Design Economics for the Built Environment

Impact of Sustainability on Project Evaluation

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WILEY Blackwell
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PART I THEORIES, PRINCIPLES AND APPROACHES

1 Economic Context, Policy Environment and the Changing Role of Design Economists
Herbert Robinson and Barry Symonds

1.1 Introduction

2 Theories and Principles of Design Economics
Herbert Robinson and Barry Symonds

2.1 Introduction

Barry Symonds, Peter Barnes and Herbert Robinson

3.1 Introduction
3.3 The RICS NRM 1 33
3.4 RIBA plan of work, RICS estimating, cost planning and NRM 1 34
3.5 Cost estimating and cost planning 35
3.6 Elemental Standard Form of Cost Analysis (SFCA) 40
3.7 Benchmarking (cost limits) 41
3.8 Building information modelling 43
3.9 Concluding remarks 44

4 The Relationship between Building Height and Construction Costs 47
David Picken and Benedict Ilozor
4.1 Introduction 47
4.2 Research in the 1970s and 1980s 48
4.3 More recent research in Hong Kong and Shanghai 50
4.4 Conclusions 59

5 Appraisal of Design to Determine Viability of Development Schemes 61
Herbert Robinson
5.1 Introduction 61
5.2 Assessing costs and benefits of design alternatives 61
5.3 Appraisal of design using discounting methods 63
5.4 Appraisal of design using residual technique 65
5.5 Case study of the blackfriars development project 69
5.6 Concluding remarks 77

6 Eco-cost Associated with Tall Buildings 80
Peter de Jong and J.W.F. Hans Wamelink
6.1 Introduction 80
6.2 Overview of the Dutch housing market and land use planning 80
6.3 Eco-costs/value ratio and the EVR model 82
6.4 Applying the EVR model to housing 86
6.5 EVR and tall buildings 88
6.6 Embedding EVR in other sustainable ranking methods 89
6.7 Conclusion 90

7 Productivity in Construction Projects 93
Shamil Naoum
7.1 Introduction 93
7.2 Concept and measurement of productivity 94
7.3 Previous literature on factors affecting site productivity 94
7.4 Productivity survey 100
7.5 Proposed framework for site productivity 102
7.6 Conclusion and further research 104

8 Design Variables and Whole-Life Cost Modelling 107
Andrea Pelzeter
8.1 Introduction 107
8.2 Whole-life cost modelling 108
8.3 Steps in LCC modelling 110
13 Space Planning and Organisational Performance  
*Benedict Ilozor*

13.1 Introduction 191  
13.2 Organisational performance and innovative work settings 192  
13.3 Hypotheses and test results 193  
13.4 Discussion 195  
13.5 Conclusions 198

14 Achieving Zero Carbon in Sustainable Communities  
*Malgorzata Jacewicz and Herbert Robinson*

14.1 Introduction 201  
14.2 Key concepts and principles 202  
14.3 Key features of decentralised energy networks 203  
14.4 Activity-based design approach 204  
14.5 Key steps in the design process 206  
14.6 Evaluating energy, space and land requirements 209  
14.7 Concluding remarks 211

15 Flood Risk Mitigation: Design Considerations and Cost Implications for New and Existing Buildings  
*Rotimi Joseph, David Proverbs and Jessica Lamond*

15.1 Introduction 213  
15.2 Increasing challenges of flooding due to global warming and urban development 214  
15.3 Flood mitigation 215  
15.4 Flood mitigation consideration for new buildings at design stage 218  
15.5 Implications of mitigation measures in terms of building cost 218  
15.6 Implications of mitigation measures in terms of property value and insurance cost 222  
15.7 Conclusions 224

PART II INDUSTRY PERSPECTIVE, CASE STUDIES AND IMPLICATIONS FOR CURRICULUM DEVELOPMENT 227

16 Reusing Knowledge and Leveraging Technology to Reduce Design and Construction Costs  
*Herbert Robinson and Chika Udeaja*

16.1 Introduction 229  
16.2 Knowledge reuse in construction processes and projects 229  
16.3 Knowledge reuse in construction projects 231  
16.4 Leveraging knowledge systems to reduce time and costs 232  
16.5 4Projects knowledge solution 234  
16.6 Case studies and discussions 235  
16.7 Concluding remarks 237
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Authors</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Sustainable Design Economics and Property Valuation: An Industry Perspective</td>
<td>Barry Gilbertson, Ann Heywood, Ian Selby and John Symes-Thompson</td>
<td>240</td>
</tr>
<tr>
<td>17.1</td>
<td>Introduction</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>17.2</td>
<td>Sustainable design economics and property valuation</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>17.3</td>
<td>Data collection</td>
<td></td>
<td>243</td>
</tr>
<tr>
<td>17.4</td>
<td>UK Government impact</td>
<td></td>
<td>244</td>
</tr>
<tr>
<td>17.5</td>
<td>The valuation process</td>
<td></td>
<td>245</td>
</tr>
<tr>
<td>17.6</td>
<td>Conclusion</td>
<td></td>
<td>247</td>
</tr>
<tr>
<td>18</td>
<td>Cost Planning of Construction Projects: An Industry Perspective</td>
<td>Jon Scott</td>
<td>248</td>
</tr>
<tr>
<td>18.1</td>
<td>Introduction</td>
<td></td>
<td>248</td>
</tr>
<tr>
<td>18.2</td>
<td>Concept and format of a cost plan</td>
<td></td>
<td>248</td>
</tr>
<tr>
<td>18.3</td>
<td>How a cost plan is put together</td>
<td></td>
<td>253</td>
</tr>
<tr>
<td>18.4</td>
<td>How the cost plan evolves through the RIBA design stages</td>
<td></td>
<td>255</td>
</tr>
<tr>
<td>18.5</td>
<td>Main factors that affect the overall cost of a building</td>
<td></td>
<td>257</td>
</tr>
<tr>
<td>18.6</td>
<td>Impact of sustainability on cost plans</td>
<td></td>
<td>258</td>
</tr>
<tr>
<td>18.7</td>
<td>Recent developments in BIM and the implications for cost planning</td>
<td></td>
<td>260</td>
</tr>
<tr>
<td>18.8</td>
<td>Conclusion</td>
<td></td>
<td>260</td>
</tr>
<tr>
<td>19</td>
<td>Life Cycle Costing and Sustainability Assessments: An Industry Perspective with Case Studies</td>
<td>Sean Lockie</td>
<td>262</td>
</tr>
<tr>
<td>19.1</td>
<td>Introduction</td>
<td></td>
<td>262</td>
</tr>
<tr>
<td>19.2</td>
<td>Sustainability considerations in design</td>
<td></td>
<td>263</td>
</tr>
<tr>
<td>19.3</td>
<td>Using the life cycle costing standards</td>
<td></td>
<td>269</td>
</tr>
<tr>
<td>19.4</td>
<td>Case study 1 – whole building</td>
<td></td>
<td>275</td>
</tr>
<tr>
<td>19.5</td>
<td>Case study 2 – lighting</td>
<td></td>
<td>279</td>
</tr>
<tr>
<td>19.6</td>
<td>Concluding remarks</td>
<td></td>
<td>282</td>
</tr>
<tr>
<td>20</td>
<td>Designing Super-Tall Buildings for Increased Resilience: New Measures and Cost Considerations</td>
<td>James Hayhoe</td>
<td>284</td>
</tr>
<tr>
<td>20.1</td>
<td>Introduction</td>
<td></td>
<td>284</td>
</tr>
<tr>
<td>20.2</td>
<td>Challenges of tall buildings and the need for increased resilience</td>
<td></td>
<td>284</td>
</tr>
<tr>
<td>20.3</td>
<td>Factors influencing design and cost of tall buildings</td>
<td></td>
<td>285</td>
</tr>
<tr>
<td>20.4</td>
<td>Design of counter-terrorism measures</td>
<td></td>
<td>288</td>
</tr>
<tr>
<td>20.5</td>
<td>Cost of new measures and design</td>
<td></td>
<td>291</td>
</tr>
<tr>
<td>20.6</td>
<td>Concluding remarks</td>
<td></td>
<td>295</td>
</tr>
<tr>
<td>21</td>
<td>Building Information Modelling: A New Approach to Design, Quantification, Costing, and Schedule Management with Case Studies</td>
<td>Aviad Almagor and Barry Symonds</td>
<td>299</td>
</tr>
<tr>
<td>21.1</td>
<td>Introduction</td>
<td></td>
<td>299</td>
</tr>
<tr>
<td>21.2</td>
<td>Concept of BIM</td>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>
21.3 Integration and dataflow
21.4 Model Progression Specification: Developing a common language
21.5 Quality
21.6 Cost planning
21.7 Construction schedule
21.8 Conclusion and future directions

22 Case Study: Value Engineering and Management Focusing on Groundworks and Piling Packages
Richard Powell
22.1 Introduction
22.2 Why VM?
22.3 When and where is VM applied?
22.4 Value management implementation and tools used
22.5 Practical benefits and savings
22.6 Reflection and concluding remarks

23 Case Study: Value Engineering of a New Office Development with Retail Provision
Paul Ullmer
23.1 Introduction
23.2 Why value management?
23.3 When and where is value management applied?
23.4 Value management implementation and tools used
23.5 Practical benefits and savings
23.6 Concluding remarks

24 Case Studies: Sustainable Design, Innovation and Competitiveness in Construction Firms
Arthlene Amos and Herbert Robinson
24.1 Introduction
24.2 Background and context
24.3 Key drivers of sustainability in design and construction
24.4 Case studies
24.5 Findings and discussions
24.6 Concluding Remarks

25 Case Study: Retrofitting Building Services Design and Sustainability in Star Island
Victoria Hardy
25.1 Introduction
25.2 Initial study or analysis to identify problems
25.3 Funding for capital improvement plan
25.4 Evaluation of design options and the cost implications
25.5 Proposed design solution and costs
25.6 Concluding remarks
26 Case Studies: Maximising Design and Construction Opportunities through Fiscal Incentives
Paul Farey

26.1 Introduction 362
26.2 Strategic considerations 362
26.3 Capital allowances planning 364
26.4 Enhanced capital allowances (ECA) 366
26.5 Land remediation relief (LRR) 367
26.6 Value added tax 368
26.7 Taxation anti-avoidance 370
26.8 Conclusion 370

27 Mapping Sustainability in the Quantity Surveying Curriculum: Educating Tomorrow’s Design Economists
Chika Udeaja, Damilola Ekundayo, Lei Zhou, John Pearson and Srinath Perera

27.1 Introduction 372
27.2 Literature review on sustainability issues 373
27.3 Development of the Sustainability Framework 376
27.4 Mapping of Sustainability Education in QS Degree Programmes 380
27.5 Discussion and conclusions 382

Appendix A: UK Property Investment Yields (December 2013) 387
Appendix B: IPD/RICS Sustainability Inspection Checklist 2014 389
Index 392
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John Pearson is a Chartered Quantity Surveyor (FRICS) and has spent 36 years working and teaching within the construction industry. During the 1970s and 1980s he worked for Private Practice and for Consultant Civil Engineers, both in the UK and Finland. Since 1987 he has been a principal lecturer at Northumbria University and has held a number of responsibilities including managing Quantity Surveying research. As an active member of the UK Green Party, John is a keen public speaker on the importance of sustainable construction and is very conscious of the need to instil awareness of this in future construction professionals. At Northumbria University, he teaches in a range of subjects and makes every effort to identify the relevance of sustainability. In addition he has supervised both undergraduate and Master’s Dissertations in this area. John also has a degree in Law (LLB) and a master’s degree in Education (MEd).
Prof. Andrea Pelzeter
Andrea Pelzeter studied architecture at the University of Stuttgart in Germany. She worked as an architect in the field of construction and revitalisation. In 2002, she began her postgraduate studies in the field of business administration and real estate at the International Real Estate Business School (IREBS). She started as a research assistant at IREBS and in 2006 pursued her doctoral studies at the European Business School (EBS), International University Schloss Reichartshausen. Her research topic was ‘Life-cycle costs of real estate: the influence of location, design and environment’. She founded her consulting agency Pelzeter Lebenszyklus-Management (Lifecycle-Management) in 2006. Since 2007 she has held a Professorship for General Business Administration, particularly Facility Management, at the Department of Cooperative Studies at the Berlin School of Economics and Law (HWR Berlin). She is the author of numerous publications on sustainable development in facilities management and building optimisation with life cycle costing.

Prof. Srinath Perera
Srinath Perera is the Chair and Professor of Construction Economics at Northumbria University, Newcastle upon Tyne. He has over 25 years’ experience working as a consultant Quantity Surveyor, Project Manager and lecturer. He is a chartered surveyor and a member of both the Royal Institution of Chartered Surveyors and the Australian Institute of Quantity Surveyors. He presently leads the Construction Economics and Management Research group at the Faculty of Engineering & Environment of Northumbria University. His main research interests are in the broad field of Construction Economics covering, risk and value management, cost planning and management, innovation management; sustainability: whole life costing, cost–benefit analysis, carbon estimating; e-business: ICT in construction, e-procurement, decision support and knowledge based systems; professional education. He is currently a coordinator of the e-Business in Construction, task group TG83 of the CIB.

David Picken
David Picken is a Fellow of the Royal Institution of Chartered Surveyors and the Australian Institute of Quantity Surveyors. After university David worked as a volunteer on an aid project in Papua New Guinea. He joined a firm of consultant quantity surveyors in Adelaide in 1973, and held similar positions in the UK and Saudi Arabia. His academic career began at The Hong Kong Polytechnic University in 1979. He completed a research Masters at the University of Salford in life cycle costing in 1989, and studied value engineering practices during a placement with the Hanscomb Group in the USA in 1994. From 1995 to 2009, he taught at the School of Architecture and Building at Deakin University (Australia). His publications include textbooks for measurement practice and papers on design and construction economics in international refereed journals. His teaching was recognised by awards for excellence and outstanding achievement. He is now an adjunct teaching fellow at Bond University in Queensland. David’s research interests focus on design economics, procurement and risk management.

Richard Powell
Richard Powell is a Senior Cost Manager with Turner & Townsend Cost Management, a leading international construction consultancy company. He chose quantity surveying as a career as he was attracted to having the on-site experience.
Richard successfully achieved a first-class honours degree in the Quantity Surveying Consultancy course at Kingston University. For the early part of his career Richard was mainly involved within the public sector supporting projects from school extensions to health centres. He then rose to the challenge on the prestigious Heathrow Terminal 5 project for 2 years prior to playing a key role within the cost management of a food retail account. As a chartered surveyor, he now leads the commercial management for a major retail banking client on the refurbishment of their branch network. Richard is passionate about first-class service delivery and passing his knowledge onto those undertaking their RICS APC.

**Prof. David Proverbs**

David Proverbs is Professor of Construction Management and presently Head of the Department of Architecture and the Built Environment and co-Director of the Centre for Floods, Communities and Resilience at the University of the West of England, Bristol. He is Chair of the Council of Heads of the Built Environment (CHOBE) in the UK, a member of the CIOB Educational Committee and a member of the RICS UK Education Standards Board. He has undertaken numerous research projects, both for industry and the government. Research funding has been secured from the research councils, and various public and private sponsors. Areas of research specialism within flood risk management issues include adaptation to flood risk, damage assessment, flood repair and flood resilience. He is Co-Editor of the *Structural Survey: Journal of Building Pathology and Refurbishment*; and the *International Journal of Sustainable Development and Planning*.

**Jon Scott**

Jon Scott is a Senior Cost Manager at Bruce Shaw, a multidisciplinary consultancy with both UK and international offices. Jon is a chartered surveyor; originally an Economics graduate with an MSc in Quantity Surveying. He has over 10 years’ experience across a number of private firms including Cyril Sweett – a leading international construction consultancy. His experience includes a variety of sectors including residential, commercial, retail and PPP sectors, both in the UK and France. This experience includes the responsibility for cost planning from the inception of many different projects. He is currently working on a number of high specification residential projects in both London and Paris with Bruce Shaw. Jon has previously undertaken published research on Operational Private Finance Initiative projects and the payment mechanism.

**Dr. Ian Selby**

Ian Selby graduated from the University of Wales Aberystwyth in 1990 with a BSc (Econ.) Hons in International Politics. He then read an MPhil (1992) and PhD at University of Cambridge (1998). During the 1990s he worked for various public and private sector organisations developing research and public affairs activities, and led a research and marketing department for a major UK media organisation between 1998 and 2000. In 2000, he took up his first post in the built environment sector at the British Council for Offices, where he was responsible for establishing the research and public affairs department, which he subsequently led between 2002 and 2008 as Director of Research & Public Policy. He is currently the Research Director at The College of Estate Management. He has managed major research projects on flooding, and grey water usage in the UK housing sector. He has been a member of HMG committees, including the ODPM’s Working Party on Decontamination of
Buildings, the DCLG’s Working Party on Building Regulations and Energy Performance Certificates Advisory Implementation Committee. Ian is also currently an adviser to the CRS in Wales, and to the Ústí Nad Labem-Libouchec Green Community Investment Project in the Czech Republic.

**John Symes-Thompson**

John Symes-Thompson has built up over 30 years of experience in the commercial property investment markets, including 11 years at ING Real Estate in a fund management role, and 3 years at CBRE in investment agency. He joined CBRE in October 2005 as a Senior Director in the Capital Markets Division, but moved over to the Investment Valuation team in 2008 where he is able to bring his market experience and knowledge to the table for key institutional clients. He is currently the lead valuer for Standard Life Assurance, UBS Global Asset Management, BAE Systems Pension Trustees, Royal Bank of Scotland Pension Fund, Lothian Pension Fund, Mountgrange and Santander Pension Trustees in the UK. On the corporate side his clients include Sports Direct, BHS plc. and Arcadia Group. He has a specialist knowledge and interest in sustainability issues and is a member of the IPD ECOPAS Steering Group and the RICS Valuation Working Group on Sustainability.

**Dr. Chika Udeaja**

Chika Udeaja graduated as a Civil Engineer and worked briefly as a site engineer and design engineer before undertaking postgraduate studies in Concrete Structures at Imperial College London. This was followed by a brief assignment as a bridge engineer in Malaysia before he returned to the UK, to undertake a PhD in Construction Management at the London South Bank University. On completion of his PhD in 2003, he joined the University of Newcastle as a researcher, and was involved in developing CAPRIKON and other research projects. He is currently a senior lecturer in the Faculty of Engineering and Environment at Northumbria University. He teaches procurement, technology, and sustainability to future generations. His main research interests are in construction management and information technology. More recently, he has become increasingly involved in innovative product and process management looking at how modern construction management techniques and sustainable technologies can be used to deliver government and industry targets on improving efficiency and reducing carbon emissions.

**Paul Ullmer**

Paul Ullmer is a Quantity Surveyor with EC Harris, a leading international built asset consultancy company which is part of ARCADIS, a leading global engineering and consultancy firm, providing consultancy, design, engineering and management services.

**Prof. J.W.F. Hans Wamelink**

J.W.F. Hans Wamelink has been the Professor of Design and Construction Management in the Faculty of Architecture and the Built Environment, Department of Real Estate and Housing, Delft University of Technology since April 2006. The educational and research activities of his Chair intend to empower professionals and organisations in the AEC industry with new processes and business models which integrate knowledge, organisations and procurement to deliver innovative building projects, and the sustainable renewal of the built environment. The Chair
takes care of the education in the bachelor degree as well as in the master’s degree programmes. Apart from his role as a professor, he was owner–director of Infocus and a consultant at DHV, both companies specialised in consultancy and building management. After finishing his PhD at the Delft University of Technology he worked for 10 years as an Assistant Professor at the Faculty of Technology Management of the Eindhoven University of Technology in the Netherlands.

Dr. Lei Zhou
Lei Zhou is a lecturer in Construction Economics at the Faculty of Engineering and Environment, Northumbria University, UK. He is a columnist for *International Journal of Project Contracting & Labour Service*. He graduated from Heriot-Watt University with an honours degree in Building Economics and Quantity Surveying. He obtained an MPhil degree in sustainable construction from the University of Manchester. He further gained a PhD degree from Oxford Brookes University in the UK in 2009. He has expertise in Project Finance and Investment, Low Carbon City and Sustainable Construction, Quantity Surveying, Construction E-business and Public Project Management and Auditing.
With continuing pressure and innovation in the built environment of today, and with more people now living in cities than in the history of mankind, getting that environment to be an exciting, vibrant, sustainable and cost effective place for communities, occupiers, as well as clients, has never been more important. Understanding design economics is critical to help deliver this vision around the globe, and to enable qualified professionals to provide effective and well considered advice in land, property and construction.

In *Design Economics for the Built Environment*, the Editors, Professor Herbert Robinson, Barry Symonds, Professor Barry Gilbertson and Professor Benedict Ilozor, are unquestionably well recognised professionals in providing such advice around the world. They, together with an expert team of academics and practitioners, bring the theory and practice alive for the reader. Collectively, they are to be congratulated on what has been a challenging task to pull together the latest thinking in such a well informed and coherent way. This is a hugely credible book, providing evidence of the importance of striking the right balance between theories and practices leading to a relevant and robust built environment of the future. It is incredibly well structured and thought through, as you would expect with such a prestigious roll call of academics and practitioners on the contributor list:

- In Part I, all the key elements necessary for effective design economics from an up-to-date view on the theories, principles, concepts and approaches to design economics. Important developments such as the new rules of measurement, new processes for productivity and efficiency, innovation and technologies including BIM, whole life sustainable costing, fiscal policies and incentives for achieving sustainability in design, effective procurement and sustainability tools (including BREEAM and LEED), sustainable communities, flooding risks and cost of mitigation all feature with many of the world’s academic experts sharing their words of wisdom.
- Part II makes the theory come alive through practitioners sharing their experience through industry perspectives, practical examples and case studies. Key elements from Part I are unpacked to reinforce the theories and principles
learned and the implications of delivering value for money alongside the need to balance environmental, economic and social pressures of today’s construction industry.

So wherever you are in the world, this is a lively and refreshing up-to-date view of design economics in terms of acting as a core enabler for delivering sustainable buildings and infrastructure projects. Whether you are currently studying for a related degree, are a practitioner or influencer in the field, this book will have something for you. I only wish something so well considered that conjoins the latest academic thinking with the practicalities of the built environment were available when I was studying.

It is a huge privilege to be asked to write the foreword for this book, with so many of those I have known in the industry involved in editing or contributing. All I can say is that it has to be worth a read. Design economics is the only thing that can influence the future of the built environment and with countries like India set to build the equivalent of a Chicago every year for the next 26 years, getting this right now is paramount for creating the best environment possible for the generations to come. If you are set to read this book you do so I am sure as a potential key contributor to the built environment now or for the future – there is no question this book will set you up with the latest thinking you require.

Amanda Clack
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Vice President of the Royal Institution of Chartered Surveyors and
Partner at PricewaterhouseCoopers
The drive towards low carbon economy, zero carbon buildings and environmentally friendly infrastructure means that there is a growing interest to design in a way that reflects sustainability principles of balancing economic, social and environmental factors. Design economists are increasingly called upon to respond to new and complex challenges by providing solutions that deliver value for money for clients within the constraints of balancing the environmental, economic and social factors in the development process. The unifying theme throughout the book is therefore how to respond to the increasing social, economic and environmental pressure as a result of changes in regulations and clients’ priorities to address emerging challenges in the built environment. Previous books on design economics are either too out-dated, or narrowly focused, on exploring the relationship between fundamental design variables relating to geometry in terms of size, shape, arrangement, height and their effects on capital costs. There have been a number of significant books written on the subject over the past decades. The *Economics of Building* by Herbert W. Robinson published in 1939 was the first book to be devoted entirely to the economic aspects of building. This book was a condensation of the author’s PhD thesis written at the London School of Economics and was followed by other significant publications including Ivor Seeley’s popular book on *Building Economics* in 1972.

However, it is now recognised that design economics should focus on a wide range of issues affecting construction costs and value from a user, buyer or tenant perspective within a changing policy environment and regulatory framework. This book presents new directions and perspectives reflecting the need to recognise the importance of climate change and sustainability in project design. Considerable attention is therefore given to design factors influencing sustainability and environmental externalities, life cycles of buildings with carbon emission treated as external costs, productivity and efficiency, taxation, monetary and fiscal policies, and other fiscal incentives (e.g. levies, reliefs and capital allowances), affect design and construction costs. Attention is also devoted to emerging issues such as the development of assessment frameworks to reduce the environmental costs of design, flooding risks and mitigation, cost implications of terrorism and similar explosive threats, new processes, innovation and technologies such as
Building Information Modelling, knowledge management systems, role of education and their impact on in improving productivity and efficiency of the design process to reduce both project duration and costs.

This book explores the theories, principles of design economics and how it is applied in the construction industry. It is carefully structured into two parts. Part I provides the context and discusses key theories and principles of design economics. Part II focuses on the application of the theories, principles and approaches in Part I by presenting practical examples, case studies as well as tools and frameworks used to achieve creativity resulting in sustainable design outcomes. This approach of integrating theory and principles with practice, tools and case studies provides a better understanding of the linkages between theories and principles of design economics to industry practices leading to a greater appreciation of the discipline of design economics and its increasingly important role in addressing critical economic, social and environmental challenges faced by clients of the construction industry today.

As editors, it has been a long and challenging process but a rewarding journey to put a book of this nature and complexity together. We want to take this opportunity to register our deepest appreciation to all the contributors from academia and industry. We also recognise that the book we are producing is at a time when there are unprecedented changes in the construction industry. The blend of invaluable contribution from academia and industry has made this book unique in many ways. The principles, industry case studies and practical tools incorporated are useful for final year and postgraduate students in design and architecture, construction management, facilities management, quantity surveying, engineering and project management, as well as government policy makers, consultants, contractors and advisers to client organisations. The book will enable both students and practitioners to explore and understand the multiplicity of factors that contribute to efficient design which can reduce both the capital and operating costs of buildings and infrastructure projects and minimise the environmental and social costs to society. Finally, we want to thank Madeleine Metcalfe and her team of editorial assistants and publishers at Wiley-Blackwell for their encouragement and patience in putting this book together.

Editors’ and Publishers’ Acknowledgement

We are grateful to Rapid 5D/Trimble for their generous support towards the colour illustrations in this book.