# USE OF INFORMATION TECHNOLOGY IN THE SRILANKAN CONSTRUCTION INDUSTRY

Ramma Waduge Ranjith Pemasiri

A Project Report submitted in partial fulfillment of the requirements for the degree of Master of Engineering in Construction Management

> Department of Civil Engineering University of Moratuwa

> > Srilanka

JUNE 2000

73192

#### ABSTRACT

Information Technology (IT) has become a vital component in the context of policy for science and technology development in many countries. Construction Industry as a whole is now geared to explore the full benefits of **IT**. **It** is evident that the construction industry differs from other industries due to its fragmented nature and involvement of expert knowledge, judgment and experience. Becauseof this complexity in the construction industry there is a greater potential for **IT** and many countries are now implementing to extend beyond productivity gains to strategic applications. This research establishes the current use of IT in the SriLankan construction industry. The research also draws out recommendations for strategic use of IT and suggests an IT framework for Sri Lankan Construction Industry.

#### ACKNOWLEDGMENT

The author wishes to thank the following individuals and organisations for their contribution to make the research successful.

Dr. G.W. Kodikara of the University of Moratuwa who supervised the project, for his corporation, valuable guidance and encouragement.

All the professionals and organisations participated in the data collection and interviews.

Mr. Susantha Pushpa Kumara of Southern Provincial Roads Improvement Project for typing and processing the report.

All the other individuals and organisations whose names were not mentioned here but helped in many to process the report.



University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations www.lib.mrt.ac.lk

# <u>INDEX</u>

1.0

2.0

Pages

•

.0		Introduction	1 - 4
			1 - 2
	1.1	Background	2
	1.2	Objectives	- 2 - 3
	1.3	Research Methodology	
	1.4	Main Findings	3 - 4
	1.5	Recommendations	4
2.0		Information Technology	4 - 19
	2.1	Introduction	4 - 5
	2.2	Categories of IT	5 - 9
	2.3	Artificial Intelligence Moratuwa, Sri Lanka.	9 - 11
	2.4	Computer Networks Theses & Dissertations	11 - 12
	2.5	Virtual Reality Modelling	12 - 13
	2.6	Product Modelling	13
	2.7	Group ware	13
	2.8	Video Conferencing	13 - 14
	2.9	Internet	14 - 16
	2.10	Multimedia	17 - 19
3.0		IT in the Construction Industry	19 - 36
	3.1	Introduction	19
	3.2	Past Experience and Present Trend	20 - 24
	3.3	Categorisation of Project Experience	24
	3.4	IT in the Construction Industry-Sri Lankan Experience	24 - 25
	3.5	Use of IT in the construction industry	25 - 27
	3.6	Benefits of IT for the construction industry	27 - 34
	3.7	Approach to be made for maximum benefit	34 - 36

			37 - 71
4.0		Trends in IT Usage in Construction Industry in Sri Lanka	57 - 71
4	1.1	Organisations involved in the study	37 - 38
4	4.2	Data Analysis-Use of Information Technology in 1996	38 - 44
4	4.3	Data Analysis-Use of Information Technology in 2000	44 - 56
۷	4.4	Use of Software in 1996	57 - 60
۷	4.5	Use of software in 2000	61 - 69
4	4.6	Summary of Results	70 - 71
5.0		An IT framework for the Sri Lankan Construction Industry-past studies	71 - 77
:	5.1	IT strategy for the Sri Lankan Construction Industry	71 - 77
6.0		Conclusion University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations	78
7.0		Recommendations	79
8.0		References	80 - 81
9.0		Annexures	82 - 85

### LIST OF FIGURES

### Pages

٠

1)	Figure -01	- Data and Information.	5
2)	Figure -02	- A Computer system	6
3)	Figure -03	- Schematic Diagram of an Intelligent Machine	9
4)	Figure -04	- The basic elements of an expert system	10
5)	Figure -05	- Potential scope of information flows in construction.	20
6)	Figure -06	- IT framework for the construction industry.	74
7)	Figure -07	- IT framework for Sri Lankan Construction Industry.	75
8)	Figure -08	- Suggested IT framework for Sri Lankan Construction Industry.	76



University of Moratuwa, Sri Lanka. Electronic Theses & Dissertations www.lib.mrt.ac.lk

#### TABLE OF CONTENTS

			Pages	
1)	Table-01	- Details of organisations surveyed in 1996	37	
2)	Table-02	- Details of organisations surveyed in 2000	37	
3)	Table-03	- Use of hardware in contractor organisations in 1996	39	
4)	Table-04	- Use of communication in contractor organisations (Percentage use)	39	
5)	Table-05	- Use of hardware in consultant organisations in 1996	40	
6)	Table-06	- Use of communication in consultant organisations in 1996 (Percentage use) S & Dissortations www.lib.mrt.ac.lk	41	
7)	Table-07	- Use of hardware in consultant/client organisations in 1996	42	
8)	Table-08	- Use of communication in client/ consultant organisations in 1996 (Percentage use)	43	
9)	Table-09	- Use of hardware in contractor organisation in 2000	45	
10)	Table-10	- Use of communication in contractor organisations in 2000 (Percentage use)	46	
II)	Table-11	- Use of hardware in consultant organisations in 2000	47	
12)	Table-12	- Use of communication in consultant organisations in 2000 (Percentage use)	48	

٠...

13)	Table-13	- Use of hardware in consultant/ client organisations in 2000	49
14)	Table-14	- Use of communication in client/ consultant organisations in 2000 (Percentage use)	50
15)	Table-15	<ul> <li>Use of hardware in contractor organisations-</li> <li>Comparison of results obtained in 1993,</li> <li>1996 and 2000</li> </ul>	51
16)	Table-16	<ul> <li>Use of communication in contractor organisations-</li> <li>Comparison of results obtained in study 1993,</li> <li>1996 and 2000 (Percentage use)</li> </ul>	52
17)	Table-17	- Use of hardware in consultant organisations- Comparison of results obtained in 1993, 1996 and 2000	53
18)	Table-18	- Use of communication in consultant organisations- Comparison of results obtained in 1993,1996 and 2000 (Percentage use)	54
19)	Table-19	- Use of hardware in consultant/client organisations- Comparison of results obtained in 1993, 1996 and 2000.	55
20)	Table-20	<ul> <li>Use of communication in consultant/ client</li> <li>organisations - Comparison of results obtained in</li> <li>1993,1996 and 2000 (Percentage use)</li> </ul>	56

.

vii

21)	Table-21	- Use of software by large contractors in 1996	57
22)	Table-22	- Use of software by small contractors in 1996	58
23)	Table-23	- Use of software by consultants in 1996	59
24)	Table-24	- Use of software by consultant/client in 1996	60
25)	Table-25	- Use of software by large contractors in 2000	61
26)	Table-26	- Use of software by consultant in 2000	62
27)	Table-27	- Use of software by consultant/client in 2000	63
28)	Table-28	Use of software by large contractors (Percentage use) Comparison of results obtained in 1993, 1996 & 2000	65
29)	Table-29	- Use of software by small contractors (Percentage use) Comparison of results obtained in 1993, 1996 & 2000	66
30)	Table-30	- Use of software by consultants (Percentage use) - Comparison of results obtained in 1993, 1996 & 2000	67
31)	Table-31	- Use of software by consultant/ clients - Comparison of results obtained in 1993, 1996 & 2000	69

٠

## LIST OF ABBREVIATIONS

3D	- Three Dimensional
4GL	- Fourth Generation Languages
BIOS	- Basic Inputs Outputs system
CAD	- Computer Aided Design
CAE	- Computer Aided Estimating
CAM	- Computer Aided Manufacturing
CASE	- Computer Aided Software Engineering
CICA	- Construction Industry Computing Association
CNC	- Computer Numerically Controlled
CPU	- Central Processing Unit
DP	- Data Processing
DOD	- US Department of Defence
EDI	- Electronic Data Interchange
EIS	- Enterprise Information System
FTP	- File Transfer protocol
FCEC	- Federation of Civil Engineering Contractors
HTPM	- Harward Total Project Manager
HTML	Hyper Text Matching Language
ICON	Intelligent Integration of Information for Construction
ICTAD	- Institute for Construction Training & Development
IIS	- Industry Information System
ISDN	- Integrated Services Digital Network
IT	- Information Technology
KBS (	Knowledge Based Systems
LAN	Local Area Networks CSES & Dissertations
LDC	Less Developed Countries
Mbps	- Mega bites per second
NI	- Natural Interaction
NN	Notural Network
NCCASL	Contractors Association of SULLANKA
NIC	- Newly Industrialised Country Status
OCR	- Optical Character Recognition
PC	- Personnel Computer
PERT	- Programme Evaluation Review Technique
PIS	- Project Information System
PSDN	- Public Switched Data Networks
	- Public Switched Telephone Network
PSTN	- Random Access Memory
RAM	- Royal Institute of British Architects
RIBA	- Royal Institute of Chartered Surveyors
RICS	- Read Only Memory
ROM	- Sri Lanka
SL	- United Kingdom
UK	- United Nations Education and Scientific Organisation
UNESCO	- Value Added Network
VAN	- Virtual Reality
VR	- Wide Area Network
WAN	- World Wide Web
WWW	- Wireless Application Protocol
WAP	- whereas Applearian Protocol

.

x