



AIN SHAMS UNIVERSITY

Faculty of Engineering
Department of Architecture

Towards a Communication Model in CMCD,
VDS in Education between Theory and Practice

By

SAMER KAMAL BAKY

B.Sc. ARCHITECTURE
FACULTY OF ENGINEERING
AIN SHAMS UNIVERSITY

A Thesis Submitted in Partial Fulfillment of
M.SC. Degree in ARCHITECTURE

SUPERVISED BY

Prof. Dr. SAYED MADBOULI ALI

Professor of Architecture
Department of Architecture
Faculty of Engineering - Ain Shams University,

AND

Prof. Dr. SAMIR SADEK HOSNY

Professor of Architecture
Department of Architecture
Faculty of Engineering - Ain Shams University

CAIRO, EGYPT
2006



جامعة عين شمس
كلية الهندسة
قسم الهندسة المعمارية

نحو نموذج للاتصال في التصميم المعماري المتشارك بمساعدة الحاسب الآلي أستوديو التصميم الافتراضي في مجال التعليم بين النظرية والتطبيق

تقديم

سامر كمال باقي

بكالوريوس الهندسة المعمارية
كلية الهندسة - جامعة عين شمس

رسالة ماجستير مقدمة
بغرض الحصول علي درجة الماجستير في مجال الهندسة المعمارية

تحت إشراف

أ.د. سيد مدبولي علي

أستاذ العمارة - قسم الهندسة المعمارية
كلية الهندسة - جامعة عين شمس

أ.د. سمير صادق حسني

أستاذ العمارة - قسم الهندسة المعمارية
كلية الهندسة - جامعة عين شمس

القاهرة - ٢٠٠٦

Acknowledgment

First of all, I thank God for helping me out to accomplish this thesis. I would like to express my deepest gratitude and appreciation to my supervisors for their guidance and encouragement especially:

Prof. Dr. Sayed Madbouli Ali

Professor of Architecture, Department of Architecture,
Faculty of Engineering, Ain Shams University.

For his helpful suggestions, valuable advice, support, sincere supervision and guidance throughout the whole thesis.

Prof. Dr. Samir Sadek Hosny

Professor of Architecture, Department of Architecture,
Faculty of Engineering, Ain Shams University.

Acting Dean, Faculty of Engineering, Misr International University.

For his valuable advice and supervision, support, unlimited help and continuous encouragement throughout the whole thesis.

Also I would like to direct acknowledgment to:

Dr. Amr Farouk El Gohary

Associate Professor of Architecture, Department of Architecture,
Faculty of Engineering, Ain Shams University.

For his valuable advice, encouragement and support throughout this work.

Finally I would like to thank and gratitude all those who affected my life, Especially my Parents.

Keywords:

Architectural Design, Computer Aided Design CAD, Computer Aided Architectural Design CAAD, Collaborative Design, Computer Mediated Collaborative Design CMCD, Communication Modes, Communication Models, Delphi Process, E-education, Graphical Issue Based Information Systems GIBIS, Hyper Text, Issue Based Information Systems IBIS, Internet, Virtual Design Studio VDS.

Towards a Communication Model
in Computer Mediated Collaborative Design (CMCD),
VDS in Education between Theory and Practice

Summary

Abstract:

The computer and information revolution opened a variety of approaches to several trades in the human life, the life became easier and accurate, and the computers now are deeply involved in the architectural design process.

This thesis aims to investigate a new approach to communication in design and Computer Aided Architectural Design (CAAD), evaluating; **"Computer Mediated Collaborative Design" (CMCD) and "Virtual Design Studio" (VDS)**, to find out methods to develop the architectural design process, which enrich the architectural learning process and the collaborative architectural design process.

The thesis contains an introduction and six chapters:

Introduction:

In the introduction the problem statement is defined exploring the value of solving the problem and the goal of the research. Then the scope and limitations of the research are defined; the objectives of the research are presented, followed by the methodologies of achieving the objectives.

Chapter One: Approach to Design and E-education:

In chapter one, the approach to design and E-education is discussed, including definitions of design methods, how designers think, design teams classification, introducing E-education, E-education requirements and different perspectives about E-education.

Chapter Two: Applied Models of Communication in Design:

In chapter two, applied models of communication (Delphi Process, Hyper Text, Issue Based Information Systems IBIS Model and Graphical Issue Based Information Systems GIBIS Model) are illustrated.

Chapter Three: VDS Theoretical Approach:

In chapter three, Virtual Design Studio is illustrated, representing how VDS facilitates the design process, adds new dimensions to it and enables practicing design between various participants, illustrating VDS modes, components, communication, environments as well as VDS potentials and limitations.

Chapter Four: The History of CMCD:

In chapter four, the history of Computer Mediated Collaborative Design is presented, exploring modes of cooperation, collaboration types, communication, representation and documentation of design information. Previous CMCD experiments are presented and analyzed, followed by CMCD advantages and obstacles, CMCD effects on individual value systems of the design teams, CMCD effects on the design process as well as the final design product.

Chapter Five: CMCD Models of Communication:

In chapter five, existing models of communication in the currently available software are presented and analyzed, exploring the pros and cons of each, to conclude a Framework for a Communication Model in CMCD to facilitate using the computer in collaborative architectural design communication.

Chapter Six: Conclusion and Recommendations:

Finally, chapter six gives a conclusion to CMCD Model, in addition to opening new horizons for other research and investigation using new technologies along the same carrier of Internet.

Followed by some recommendations for the use of the computer to support the cooperation between the different parties involved in the design process in a **VIRTUAL DESIGN STUDIO.**

LIST OF CONTENTS

Acknowledgment.....	I
Keywords.....	II
Summary.....	III
List of Contents.....	V
List of Figures and Tables.....	XII
List of Abbreviations and Acronyms.....	XIV
List of Definitions.....	XV

Introduction:

Introduction.....	1
Problem Definition.....	2
Value of Solving the Problem.....	2
Goal of Research.....	3
Scope and Limitations of Research.....	3
The Objectives of the Research.....	4
Methodology.....	5
Research Structure.....	6

Chapter One: Approach to Design and E-education:

Introduction.....	7
1.1 How Designers Think.....	8
1.1.1 Sketching.....	9
1.1.2 Formulate Problem.....	10
1.1.3 Generate Solutions.....	10
1.1.4 Think Tank.....	10
1.1.5 Brain Storming.....	10
1.2 Case Based Design.....	11
1.3 Propose and Revise.....	11
1.4 Artificial Intelligence.....	11
1.5 Studying Design Teams.....	12
1.6 Think Aloud Method.....	13
1.7 Web Media and the Specifics of Design Education.....	13

1.8	Introduction to E-education.....	14
1.9	E-education.....	14
1.10	E-education Requirements.....	17
1.11	The University Perspective about E-education.....	17
1.12	The Tutor Perspective about E-education.....	19
1.13	The Student Perspective about E-education.....	20
1.14	E-education Conclusion.....	21

Chapter Two: Applied Models of Communication in Design:

	Introduction.....	22
2.1	Delphi Process.....	22
2.1.1	Delphi Process Key Elements.....	24
2.1.2	Computerized Delphi Process.....	25
2.1.3	Advantages of Computerized Delphi Process.....	26
2.1.4	Disadvantages of Delphi Process.....	27
2.2	Hypertext.....	28
2.2.1	The Author and Reader.....	28
2.2.2	The Meta-text.....	29
2.2.3	Nonlinearity.....	29
2.2.4	Hypertext and the Mind.....	29
2.2.5	History and Prehistory of the WEB.....	30
2.2.6	Hypertext Paradigm.....	30
2.2.7	Multimedia Paradigm.....	31
2.2.8	Hypermedia.....	31
2.2.9	Adaptive and Functional Interactivity.....	31
2.3	Issue Based Information Systems (IBIS).....	32
2.3.1	The Heart of IBIS: Questions, Ideas & Arguments.....	34
2.3.2	IBIS Node Types.....	35
2.3.3	IBIS Link Types.....	36
2.3.4	Resolution.....	37
2.3.5	Quest-Map.....	38
2.3.6	Rules for Effective Dialogues.....	39
2.3.7	Using Quest-Map Mail.....	42
2.3.8	Wicked Problems.....	43
2.3.9	Disadvantages of IBIS.....	44
2.4	Graphical Issue Based Information Systems (GIBIS).....	45
2.4.1	Node Types.....	46
2.4.2	Note Cards.....	46
2.4.3	Local Map.....	47
2.4.4	Global Map.....	47
2.4.5	Cluster.....	47
2.4.6	Link Types.....	48

2.4.7	Cognitive Overhead.....	48
2.4.8	Index.....	49
2.4.9	Filter.....	49
2.4.10	Multi-user.....	49

Chapter Three: VDS Theoretical Approach:

	Introduction.....	50
3.1	VDS Reforms the Design Process.....	51
3.2	VDS Modes of Communications.....	52
3.3.1	Synchronous Communication Mode in VDS.....	53
3.3.2	Asynchronous Communication Mode in VDS.....	53
3.3	VDS Components.....	54
3.3.1	Digital Images.....	58
3.3.2	CAD and 3D Models.....	59
3.3.3	Text.....	60
3.3.4	E-mail.....	61
3.3.5	Hypermedia and Multimedia.....	61
3.4	Network Technology.....	62
3.5	VDS Communication.....	63
3.6	VDS Environments.....	65
3.7	The Distributed Environment.....	69
3.7.1	Loosely Coupled Desktop.....	70
3.7.2	Tightly Integrated Desktop.....	70
3.8	The Centralized Environment.....	71
3.8.1	The Desktop Metaphor.....	72
3.8.2	The Place Metaphor.....	72
3.9	Management and Collaboration.....	73
3.10	Communication and Collaboration.....	74
3.11	Organizing a New VDS.....	76
3.12	Potentials and Limitations in VDS.....	77
3.12.1	Potentials of VDS.....	78
3.12.2	Limitations in Current VDS.....	79

Chapter Four: The History of CMCD:

Introduction.....	82
4.1 Modes of Cooperation.....	82
4.2 Collaboration Types in a Virtual Design Studio.....	84
4.2.1 Observing.....	84
4.2.2 Teaming.....	84
4.2.3 Deliberation and Critiquing.....	84
4.2.4 Borrowing.....	85
4.2.5 Multiplying.....	85
4.3 Communication, Representation and Documentation of Design Information in a VDS.....	86
4.3.1 Communication Modes in a VDS.....	87
4.3.2 Representation in a VDS.....	88
4.3.3 Documentation in a VDS.....	89
4.4 The VDS History.....	90
4.5 Previous Experiments.....	92
4.5.1 Virtual Village, Kat Hing Wai, (1993).....	94
4.5.2 Li Long Housing, (1994).....	96
4.5.3 Exhibition Pavilion, Bellevueplatz/Boatquay, (1994).....	98
4.5.4 Miyajima Island Project, Centre for Cultural and Religious Studies, (1995).....	99
4.5.5 National Exhibition Pavilion, Bellevueplatz/Ottawa,(1995).....	100
4.5.6 Virtual Design Studio, Live/Work Project, (1995).....	101
4.5.7 Olympic Exhibition Building, Homebush Bay, (1995).....	103
4.5.8 Monument to 1997 Competition, (1996).....	105
4.5.9 Kumamoto ArtPolis, (1996).....	106
4.5.10 Screen to Screen, (1996).....	108
4.5.11 Communicating a Sense of Place, (1997).....	109
4.5.12 MIT/XeroxPARC Studio, (1997).....	110
4.5.13 Lisbon Urban Design Charette, (1997).....	111
4.5.14 Multiplying Time, (1997).....	112
4.5.15 Remote Collaborative Fast Track Mini Charette, (1998).....	114
4.5.16 Om'nium [VDS], Virtual Design Studio, (1999).....	115
4.5.17 Active Worlds and Education, (2000).....	117
4.5.18 Collaborative Studio in a Virtual Environment, (2001).....	119
4.5.19 The First Egyptian VDS, (2003).....	121

Chapter Five: CMCD Models of Communication:

	Introduction.....	123
5.1	Modes of Collaboration.....	124
5.1.1	Synchronous Collaboration.....	124
5.1.2	Asynchronous Collaboration.....	124
5.2	Communication Software.....	125
5.2.1	MSN Messenger.....	126
5.2.1.1	MSN Messenger Advantages.....	128
5.2.1.2	MSN Messenger Disadvantages.....	128
5.2.2	Yahoo Messenger.....	129
5.2.2.1	Yahoo Messenger Advantages.....	131
5.2.2.2	Yahoo Messenger Disadvantages.....	131
5.2.3	Hyper Terminal.....	132
5.2.3.1	Hyper Terminal Advantages.....	133
5.2.3.2	Hyper Terminal Disadvantages.....	133
5.2.4	CU See Me.....	134
5.2.4.1	CU See Me Advantages.....	137
5.2.4.2	CU See Me Disadvantages.....	137
5.2.5	Net Meeting.....	138
5.2.5.1	Net Meeting Advantages.....	140
5.2.5.2	Net Meeting Disadvantages.....	140
5.3	Comparative Analysis of Communication Software....	141
5.4	A Framework for Communication Model in CMCD....	143
5.4.1	Instant Messaging Application.....	144
5.4.2	Shared Interactive Whiteboard.....	144
5.4.3	Application Sharing.....	145
5.4.4	Video Conferencing.....	145
5.4.5	Correspondence.....	145
5.4.6	Shared Web Browser.....	145
5.4.7	Moderator Tools.....	146
5.5	Different Platforms Integration.....	147

Chapter Six: Conclusion and Recommendations:

6.1	Conclusion.....	148
6.2	Recommendations.....	151
6.3	Future Directions.....	153
	References.....	
	Arabic Summary.....	

List of Figures and Tables

Fig. 1: Research Structure.....	6
Fig. 2: Design Process Management.....	8
Fig. 3: Computer Based Sketching.....	9
Fig. 4: University Home Page Structure.....	17
Fig. 5: Delphi Process Diagram.....	22
Fig. 6: Nonlinear Information Structure.....	29
Fig. 7: Issue Based Information Systems, IBIS Diagram.....	32
Fig. 8: IBIS Link Types Diagram.....	33
Fig. 9: Graphical Issue Based Information Systems, GIBIS Diagram.....	45
Fig. 10: Nontraditional Design Studio Diagram.....	51
Fig. 11: Nontraditional Design Studio.....	52
Fig. 12: Synchronous Communication Mode in VDS.....	53
Fig. 13: Asynchronous Communication Mode in VDS.....	53
Fig. 14: Individual Desktop Sample in VDS.....	54
Fig. 15: Personal Computer Equipped with Video Conferencing Software.....	55
Fig. 16: Shared White Board.....	55
Fig. 17: Hypermedia Shared Representation in a VDS.....	65
Fig. 18: Integration and Autonomy in a VDS.....	66
Fig. 19: Distributed Environment Diagram.....	69
Fig. 20: Centralized Environment Diagram.....	71
Fig. 21: Design Information Communication.....	86
Fig. 22: Virtual Village, Kat Hing Wai.....	94
Fig. 23: Li Long Housing.....	96
Fig. 24: Exhibition Pavilion, Bellevueplatz/Boatquay.....	98
Fig. 25: Miyajima Island Project, Center for Cultural and Religious Studies.....	99
Fig. 26: National Exhibition Pavilion, Bellevueplatz/Ottawa.....	100
Fig. 27: Virtual Design Studio, Live/Work Project.....	101
Fig. 28: Olympic Exhibition Building, Homebush Bay.....	103
Fig. 29: Monument to 1997 Competition.....	105
Fig. 30: Kumamoto ArtPolis.....	107

Fig. 31: Screen to Screen.....	109
Fig. 32: Communicating a Sense of Place.....	110
Fig. 33: Mit/XeroxPARC Studio.....	111
Fig. 34: Lisbon Urban Design Charette.....	112
Fig. 35: Multiplying Time.....	113
Fig. 36: Remote Collaborative Fast Track Mini Charette.....	115
Fig. 37: Active Worlds and Education.....	119
Fig. 38: Collaborative Studio in a Virtual Environment.....	121
Fig. 39: The First Egyptian VDS.....	123
Fig. 40: MSN Messenger Offline Interface.....	126
Fig. 41: MSN Messenger Online Interface.....	127
Fig. 42: Yahoo Messenger Offline Interface.....	129
Fig. 43: Yahoo Messenger Online Interface.....	130
Fig. 44: Hyper Terminal Interface.....	132
Fig. 45: CU See Me Offline Interface.....	134
Fig. 46: CU See Me Online Interface.....	134
Fig. 47: CU See Me, Pull Down File Menu.....	135
Fig. 48: CU See Me, Interface, During Visual Conversation.....	136
Fig. 49: CU See Me, Icons Legend.....	136
Fig. 50: Net Meeting Online Interface.....	138
Fig. 51: Net Meeting Add on Software.....	139

Tab. 1 : Virtual Design Studio (VDS) History Map.....	93
---	----

Tab. 2 : Comparative Analysis of Communication Software.....	142
--	-----