## Construction Innovation and Process Improvement

Edited by

Akintola Akintoye, Jack Goulding and Girma Zawdie

## **Contents**

Cont	Contributors	
Part	t I Theory and Practice	1
Akir	oter 1 Construction Innovation and Process Improvement atola Akintoye, Jack S. Goulding Girma Zawdie	3
1.1	Introduction	3
1.2	Innovation in Construction	4
1.3	Construction Innovation: Theory and Practice	7
	Construction Innovation: Process Drivers	10
	Construction Innovation: Future Technologies	13
1.6	Conclusion	15
	oter 2 Construction Innovation through Change Management na Zawdie	19
2.1	Introduction	19
2.2	The Innovation Process: Evolution	
	as a Systemic Phenomenon	21
2.3	Role of Culture as Challenge for Change Management	
	and Innovation	27
2.4	General Framework for Change Management	32
	Innovation in Construction	36
2.6	Conclusion	40
	pter 3 Construction Innovation: Theory and Practice tin G. Sexton and Shu-Ling Lu	45
3.1	Introduction	45
	Definitional Debate on Innovation	45
	Market-based, Resource-based and Balanced Perspectives	
	on Innovation	47
3.4	Case Study of Innovation in a Small Construction	
	Professional Service Firm	50
3.5	Conclusion	59

	oter 4 Culture and Innovation  a Liu and Richard Fellows	63
4.1	Introduction	63
4.2	Culture and Construction	64
4.3	Culture and Innovation	75
4.4	Factors Affecting Innovation	82
4.5	Conclusion	87
4.6	Acknowledgements	88
	oter 5 Innovation, Technology and Knowledge Transfer	
	Sustainable Construction	95
Emi	lia van Egmond	
5.1	Introduction	95
5.2	Innovation, Technology and Knowledge	
	Transfer Practices	97
5.3	Innovation, Technology and Knowledge	
	Transfer in Construction	106
5.4	•	110
5.5	Technological Regime in Construction	112
5.6	Opportunities, Appropriation and Cumulative Effect	
	of Innovation	113
<i>5.</i> 7	Managing Innovation for Sustainable Construction:	
	The Dutch Case	114
5.8	Conclusion	118
Cha	pter 6 Innovation and Value Delivery through Supply	
Chai	in Management	125
Der	rek H.T. Walker	
6.1	Introduction	125
	Organisational Value	126
	Value Generation and SCM	131
	Emerging Supply Chain Management Issues	135
6.5		
0.5	Total Business Transformation	140
6.6		147
	Acknowledgements	148
Par	rt II Process Drivers	155
	pter 7 Strategic Management in Construction k S. Goulding	157
7,1	Introduction	157
	Construction Sector Dynamism and Drivers	158
	Business Processes Redesign	159
	Business Strategy	161

		Contents	vii
7.5	Business Performance Assessment		165
7.6	Strategy Development within Construction		169
7.7	Conclusion		175
	er 8 Risk Management in Planning		
	ocess Improvement vaseyi Awodele, Stephen Ogunlana and Graeme Bowles		181
8.1	Introduction		181
8.2	Process Improvement		183
8.3	Planning for Process Improvement		191
8.4	Risk and its Management		193
8.5	Integrating Risk Management into Planning		
	for Process Improvement		202
8.6	Conclusion		204
Chapt	er 9 Modern Methods of Construction		209
Wafa	a Nadim		
9.1	Introduction		209
9.2	The Need for Change		210
9.3	Modern Methods of Construction		212
9.4	Open Building Manufacturing - ManuBuild Project		217
9.5	Offsite Production in the UK Construction Industry		220
9.6	Conclusion		227
Chapt	ter 10 Construction Innovation through		
	ledge Management		235
	les Egbu		
10.1	Introduction		235
10.2	Knowledge and Knowledge Management - Context		
	and Definition		236
10.3	Knowledge Management and Innovations in Project		
	Based Environments		238
10.4	Managing Knowledge in Construction: Challenges		
40 =	Facing Project Based Organisations		239
10.5	Knowledge Management Strategy - Issues and Contex		241
10.6	Knowledge Management Techniques and Technologies		242
10.7	Effective Knowledge Management Practices in Turbule	ent	245
100	Economic and Market Conditions		245
10.8	Conclusion		247
	ter 11 Innovation through Collaborative Procurement		
Chapt			
	egy and Practices		251
Strate			251
Strate Akin	egy and Practices tola Akintoye and Jamie Main		
Strate	egy and Practices	:	251 251 252

11.4	Conventional Procurement Methods	254
11.5	Collaborative Procurement or Innovation	
	Procurement Methods	259
11.6	Conclusion	271
Chapte	r 12 Concurrent Engineering in Construction	277
Chima	y J. Anumba and John M. Kamara	
12.1	Introduction	277
12.2	The Concept of Concurrent Engineering	278
12.3	Implementation of CE	279
12.4	Benefits of Concurrent Engineering	281
12.5	CE in Construction	281
12.6	Critical Enablers of CE Adoption	
	in the Construction Industry	286
12.7	Overcoming Barriers to CE Adoption	289
12.8	Benefits of CE to the Construction Industry	290
12.9	Conclusion	291
12.10	Acknowledgement	292
Chapte	r 13 Complexity Theory: Implications	
	Built Environment	297
	D. Sharp	
13.1	Introduction	297
13.2	Complexity Overview	297
13.3	Complexity in the Built Environment	301
13.4	Complexity in Organisations	302
13.5	Toolkits	303
13.6	Complex Innovation in Organisations	308
13.7	Conclusion	314
Part II	II Future Technologies	319
		224
Chapte Farzao	er 14 Design Innovation: Advanced Visualisation Futures  Pour Rahimian	321
·		321
14.1 14.2		323
11.2	Design milotation and Emisting risuarism room	323
		34/
14.4	Virtual Reality Interfaces within Conceptual	329
4.5	Architectural Design	323
14.5	Technical Implications for Developing Tangible	120
	Virtual Reality Design Interfaces	338
14.6	Conclusion	339
-	er 15 Virtual Planning and Knowledge-based	<b>-</b>
	on Support	347
Joseph	H.M. Tah	
15.1	Introduction	347
15.2	The Complex Nature of Construction Projects	348

Contents	îx

15.3	Construction Planning and Virtual Prototyping	349
15.4	Building Information Modelling	351
15.5	Interoperability and Industry Foundation Classes	353
15.6	Knowledge-based Decision Support	
	for Virtual Prototyping	354
15.7	The Promotion of Innovation through Virtual	
	Planning in Practice	357
15.8	Conclusion	359
Chapt	er 16 E-readiness in Construction	363
Eric l	Lou, Mustafa Alshawi and Jack S. Goulding	
16.1	Challenges Facing the Construction Industry	363
16.2	Business Dynamics and Technology	365
16.3	Building ICT Capability	365
16.4	Business Process and ICT	366
16.5	People and ICT	367
16.6	Business Process and Implementation	369
16.7	E-readiness	370
16.8	Organisational E-readiness in Construction	372
16.9	Conclusion	378
	ter 17 Building Information Modelling	385
Umit	Isikdag, Jason Underwood and Murat Kuruoglu	
17.1	Introduction	385
17.2	Background	387
17.3	A Case Study on the Implementation of BIM	391
17.4	Building Information Modelling in the UK	393
17.5	Innovation through BIM	399
17.6	Conclusion	403
Chap	ter 18 Industry Preparedness: Advanced Learning	
Parac	ligms for Exploitation	409
Jack .	S. Goulding and Farzad Pour Rahimian	
18.1	Introduction	409
18.2	Learning and Training Developments and Opportunities	41.0
18.3	Virtual Reality Systems	413
18.4	Case Study	415
18.5	Conclusion	427
18.6	Acknowledgements	428
Index		435