USING GPS MONITORING SYSTEM TO ENHANCE PRODUCTIVITY OF CONSTRUCTION EQUIPMENT IN LARGE-SCALE CONSTRUCTION COMPANIES IN SRI LANKA

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Degree of Master of Science in Construction Project Management

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Thesis was submitted in partial fulfillment of the requirements for the Master of Science in Construction Project Management

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DECLARATION

I declare that this is my own work, and this thesis does not incorporate, without acknowledgment, any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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J.R.M Bogahawatta

The above candidate has carried out research for the Masters Thesis under my supervision.

…… Date: ……

Prof. A.A.D.A.J. Perera

ABSTRACT

USING GPS MONITORING SYSTEM TO ENHANCE PRODUCTIVITY OF CONSTRUCTION EQUIPMENT IN LARGE-SCALE CONSTRUCTION COMPANIES IN SRI LANKA

Productivity of construction equipment refers to the value of work done in a period as a piece of individual equipment or as a fleet of equipment. Estimating the actual productivity of construction equipment requires tracking and monitoring. Manual data collection methods and data input procedures restrict access to precise and real-time performance data. This limitation creates a need for GPS tracking, eliminating human reporting errors and increasing productivity. GPS-based equipment tracking and monitoring systems are more efficient than traditional performance estimating systems on productivity assessment. Therefore, the main objectives of this study will be to i) Identify current issues in tracking and monitoring the construction equipment, ii) Investigate the tracking and monitoring information needed to enhance the productivity of construction equipment, and iii) Analyse the impact of GPS monitoring systems on the productivity of construction equipment. Relatively important issues in construction equipment tracking and monitoring were prioritized based on questionnaire responses. Using relative important index, tracking information needed to enhance productivity was prioritized based on questionnaire responses. The current equipment monitoring process of the selected construction company for the dump trucks was mapped and analyzed. The production of the dump truck is based on truckload, the number of trucks used for the operation, truckload time, truck haul time, dump time, and return time. The areas for process improvement for the dump trucks were identified using the prioritized outputs of the GPS monitoring system, which are machine location tracking, fuel consumption, trip history, idling trends, and route optimization. Finally, realistic recommendations for identified issues and future developments were suggested.

Key Words: GPS, Tracking and Monitoring, Telematics, Equipment Productivity, Hauling Equipment, Dump Trucks, Process Mapping

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LIST OF ABBREVIATIONS

Abbreviation	Description
GPS	Global Positioning System
OBD	On-Board Diagnostics
GNSS	Global Navigation Satellite System
RTK	Real-Time Kinematic
CORS	Continuously Operating Reference Stations
NRTK	Network Real Time Kinematic
US	United States
A-GNSS	Assisted Global Navigation System
API	Application Programming Interface
CIDA	Construction Industry Development Authority, Sri Lanka
CS1 (CIDA)	Contractor organization registered with CIDA, Sri Lanka, with a financial limit between LKR 3000 to 1500 million per year
CS2 (CIDA)	Contractor organization registered with CIDA, Sri Lanka, with a financial limit of more than LKR 3000 million per year
C1 (CIDA)	Contractor organization registered with CIDA, Sri Lanka, with a financial limit between LKR 1500 to 600 million per year

LIST OF APPENDICES