A SIMPLIFIED NETWORK-LEVEL PAVEMENT INFORMATION AND MANAGEMENT SYSTEM (PIMS) FOR FEDERAL ROADS IN NORTH-CENTRAL NIGERIA

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CERTIFICATION

This is to certify that the Thesis:

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is a record of original research carried out
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SPGS REPRESENTATIVE SIGNATURE DATE

DEDICATION

This thesis is dedicated to GOD Almighty, the Invincible, the Omnipotent, Omniscient and Omnipresent, the Giver and Taker of Life, My ever-present help in times of trouble, My Sustainer and the Preserver of my soul.

To You, I give all the glory and adoration.

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ABSTRACT

All over the world, the importance of prediction of pavement performance to aid long term scheduling of maintenance and rehabilitation (M&R) activities and budgetary allocation, has been widely recognized. Pavement deterioration modelling, based on historical record of performance variation with time, requires regular measurement of the condition rating of pavement sections over a period of time. Based on the generated model curves using historical data, future condition rating could then be predicted. Since such information and record are absent in the country (Nigeria), this method cannot be used and the alternative is to use probabilistic modelling.

Some attempts have been made to develop deterioration model using the Markov probability matrix method with a constant transition probability matrix (TPM). However, with this approach, the two important effects of pavement age and traffic volume were not reflected. As an improvement over these limitations, this study attempted the development of a more realistic and dynamic pavement deterioration prediction by modelling a series of TPM that incorporate the effects of age and traffic volume on pavement deterioration. Road user costs model was also developed to determine road intervention maintenance costs, and evaluate benefits of reduced vehicle operating cost upon improvement at network level. Detailed analyses of road deterioration and incurred road user costs were performed for a case-study road over a period of twenty (20) year.

A simplified but computerized pavement information and management system (PIMS) was developed, within Matlab™ and Visual Basic™ environments. The PIMS is capable of storing, analyzing, modifying, reporting and displaying pavement and traffic information for individual and entire network of federal highways in Nigeria. Results can also be displayed in charts and themes.

Visual condition surveys were carried out for twelve selected road sections in the North Central part of Nigeria. Condition evaluations were performed for the surveyed roads using manual and automated PCI-based method. The results showed that the developed PIMS is quite suitable for use on Federal roads in a developing country such as Nigeria.

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