Faculty of Electronic and Computer Engineering

NEW SOLUTION FOR ICT/ELV INFRASTRUCTURE PROJECT REPORTING USING DATALINK TECHNIQUE SYSTEM

Hisamuddin bin M Saleh

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HISAMUDDIN BIN M SALEH

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DECLARATION

I declare that this thesis entitled "New Solutions for ICT/ELV Infrastructure Project Reporting Using Datalink Technique System" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : Hisamuddin Bin M Saleh

Date : 14th September 2018

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Doctor of Engineering.

Signature : .....

Supervisor Name : Prof. Dato' Dr. Mohd Nor Bin Hussain

Date : 14th September 2018

DEDICATION

To my beloved mother and father

ABSTRACT

The main purpose of the research work is to solve the persistent infrastructure project issue such as variation order (VO) issue, and project delay issue. It has been occurring in the project for over quite a long period of time. In infrastructure project, failed to make a reliable project report will lead to an issue on VO and project delay happen. It has become a normal phenomenon in which issue has led to many negative effects such as cases of lawsuits, poor productivity, revenue loss, and contract termination among all parties involved. Therefore, to overcome this problem, the latest solution system known as Datalink Technique System (DTS) has been developed. It has been tested and applied in one of the government projects in Malaysia. It has turned out with positive results as compared to the existing one. It has been able to deliver reliable information, and yet it is still consistent with the current approach to manage the project. There are two main objectives have been achieved in this thesis. The first is to eliminate the loss and save the project cost by reducing the VO issue and project delay issue in the Information Communication Technology (ICT) work and Extra Low Voltage (ELV) work, but it is not limited to that, in future it can be applied to other infrastructure works like mechanical and electrical (M&E), civil works, and etc.. The second objective is to make the project report more transparent in the monthly project reporting that presented to project management. This to prevent the report from being manipulated by contractors as happened to other projects before. A methodology for system approach is proposed and demonstrated for solution purposes. The process began with a comprehensive issue on VO and followed by project delay factor phenomena. The problem and the main factors that caused the issue is identified and data acquisition based on actual problems that happened in the project. The performance and limitations of conventional methods are studied thoroughly to discover solutions with new more effective methods. The system approach is served by implementing the DTS system in one of the selected infrastructure projects. A pilot project has been implemented at Kota Kinabalu Sabah new court complex project is to evaluate the credibility and actual capabilities of the DTS system. It has contributed a good result for the project, and many benefits have been derived from the implementation. From the result, the bad performance that the team can tolerate could be derived from the equation of the percentage of completion versus the duration of working days, $Y = a1x-b1$, where b1 is the value of the bad performance of the system which is measured as below 34%. To support the validation of the result, the actual copy of the report is attached together. The new system has several advantages compared to the existing conventional process method. It helps in reducing the loss in project costing, provide a reliable progress report to the client while able to convey information of project tasks instantly and accurately.

ABSTRAK

Tujuan utama kerja penyelidikan adalah untuk menyelesaikan masalah isu projek infrastruktur yang berterusan seperti isu pesanan variasi (VO), dan isu kelewatan projek. Ia telah berlaku dalam pengurusan projek infrastruktur untuk tempoh masa yang agak lama. Dalam projek infrastruktur, kegagalan membuat laporan projek yang boleh dipercayai akan menyebabkan isu VO dan kelewatan projek berlaku. Ia telah menjadi fenomena biasa di mana isu tersebut telah membawa kepada banyak kesan negatif seperti kes tuntutan undang-undang, produktiviti yang lemah, kerugian hasil, dan penamatan kontrak di kalangan semua pihak yang terlibat. Oleh itu, untuk mengatasi masalah ini, satu sistem penyelesaian terbaharu yang dikenali sebagai Sistem Kejuruteraan Kaitan Data (DTS) telah dibangunkan. Ia telah diuji dan diterapkan ke dalam salah satu projek kerajaan di Malaysia. Ia telah menghasilkan keputusan positif berbanding dengan sistem yang sedia ada. Ia dapat menyampaikan maklumat yang boleh dipercayai, namun ia tetap konsisten dengan pendekatan semasa untuk menguruskan projek tersebut. Terdapat dua objektif utama yang telah tercapai di dalam tesis ini. Yang pertama ialah menghapuskan kerugian dan menjimatkan kos projek dengan mengurangkan isu VO dan kelewatan projek dalam kerja-kerja Teknologi Komunikasi Maklumat (ICT) dan Kerja-Kerja Voltan Lebih Rendah (ELV) tetapi ianya tidak terhad kepada itu sahaja, pada masa akan datang, ia boleh digunakan untuk kerja-kerja infrastruktur lain seperti kerja-kerja mekanikal dan elektrik (M & E), kerja-kerja sivil, dan lain-lain. Objektif kedua adalah untuk membuat laporan projek lebih telus dalam laporan projek bulanan yang dikemukakan kepada pengurusan projek. Ini untuk mengelakkan laporan daripada dimanipulasi oleh kontraktor seperti yang berlaku kepada projek-projek lain sebelum ini. Kaedah untuk pendekatan sistem dicadangkan dan ditunjukkan untuk tujuan penyelesaian. Proses ini bermula dengan isu komprehensif mengenai VO dan diikuti oleh fenomena faktor kelewatan projek. Masalah dan faktor-faktor utama yang menyebabkan isu itu dikenalpasti dan pengambilalihan data berdasarkan masalah sebenar yang berlaku dalam projek. Prestasi dan batasan kaedah konvensional dikaji dengan teliti untuk mencari penyelesaian dengan kaedah baharu yang lebih berkesan. Pendekatan sistem dilaksanakan dengan melaksanakan sistem DTS di salah satu projek infrastruktur terpilih. Satu projek perintis telah dilaksanakan di projek kompleks mahkamah baru Kota Kinabalu Sabah adalah untuk menilai kredibiliti dan keupayaan sebenar sistem DTS. Ia telah menyumbang hasil yang baik untuk projek itu dan banyak manfaat telah diperolehi daripada pelaksanaannya. Dari hasil kajian penyelidikan, prestasi buruk pasukan yang boleh ditolak ansur boleh diperolehi dari persamaan peratusan siap berbanding tempoh hari kerja, Y = a1x-b1, di mana b1 adalah nilai prestasi buruk sistem yang diukur sebagai di bawah 34%. Untuk menyokong pengesahan hasil kajian kes, salinan laporan sebenar dilampirkan bersama. Sistem baharu mempunyai beberapa kelebihan berbanding dengan kaedah proses konvensional sedia ada. Ia membantu mengurangkan kerugian kos projek, menyediakan laporan kemajuan yang boleh dipercayai kepada pelanggan sambil dapat menyampaikan maklumat tugas projek dengan serta-merta dan tepat.

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ASP	-	Alert System Program
BoQ	-	Bill of Quantity
CCC	-	Completion Compliance Certificate
CPM	-	Critical Path Method
DCC	-	Document Control Centre
DTS	-	Datalink Technique System
EOT	-	Extension Over Time
ELV	-	Extra Low Voltage
ICT	-	Information Communication Technology
JKR	-	Jabatan Kerja Raya
M&E	-	Mechanical & Electrical
MPDP	-	Main Page Datalink Program
PMO	-	Project Management Office
RE	-	Resident Engineer
RFI	-	Request For Information
SLPP	-	Section Link Page Program
SOA	-	Schedule Of Accommodation
TDPR	-	Tabulation Detail Project Reporting
VB	-	Visual Basic

VBA - Visual Basic Applications

VESPA - Very Early System Program Alarm

LIST OF PUBLICATIONS

The research papers produced and published during the course of this research are as follows:

1. H. M. Saleh, M. N. Husain, A. A. M. Isa, 2017. New Solution for ICT/ELV Infrastructure Project Reporting Using Datalink Technique System, *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*, 10(1), pp. 57-62.

CHAPTER 1

INTRODUCTION

Issue on Variation Order (VO) and project delay in the infrastructure project industry in Malaysia are a well-known menace that has tarnished the reputation of construction professionals across the country. This phenomenon brings major implications, such as higher construction costs and the termination of the contract. This is especially in the case of government related project. Construction industry is one of the key industries in Malaysia. Unfortunately, the industry is facing many problems in its projects. One of the major problems faced by the construction project is the issue of the variation order occurring during the construction phase (Ibb, *et.al,* 2001) which results in delaying projects, overruns the cost and causes other negative effects. Hence it is very important to control variation orders. Taxpayers are constantly puzzled by the persistent delays in most government-approved construction projects. This problem indicates the need to develop an effective method to avert such issues in the future. The study focuses on the issues in an infrastructure project, such as the variation work during construction at the site and on the time that elapses beyond the date for completion.

VO and project delay are costly to a project especially the time lapse, over expenditure, litigation, disputes, and abandoned projects. A change of schedule during the project construction phase may result in a major reallocation of resources (Fisk, 1997; O'Brien, 1998). In most cases, projects which are delayed beyond the time specified in the project schedules goes a long way to endure hardship, loss of revenue, and a bad

reputation. Further consequences resulting from the delay of a project in terms of its cost includes labor cost of non-productive workers, supervisors, leased equipment and machinery, material delivery schedules and additional overhead costs. This gives a clear indication that in the cause of a delay, not only the contractor suffers loss but also the government.

1.1 Research Background

Variation Order (VO) issues, budget overrun, and project delay are contributing to a big amount of project losses and project delay. There are considered as part of major issues (Dubem, et.al, 2014) that still persist in construction.

Existing Design and Built concepts in infrastructure projects are very common to see project owners getting very limited information, inadequate data and unreliable project reporting because the methods used are ineffective. It ends up with project delay issue and variation order issue (Ali, et.al, 2010) and it causes the project cost burst by spending more money on the unnecessary item.

Other studies, (Mokhtar, *et.al,* 2000) identified that the most important methods to control of variation order such as clarity of variation order procedures in construction stage is an integral part of effective management of variation orders, use of project scheduling/management techniques in the construction stage, and utilize work breakdown structure.

The most important methods to control of variation order are clarity of variation order procedures in construction stage would help in reducing the processing time, and other mishandling issues, a well-defined scope can assist the professional team in recognizing and planning, variation logic and justification for implementation,