

**TECHNOLOGY TRANSFER TO LOCAL
PROFESIONALS THROUGH UMA OYA PROJECT
A CASE STUDY**

P.L.N Puranegedara

(138975 H)

Degree of Master of Science

Department of Civil Engineering

University of Moratuwa
Sri Lanka

January, 2017

DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement 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 acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my dissertation, in whole or in part in print electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:Date:

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

Signature of the supervisor:Date:

DEDICATED TO

MY BELOVED PARENTS AND TEACHERS

FOR THEIR GUIDENCE,

SUPPORT AND ENCOURAGEMENT

ACKNOWLEDGEMENT

First and foremost, I owe my immense gratitude to my supervisor Dr.L.L. Ekanayake, Senior Lecturer, Department of Civil Engineering, University of Moratuwa for his excellence supervision and encouragement. I would like to give my foremost gratitude to Prof. A. A. D. J. Perera, Senior professor, University of Moratuwa for his respected provision and the guidance toward the success of this project.

I would like to express my warmest appreciation and special gratitude to Dr. Eng. N. S. K. N. De. Silva, Project Director (UOMDP) and Eng. H. M. N. U. Jayathilaka (Consultant) for their valuable support and guidance during my research.

My sincere thanks to colleagues, Mr. S. Maheshwaran, Mr.P.De. Silva, Miss. D.G.A. Namalee, Mr. M.S. Ahamed for their great help during my research.

I hereby appreciate for all academic staff and non-academic staff of Faculty of Engineering, University of Moratuwa for their sincere support.

Last but always I loved in memorized, my mother, wife, son and two daughters for stay with me at hard times and for giving me the strength and the spirit with all your heart, thank you so much dear family.

ABSTRACT

Economic growth of a country is linked with the construction industry. Advancement of construction industry is depend on the degree of transformation of technology in to the field. Therefore it is important to understand deeply the best practices in Technology Transfer (TT) by examining significant areas of enablers and hallmarks. During the past few decades, number of major projects were completed by foreign contractors linking with domestic contractors in various approaches such as joint ventures, partnerships and sub contracts, as well at present large number of foreign firms are involved in major construction projects in the country. Engineering Procurement and Construction (EPC) contract of Uma Oya Multipurpose Development Project (UOMDP) is awarded to FARAB. Though FARAB use new technology, there is a doubt whether appropriate TT benefits will acquire through this contract? Therefore this research was carried out with the objectives of identifying barriers exist in technology transfer to local construction industry through the foreign contract and proposing of strategies to enhance the level of technology transfer to local construction industry from foreign contractors working in Sri Lankan projects. Scope of this research is limited to level of TT to local professionals directly engaged in project activities. Hence carried out interviews with twenty six numbers of senior, middle and junior level professionals working in the project. Collected data was analyzed by Suitability, Acceptability, Feasibility (SAF) model and recommendations were summarized. As a result of deep study through the case, lack of joint venturing (JV) , lack of involvement of junior engineers and insufficient involvement of higher educational institutes are within the finding mentioned in the conclusion. Increase of involvement of local contractors through JVs, giving priority to TT clauses in the formation of EPC contracts, opening of TT offices in the Universities and improvements of skill level of non-professional groups are within the recommendations. Further, responsible institutions such as Ceylon Electricity Board, Mahaweli Authority and Irrigation Department should increase the participation of their professionals covering top to bottom levels of their organizations.

Key words: Technology Transfer, Construction industry, Tunnel Boring Machine

TABLE OF CONTENT

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF FIGURES	vii
LIST OF TABLES	viii
LIST OF ABBREVIATIONS	ix
LIST OF ANNEXES	x
CHAPTER 1 : INTRODUCTION	1
1.1 Background	1
1.2 Research Problem	4
1.3 Objectives	5
1.4 Significance of research	5
1.5 Methodology	5
1.6 Main finding	6
1.7 Structure of the Thesis	6
CHAPTER 2: LITRATURE REVIEW	8
2.1 Introduction	8
2.2 Definition of Technology	9
2.3 Technology transfer	10
2.4 Technology transfer classifications	16
2.5 Factors Affecting on Technology Transfer	18
2.6 Modes of Technology transfer	20
2.6.1 Foreign Direct Investments	22
2.6.2 Joint Ventures	23
2.6.3 Co-operative Alliances	26
2.6.4 Licensing.	26
2.6.5 Subcontracting	27
2.6.6 Technology Transfer through Training and Learning	28

2.7	The Construction industry in developing countries	30
2.8	Brief History on Technology Transfer in Sri Lanka	30
2.9	Problems in quantifying Technology Transfer	32
2.10.	Barriers and enablers	32
CHAPTER 3 : METHODOLOGY OF STUDY		34
3.1	Introduction	34
3.2	Method of data Collection; Reasons for selection of the methodology	38
3.3	Interview schedule & guide	40
3.4	Data Analysis	42
CHAPTER 4: ANALYSIS OF DATA AND DISCUSSION RESULTS		45
4.1	Introduction	45
4.1.1	Introduction to the selected case	45
4.1.2	Analysis of Components of Technology that is been transfer through Uma Oya Project	52
4.1.2.1	Vertical vs Horizontal Technology Transfer	53
4.1.3	Water ingress issues and concerns for TBM excavation	54
4.2	Identified issues in transferring of Technology	56
4.3	Proposed solutions	57
4.4	Analysis of the proposed solutions using SAF Model	57
4.4.1	Enhanced involvement of junior and middle level engineers	57
4.4.2	Joint venturing with foreign companies	58
4.4.3	Opening of Technology Transfer offices at Universities	59
CHAPTER 05: CONCLUSION AND RECOMMENDATIONS		61
5.1	Conclusion	61
5.2	Recommendations	62
5.3	Recommendations for further studies	64
REFERENCES		65

LIST OF FIGURES

Figure 1.1:	Sri Lanka Foreign Direct Investment Net Inflow 2006-2014	3
Figure 3.1:	Flow chart of methodology of study	37
Figure 3.2:	Summary of staff involvement UOMDP by Stakeholder Institution	41
Figure 4.1:	Uma Oya Multipurpose Development Project - The Project area	47
Figure 4.2:	Uma Oya Multipurpose Development Project map	49
Figure 4.3:	Schematic Diagram of Uma Oya Multipurpose Development Project	51

LIST OF TABLES

Table 4.1:	Evaluation of Uma Oya Project based on components of technology	53
Table 4.2:	Summary of SAF Analysis	60

LIST OF ABBREVIATIONS

Abbreviation	Description
EPC	Engineering, Procurement and Construction
TBM	Tunnel Boring Machine
TT	Transfer of Technology
UOMDP	Uma Oya Multipurpose Development Project
SAF	Suitability Acceptability Feasibility

LIST OF ANNEXES

Annex-01:	List of senior level professionals interviewed	73
Annex-02:	List of middle level professionals interviewed	74
Annex-03:	List of junior professionals interviewed	75
Annex-04:	Questionnaire to guide interviews	76