COMPARATIVE ANALYSIS OF THE PRODUCTIVITY LEVELS ACHIEVED THROUGH THE USE OF PANELISED PREFABRICATION TECHNOLOGY WITH THOSE OF TRADITIONAL BUILDING SYSTEM

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A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy (PhD)

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STATEMENT OF ORIGINALITY

I declare that this thesis is my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for degree or any other qualification.

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Wajiha Mohsin Shahzad

ABSTRACT OF RESEARCH

Several studies have documented benefits of prefabricated building system compared to the traditional approach. Despite the acknowledged benefits of prefabrication, its application is generally low in the New Zealand construction industry. This low uptake is largely attributed to the fact that the documented benefits of prefabrication technology are anecdotal, or based on investigations of isolated case studies. This study aims to contribute to filling this knowledge gap by analysing cost savings, time savings, and productivity improvement achievable by the use of panelised prefabrication in place of the traditional building system. A two-phased mixed method of research was adopted for the study. The first phase involved the use of case study-based archival research to obtain qualitative data from records of 151 completed building projects in three cities of New Zealand – Auckland, Christchurch and Wellington. The second phase involved the use of questionnaire survey to obtain feedback from industry stakeholders. Results showed that the use of panelised prefabrication in place of traditional building system contributed to 21 percent cost saving, 47 percent time saving and 10 percent average improvement in the productivity outcomes in the building projects. Results further showed that 17 factors could significantly influence the levels of benefits achievable with the use of prefabrication technology. 'Building type' and 'location' were the factors having the most significant influence on the benefits achievable by the use of panelised prefabrication in place of the traditional building systems. Other factors that influence the benefits of prefabrication included (in diminishing order of influence): logistics, type of prefabrication, scale/repeatability, standardisation, contractor's level of innovation, environmental impact, project leadership, type of procurement, whole of life quality, site conditions, site layout and client's nature.

Key words: Construction, Cost, New Zealand, Prefabrication, Performance, Productivity, Time.

ETHICAL APPROVAL

Massey University Human Ethics Committee (MUHEC) granted 'Low Risk Notification' to this research project on 6 March 2013 (Appendix A).

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DEDICATION

To my amazing parents

Khalida Gulzar & Gulzar Ahmed

LIST OF ABBREVIATIONS

ACENZ	Association of Consulting Engineers New Zealand
ANOVA	Analysis of Variance
BCSPT	Building and Construction Sector Productivity Taskforce
BRANZ	Building Research Association of New Zealand
CRC	Cooperative Research Centre
DBH	Department of Building and Housing
GFA	Gross Floor Area
IPENZ	Institute of Professional Engineers New Zealand
JIT	Just in Time
LVL	Laminated Veneer Lumber
NZIA	New Zealand Institute of Architects
NZIOB	New Zealand Institute of Builders
NZIQS	New Zealand Institute of Quantity Surveyors
MBI	Modular Building Institute
MNOVA	Multivariate Analysis of Variance
MUHEC	Massey University Human Ethics Committee

OECD	Organization of Economic Co-operation and Development
OSM	Off-Site Manufacturing
PCA	Principle Component Analysis
Prefab	Prefabrication
RMBF	Registered Masters Builders Federation
SPSS	Statistical Package for the Social Sciences
TBS	Traditional Building System
UK	United Kingdom
USA	United States of America

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