Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.
Application of Theory of Constraints concepts and Lean tools as an innovative approach to the Timor-Leste public procurement process

A thesis presented in partial fulfillment of the requirements for the degree of:

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ABSTRACT

At a time when public resources are very limited and while demand for better services is continuously increasing, the public procurement function can have clear benefits from ‘doing more with less’. This thesis has sought to explore the mechanisms and practices that inhibit the ability of the Timor-Leste procurement (TLS-P) services to make better use of available resources. It also sought to investigate the viability of usage of the Theory of Constraints concepts and Lean tools (TOC-L) towards ongoing improvement processes within such a system.

The Theory of Constraints (TOC) concepts and Lean tools have been developed and intensively used within profit organisations: especially in production and distribution systems, in addition to service industries, such as health care services. Although applications of the Theory of Constraints concepts and Lean have been successful within the service sector, the literature is predominantly reporting cases where the concepts were applied separately, rather than as an integrated concept and the researcher has not identified any literature that discusses the application of both concepts within a public procurement process.

This study demonstrates that TOC-L can provide TLS-P services with a systematic framework for identifying problems that limit their ability to maximise budget execution effectiveness. The TOC analysis shows several policies and practices exist within the TLS-P which, whilst seeming to be intuitively logical and efficient for each agency, actually tend to focus these agencies on sub-optimal local performance. This approach means that the system’s agencies do not have a clear agreement to coordinate and synchronise their activities, measurements and schedules —and therefore, budget execution effectiveness suffers in this situation. The results of the analysis suggest that all agencies must realign their local performance focus to one of a system-wide performance, in order to achieve desired benefits.

In order to facilitate this realignment, the researcher proposes a modification of the drum-buffer-rope methods for goods and services into a hybrid model, which can work for the TLS-P dynamic environment. This ‘Dynamic-DBR’
(DBRD) model provides the system with the ability to adjust capacity resources to meet service levels and due dates. The aim of this DBRD is to fill the gap in the literature of reported adaptations of drum-buffer-rope methods, in order to suit the synchronisation of scheduling within public procurement processes.

The study also develops recommendations for the improvement of this approach, which is intended to facilitate future research.
ACKNOWLEDGMENTS

The endeavour of completing this thesis has been a challenge and without the support and help of others it would never have eventuated. Therefore, I have had the pleasure and honour to be surrounded by brilliant people, who have supported me along the way to finalising this thesis, especially Mr. Alan Wright (1st supervisor) and Dr. Norman Marr (2nd supervisor), who have both provided a great impact on my work.

Mr. Wright taught me how to use the TOC and Lean for supply chain optimisation and for ongoing improvement of processes within production and distribution systems. He stimulated my thinking and interest on how both concepts could be applied to the public sector — and especially to improve the TLS-P process. His ability to provide scientific freedom and encouragement to find my own way, together with his offered guidance and feedback has added considerable value to the quality of this writing. Dr. Norman Marr deserves special recognition for his role in showing me how to use research methods in supply chain management, in addition to providing valuable feedback on both the structure and quality of the writing in this thesis and their valued contribution has raised the level of this thesis.

I also would like to express my gratitude to the National Procurement Commission (NPC) and the National Development Agency (ADN) of Timor-Leste. Special thanks must go to the heads of both agencies: H.E. Mr. Xanana Gusmao, the Prime Minister of Timor-Leste, Mr. Aniceto (NPC commissioner), Mr. Hermingardo (NPC Commissioner) and Mr. Samuel (Director of ADN), who have all provided me with valuable data during my fieldwork at their offices. I also would like to express my thanks to New Zealand Aid for funding this research and especially to the staff at the International Support Office, Massey University (ISO).

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<tbody>
<tr>
<td>ADN</td>
<td>Agencia Decevolvimento Nacional (National Development Agency)</td>
</tr>
<tr>
<td>BoQ</td>
<td>Bill of Quantity</td>
</tr>
<tr>
<td>C/O</td>
<td>Change Over</td>
</tr>
<tr>
<td>CAFI</td>
<td>Conselho Administrasaun das Fundus da Infrastructura (Council of Administration for Infrastructure Funds)</td>
</tr>
<tr>
<td>CCR</td>
<td>Capacity Constraint Resources</td>
</tr>
<tr>
<td>CM</td>
<td>Capacity Management</td>
</tr>
<tr>
<td>CNE</td>
<td>Commisariado Nacional das Elecoens (National Election Commission)</td>
</tr>
<tr>
<td>CoM</td>
<td>Council of Ministry</td>
</tr>
<tr>
<td>CPV</td>
<td>Cashier Payment Voucher</td>
</tr>
<tr>
<td>CRD</td>
<td>Conflict Resolution Diagram</td>
</tr>
<tr>
<td>EC</td>
<td>Evaporating Cloud</td>
</tr>
<tr>
<td>CRT</td>
<td>Current Reality Tree</td>
</tr>
<tr>
<td>CS-VSM</td>
<td>Current State Value Stream Map</td>
</tr>
<tr>
<td>DBR</td>
<td>Drum-Buffer-Rope</td>
</tr>
<tr>
<td>DBR_s</td>
<td>Drum-Buffer-Rope for services</td>
</tr>
<tr>
<td>DEs</td>
<td>Desirable Effects</td>
</tr>
<tr>
<td>EC</td>
<td>Evaporating Cloud</td>
</tr>
<tr>
<td>FCFS</td>
<td>First Come First Serve</td>
</tr>
<tr>
<td>FRT</td>
<td>Future Reality Tree</td>
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<tr>
<td>FS-VSM</td>
<td>Future State Value Stream Map</td>
</tr>
<tr>
<td>GoTL</td>
<td>Government of Timor-Leste</td>
</tr>
<tr>
<td>I_a</td>
<td>Active Inventory</td>
</tr>
<tr>
<td>IO</td>
<td>Intermediate Objective</td>
</tr>
<tr>
<td>I_p</td>
<td>Passive Inventory</td>
</tr>
<tr>
<td>L/T</td>
<td>Lead Time</td>
</tr>
<tr>
<td>LMs</td>
<td>Line Ministries</td>
</tr>
<tr>
<td>MDGs Suco</td>
<td>Millennium Development Goals Sucos</td>
</tr>
<tr>
<td>MoF</td>
<td>Ministry of Finance</td>
</tr>
<tr>
<td>MPS</td>
<td>Major Project Secretariat</td>
</tr>
<tr>
<td>NPC</td>
<td>National Procurement Commission</td>
</tr>
<tr>
<td>NVA</td>
<td>Non-Value Added</td>
</tr>
<tr>
<td>OE</td>
<td>Operation Expenses</td>
</tr>
<tr>
<td>P/T</td>
<td>Processing Time</td>
</tr>
<tr>
<td>PDD</td>
<td>Pakote Desenvolvimento Decentralizado (Decentralization Development Package)</td>
</tr>
<tr>
<td>PO</td>
<td>Purchase Order</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private-Partnership</td>
</tr>
<tr>
<td>PR</td>
<td>Purchase Requisition</td>
</tr>
<tr>
<td>PRT</td>
<td>Prerequisite Tree</td>
</tr>
<tr>
<td>SBD</td>
<td>Standard Bidding Document</td>
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</table>
SLA<sub>Q</sub>  Service Level Agreements quality
SLAs  Service Level Agreements
SLA<sub>T</sub>  Service Level Agreements cycle time
SLA<sub>U</sub>  Service Level Agreements utilization
SPP  Strategic Procurement Plan
STA  Secretariado Tekniko do Approvisionamento (Procurement Technical Secretariat)
T  Throughput
TLS-P  Timor-Leste Procurement
TLS-P EC  Timor-Leste Procurement Evaporating Cloud
TLS-P CRT  Timor-Leste Procurement Current Reality Tree
TLS-P FRT  Timor-Leste Procurement Future Reality Tree
TLS-P PRT  Timor-Leste Procurement Prerequisite Tree
TOC  Theory of Constraints
TOC-FS  Theory of Constraints – Five Steps Focus
TOC-L  Theory of Constraints and Lean
TOC-TP  Theory of Constraints – Thinking Process
TP  Thinking Process
TSDP  Timor-Leste Strategic Development Plan
TT  Transition Tree
UDEs  Undesirable Effects
VSM  Value Stream Map
WIP  Work-In-Progress