) prinsip dalam pelaksanaan UGTDDP (Rekabentuk Hijau Pengangkutan UniMAP dan Projek Pembangunan), Untuk memastikan bahawa UGTDDP dilakukan secara efisien dari segi masa, kos, kualiti, dan aspek hijau, Untuk memastikan kesinambungan projek itu untuk masa depan dengan mengembangkan dokumentasi yang tepat dari UGTDDP (Pengangkutan Green Design UniMAP dan Projek Pembangunan) dan Untuk mengambil bahagian dalam perancangan sebenar, reka bentuk, pembangunan, pelaksanaan, dan pemantauan sistem baru pengangkutan hijau Unimap ini. Kajian ini dilakukan dengan menggunakan alat-alat pengurusan dan penjadualan seperti memohon AHP, WBS, PERT, CPM. Selain memenuhi yang melakukan projek ini untuk menganalisis data projek dan untuk menyediakan reka bentuk terbaik untuk kenderaan pintar. Dalam usaha untuk menyediakan reka bentuk pengurusan patut untuk projek ini, alat-alat pengurusan dan alat jadual yang digunakan. Hasil penelitian menunjukkan bahawa projek ini adalah baik dari segi struktur itu, sesuai dengan tujuan dan manfaat kepada alam sekitar. Peneliti disyorkan untuk semua jenis kajian ini untuk mencari sumber wang, perancangan yang baik untuk membuat projek yang lebih sesuai dengan alam sekitar dan tamadun dan mencari strategi untuk membuatnya mampan.

Designe, Development and Management of Uimap's Green Transportation System

ABSTRACT

This study aims to apply proper Project Management (PM) principles in the execution of UniMAP's Green Transportation Design and Development Project (UGTDDP) and Smart Vehicle (SV). This is to ensure that the UGTDDP is carried out efficiently in terms of the time, cost, quality, and green aspects. Besides, the objective is also to ensure the continuity of the project for future purposes by developing proper documentation of the UGTDDP and to participate in the actual planning, design, development, implementation, and monitoring of the UniMAP's new system green transportation. The study was performed by using the management tools and scheduling, Analytic Hierarchy Process (AHP), Work Breakdown Structure (WBS), Program Evaluation Review Technique (PERT) and Critical Path Method (CPM) to achieve the objectives of the study. A collected information that related to the project and computational analyzes were performed. The result showed that this project is good in term of it structure, fit the set objectives and beneficial to the environment. In addition, results have shown using 4-seats vehicles would help achieving the social goal. Besides, using the electrical and human body energy in vehicles are the optimum way to satisfy the environmental objectives of the project.

CHAPTER 1

INTRODUCTION

1.1 Background

The UniMAP Green transportation design and development project (UGTDDP) is a project to design, develop, and use a transportation system that utilizes green technology. It allows for advanced technology to be adapted and put into practice much more efficiently. The UGTDD project aims to satisfy the needs of students, staff and faculty members, and at the same time, it keeps in view the requirement to safeguard the environment. The vehicle designed is based on the principal of sustainability, with distinct features for both social and economic benefits for the society.

“Green” is not simply a color. Rather, it represents the concept of eco-friendliness, social justice, economic development, and healthy living. While “environmental protection” stresses reduced pollution and waste, the concept of “green” is broader. Green industry is sustainable industry. Green industry considers recycling, low pollution, and energy conservation. It is also about the use of clean energy sources such as the wind and the sun, considerations on usage and disposal cycle, environmentally friendly material purchasing, and many other aspects related to production, processing, packaging, marketing, and waste management.

"Green project management" is a management concept which thinks green all through the entire process’s undertakings. It settles on choices that consider the effect

on nature's domain. It is an approach to imbue "green think" into each related administration process.

In the past, companies managed projects by way of assigning the project and the essential resources to an individual using some form of project management structure. The project management concept is explained as comprising tools and techniques that help in directing the usage of diverse resources for the purpose of accomplishing unique, one-time task within time, cost, and quality constraints. Every task needs a specific mix of these tools and techniques which are developed to suit the task environment and life cycle from conception to completion (Atkinson, 1997).

Using project management techniques helps in reducing the disruption of daily business activities by placing all the skills, technologies, and resources needed for the project under a single command. The form of project management will be unique for every project endeavor and will change throughout the project (Atkinson, 1997)

Usually, a control system is designed by management engineers. Now, an effort is made to develop systems which will support change. With this shift, which is a shift from project focus to systems focus, various disciplines and departments can be reasonably managed. Management engineering takes help from industrial engineering, for the purpose of making available internal consulting services for all departments within the organization, so that the task of implementing, developing, and monitoring become more efficient and cost effective for facing challenges in the future.

Industries face various challenges related to time, cost, quality, and targets when it comes to implementing projects. These challenges have strong connections with management. Management processes have aspects that can enter into the modern human's lives, and these aspects have various applications in project management. Engineering science solves problems using savvy technological solutions that can be applied to organizational, administrative, and planning processes.

Today, project management incorporates green thinking in its planning, monitoring, and execution phases. In fact, green projects are currently considered among the broadest areas of engineering management in manufacturing, energy, electrical and communication disciplines. Nearly all current environmental problems in land, water and air originated from production and consumption patterns created during the industrial revolution. Adopting proactive environmental management approaches is an alternative way to attenuate these impacts.

1.2 Successful Green Project Management

Green consciousness has been around for quite some time, particularly since the 1970s. Throughout the years, green consciousness was exhibited through neighborhood 'reducing, reusing, and recycling' projects, the sort of vehicles bought by consumers, and the consideration regarding carpooling. This calling appears to be in its early stages in terms of applying green benchmarks. From the start, it creates the impression that any undertaking can be made green by reusing and lessening the utilization of assets.

Project management (PM) is considered a challenging task with various difficult responsibilities. Fortunately, there have been many tools which ensure help in accomplishing the task and executing the responsibilities. Some need computer software while others can be handled manually. It is up to the project manager to select the best project management tool that is most appropriate to the nature of the project and the project manager's style. Program Evaluation Review Technique (PERT) and Gantt Charts are two of the most commonly used project management tools. Both of these tools can be used manually as well as with available project management software (Wilson et al., 2002).

The success of any environmental management approach to PM can be achieved with the help of adopting several techniques, namely:

1. Specialized techniques that aim at minimizing the environmental influence of the products which are used or developed by companies,
2. Clean technology both in services and manufacturing,
3. Management systems that support the inclusion of environmental awareness in various departments in the organization, including marketing and operations.

Work break down structure (WBS) is a tool that organizes the entire work of the team into manageable sections. The WBS is defined as "deliverable oriented hierarchical decomposition of the work to be executed by the project team." It visually defines the work scope into manageable chunks that a project team can understand, and each level of the WBS provides further definition and detail (Globerson, 1994).

The use of WBS has various benefits in defining and organizing the project work. The budget of the project can be allocated to the top level of WBS. On the basis of the WBS, the project budget can be easily and quickly calculated. With the allocation of estimates of time and cost to a particular section of the WBS, the schedule and budget of the project can be easily developed. As the project is implemented, specific sections of the work breakdown structure can be tracked to identify project cost performance and identify issues and problem areas in the project organization (Zwikael, 1994).

1.3 Problem Statement

Protection of the environment must be carried out in order to improve the conditions of life. The transportation sector is a big pollution source, and hence the design and development of a green transportation system should be initiated. In UniMAP, there is a policy of keeping the environment clean, and reducing the time taken to move from one point to another in the campus. The use of cars and other motor vehicles is discouraged as they do much damage to the environment. Instead, students are encouraged to walk or use the bicycle. However, rain falls quite heavily from time to time in the area, and this is a hindrance to the movement of students between different parts of the university. Not all students have cars, and the use of bicycles does not provide them with protection from the rain. Even if they have cars or motorcycles, these consume fuel, which is harmful to the environment.

Presently, there is an ongoing research on the design and development of a new green transportation system, which is called 'Smart Vehicle (Green Vehicle) Project'. The project is also called 'UniMAP Green Transportation Design & Development

Project' (UGTDDP). It aims to reduce the emission of toxic gases by offering an alternative transportation vehicle that does not emit any toxic gas. The UGTDDP is also helpful in reducing in-campus traffic by providing a public vehicle that:

- Reduces the time of movement between two places
- Decreases empty miles using cooperative routes
- Lowers total emissions by optimizing loaded miles driven
- Provides sustainable environment

Unfortunately, the running of this project does not use proper project management (PM) principles. There is no proper use of tools and techniques that can help ensure the project to be executed properly. As a result, the project requires much time before it can be completed. Previous studies have stressed that lack of PM poses much difficulties, and frequently lead to the failure of the project altogether. In other words, chances of failure of the project become very high as a result of non implementation of PM tools and techniques. Therefore, adequate and proper PM is required to increase the likelihood of success of the project.

1. 4 Objectives of the Study

There are three objectives of this study, namely:

1. To apply proper Project Management (PM) principles in the execution of UGTDDP (UniMAP Green Transportation Design and Development Project).
2. To ascertain that the UGTDDP is well organized with regards to time, cost, quality, green aspects, and vehicle design and performance.

3. To participate in the actual planning, design, development, implementation, and monitoring of the new vehicle.

1.5 Scope of the Study

The scope of the study refers to the parameters in which the study is to be conducted. The scope makes clear that what is being studied and what factors are within the accepted range of the study (Delva et al., 2002). The scope of the study is as follows:

1. Planning, development, management, and monitoring of all related processes and documentation of the UGTDDP.
2. The project is carried out within the period of April, 2014 to October, 2014.
3. The project is limited to the UGTDDP that is executed entirely in UniMAP Pauh Putra Campus.

1.6 Significance of the study

The execution of the study will increase the chances of the UGTDDP to be carried out more efficiently. It will also increase the likelihood that the new vehicle being designed and developed to be successful, and that the project leaves behind proper documentation and filing, which will be useful for future projects that are similar. The success of the UGTDDP will ensure that UniMAP's green policy can be implemented appropriately.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Project management (PM) is about planning, coordinating and controlling the complex and diverse activities of modern industrial, commercial and management undertakings. The purpose of PM is to predict as many project dangers and problems as possible so that rectification plans can be implemented. Hence, PM helps plan, organize and control activities so the project can be completed successfully in spite all risks encountered. This process should start well before any resource is committed, and must continue until all work is finished.

2.2 Green Project Management

"Green project management" is a model where green practices are embedded within the project management (PM) activities carried out. It is an approach to incorporate "green think" into each PM administration process (Maltzman and Shirley, 2012).

Going green basically changes the conventional concept of managing projects. GPM (green project management) is a model where green thinking is developed and used throughout the project. Every decision that is made considers the influence that the decision has on the environment. GPM comprises of environment-related goals in

project planning and management. It encompasses diverse practices, and consists of various approaches. It is based on a range of green action related options. The green movement in recent years has introduced GPM, which combine environmentally friendly standards with methodologies and processes of project management. Typically, GPM is guided by the environmental management system (EMS) of an organization, and it considers different elements like authorities, procedures, responsibilities, and resources (Maltzman & Shirley, 2012).

Nowadays, there are a number of resources available to help a project manager runs his/her project in an environmentally-friendly fashion. For example, there is the 'Green PM' model that is developed by a group of consultants. In this model, every decision throughout the implementation of the project must be made with green concerns in place. This however does not mean that 'green think' invalidates all other decision options. There will be some instances whereby the project manager will have to take an option that is not necessarily green due to one reason or another. But whatever the decision, green aspects must have already been thought of. This is different from the traditional way of making decisions, whereby green concerns were normally totally ignored by the decision maker.

2.3 Malaysian Green Initiatives

Malaysia, just like many other countries in the world, should go green. Unfortunately, while the government sees that environmental concerns are important to take into account, there is still much to do to convince the mindset of Malaysian citizens to change their lifestyle into being green. Studies have shown that the average

Malaysian has the "it does not matter to me" attitude when it comes to changing lifestyle to be 'more green'. There is actually much potential for Malaysia to go green, especially in the transportation sector. Decreasing the release of CO2 emissions has never been more important. Fortunately, some portions of the private sector have moved forward in taking the environment into the forefront. For example, out of more than 50 Belgian organizations in Malaysia, seven of them attribute importance to green initiatives (Thibault and Jacquemin, 2012).

*2.*4 Government Activities in Pushing Green Technology

To further push the advancement of green engineering exercises, the Malaysian government has carried out the following:

- Establishing the 'Malaysian Green Innovation Enterprise' that is tasked with developing a green engineering improvement plan. This enterprise will work as the point of convergence to set benchmarks and to push green engineering projects. To escalate green mindfulness, a portion of a RM20 million (Euro 4.2 million) allocation will be given.
- Organizing the 'Worldwide Green Technology and Eco Items Presentation and Gathering Malaysia' (IGEM) from 14-17 October 2010. This is to pull in globally renowned organizations and masters in green technology (GT) to showcase their items in Malaysia.
- Creating Putrajaya and Cyberjaya as pioneer townships in green engineering, as a showcase for the advancement of different townships.