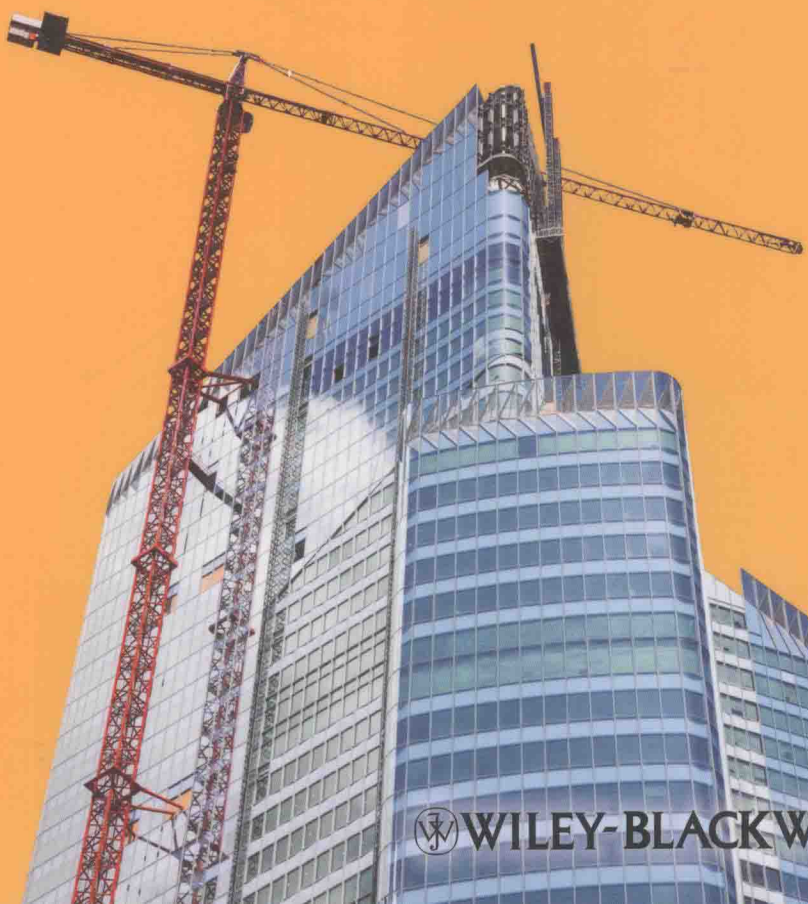
CONSTRUCTION MANAGEMENT STRATEGIES

A THEORY OF CONSTRUCTION MANAGEMENT

MILAN RADOSAVLJEVIC
JOHN BENNETT



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Construction Management Strategies

A Theory of Construction Management

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The book's companion website at
www.wiley.com/go/constructionmanagementstrategies
offers invaluable resources for students and lecturers as well as for practising construction managers:

- end-of-chapter exercises + outline answers
- Gantt charts to accompany examples in the book
- PowerPoint slides for each chapter
- ideas for discussion topics
- links to useful websites

About the Authors

Dr Milan Radosavljevic, u.d.i.g. PhD ICIOB

Dr Milan Radosavljevic is a lecturer in Construction Management, Director of Postgraduate Programmes and Director of the prestigious MSc Project Management in the School of Construction Management and Engineering of the University of Reading.

Dr Radosavljevic currently serves as a committee member of the Association of Researchers in Construction Management (ARCOM), he sits on the Board of the International Council for Research and Innovation in Building and Construction (CIB), and represents the University of Reading in the UK Construction Industry Research and Information Association (CIRIA) and Constructing Excellence in the Built Environment (CEBE). He is also a Visiting Professor at the University of Ljubljana in Slovenia.

Before joining the University of Reading Dr Radosavljevic worked as a Production Director in the medium size off-site construction company in Central Europe from 1997 to 2001, as a Research Assistant at the Construction Information Technology Centre (CITC) of the University of Maribor in Slovenia where he administered the EU funded ITC Euromaster programme between 2001 and 2002, and as a Demonstration Projects Coordinator for Scotland on behalf of the Communities Scotland and Constructing Excellence between 2003 and 2006.

He has made contributions on various courses at institutions around the world, including the Norwegian School of Management, Tallinn University of Technology in Estonia, University of Ljubljana in Slovenia, Shandong University in China, and has developed and run executive courses in Project Management in the United Kingdom and abroad.

He was a Principal Investigator in the KanBIM project. This was an international project involving researchers from the University of Reading and Technion in Israel aimed at developing a Building Information Modelling (BIM) based lean production management system for construction jointly funded by the Innovative Construction Research Centre (ICRC) of the University of Reading and Tekla Oy, a major BIM software vendor from Finland. The initial year-long project culminated in a paper published by *Automation in Construction* journal where it has soon become the second most popular and downloaded research paper.

Apart from BIM and digital technologies in their broadest sense, his current research interests include programme and project management, and computational simulation of construction organizations as heterogeneous and evolving networks.

Key publications

Cus Babic, N., Rebolj, D., Magdic, A., and Radosavljevic, M (2003) MC as a means for supporting information flow in construction processes. *Concurrent Engineering: Research and Applications*, 11(1), 37–46.

Radosavljevic, M. (2008) Autopoiesis vs. social autopoiesis: critical evaluation and implications for understanding firms as autopoietic social systems. *International Journal of General Systems*, 37(2), 215–30.

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Professor John Bennett, DSc, FRICS

John Bennett is Professor Emeritus of The University of Reading where he was Professor in the Department of Construction Management & Engineering from 1975 to 2001. He was the United Kingdom's first Professor of Quantity Surveying following a successful career in both the public and private sectors. This included being Senior Quantity Surveyor in the CLASP Development Group which pioneered the use of industrialised building and subsequently Chief Quantity Surveyor at Hampshire County Council.

Professor Bennett was Director of the Centre for Strategic Studies in Construction from 1986 to 1997 where he took the lead in publishing reports based on rigorous academic research that influenced practice. Important examples include *Building Britain 2001* and *Investing in Building 2001* which provide an action plan for UK construction endorsed by the then Prime Minister, Margaret Thatcher.

Professor Bennett's research provided the basis for the UK construction industry's approach to partnering. This is reflected in his influential publications: *Trusting the Team, The Seven Pillars of Partnering* and most recently *Partnering in the Construction Industry; Code of Practice for Strategic Collaborative Working*.

In 1991 Professor Bennett was employed as Professor in the Research Centre for Advanced Science and Technology (RCAST) at the University of Tokyo where he continued research, begun in 1985, into the management methods of the 'big five' Japanese contractors. In 2002 he was an international visitor providing strategic advice to the Australian Cooperative Research Centre for Construction Innovation based at the Queensland University of Technology in Brisbane.

He was the principle academic member of the consortium, led by W S Atkins International, which produced the Strategic Study on the Construction Sectors for the Commission of the European Union. He was one of two main authors of the Final Report, *Strategies for the European Construction Sector*, published in 1994 to provide a factual and theoretical basis for the EU's strategy towards construction.

He was Chairman of the SMM Development Unit that drafted SMM7 and the first Chairman of the joint ACE/BEC/RIBA/RICS Building Project Information Committee set up to run the UK's co-ordinated conventions for production information for building projects.

He was founding editor of the leading international refereed journal *Construction Management and Economics*, and remained in this role from 1982–91. His main theoretical publications are *International Construction Project Management*, which provides a contingency theory of construction project management based on practice in the United States, Japan and the United Kingdom and *Construction – The Third Way*, which describes construction organizations in terms of self organizing networks of teams guided by open information and feedback.

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Atkins, W. S. and consultants including the Centre for Strategic Studies in Construction (1993) *Secteur, Strategic Study on the Construction Sector: Final report: strategies for the construction sector.* W.S. Atkins International.

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With an ambition to multiply its customers' potential to think and achieve big, Tekla provides a BIM (Building Information Modeling) software environment that can be shared by contractors, structural engineers, steel detailers and fabricators, as well as concrete detailers and manufacturers.

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Preface

Construction management involves unique challenges. It has features which are similar to the systematic improvement of products and production processes which characterise manufacturing but it also has features more usually associated with the controlled innovation and creativity which characterise project based industries, such as software development. The distinctive characteristics of construction result from buildings and our physical infrastructure involving many different technologies. Some are based on very local industries, some depend on companies which operate nationally but an increasing number of construction technologies depend on global networks of organizations often with widely different approaches to business. All this is further complicated by construction projects having individual locations which inevitably throw up at least a few surprises.

This combination of challenges is not comprehended by general management theories. Yet historically these provided the basis of most construction management courses. The inevitable result is young construction managers quickly discover the ideas they have been taught do not fit the practical situations they face. They find it difficult to make sense of bewildering mixes of terms, responsibilities and roles. Eventually most learn from experience in one sector of construction how to work reasonably effectively but that provides a poor basis for working in other sectors.

Similar limitations characterise construction management research. Too much of what is published distorts the realities of construction to make it fit theories developed in other industries. Inevitably the results appear remote from practice which has created a gulf between researchers and practitioners. The subject needs a new foundation which is firmly grounded in the characteristics of construction. This book attempts to provide that foundation by proposing a theory of construction management which identifies the actions which help construction projects and companies to be efficient.

The theory and the practical guidance which flows from it draw on knowledge and experience from two generations of construction management. The authors between them have been involved with the leading edge of construction management from the earliest days of its emergence as a distinct profession and academic subject through to contemporary best practice. When Milan Radosavljevic and John Bennett met in 2008 they rapidly found common ground in understanding the need for construction management to have a robust theoretical basis. They both recognised the absence of this essential foundation results in too much practice and far too much research being based on individual ideas and isolated initiatives. As a result good ideas are lost; systems to ensure year-on-year improvements in performance are weak or non-existent and progress in practice and research is painfully slow.

The fundamental aim of this book is to provide a basis for construction management to develop systematically on robust theoretical foundations. Theory is essential for practice and research to make the steady, relentless progress which is the hallmark of all outstanding industries and bodies of knowledge.

Given this high ambition, the book is organized to provide a coherent message for construction managers at all levels. It recognises that students and practitioners have different needs by developing the material in four sections, each designed to match the knowledge and experience of a distinct group of readers. In addition the authors have recognised the needs of the ever growing number of international students who come from different cultures and are not familiar with English construction terminology. The book therefore carefully defines all the key terms needed to understand the theory of construction management.

The book begins with a basic introduction to construction processes and products. This is in Chapters 1 and 2 and is suitable for first year undergraduate students in courses for all the professions involved in modern construction. The next section of the book describes the theory of construction management. It begins in Chapter 3 which defines the basic concepts of the subject. This is necessary because the construction management literature lacks consistent definitions of commonly used terms like *built environment*, *construction*, *design*, and so forth. Throughout the existing literature different terms are used for the same or similar concepts and the same terms are used for obviously different concepts. For example, a plethora of muddled and overlapping role titles are currently used in construction which makes it difficult to establish how projects are actually managed and by whom. Chapter 3 provides a set of clear and consistent definitions of the basic concepts needed to understand construction management.

The resulting set of fundamental definitions is used in Chapter 4 to describe the theory of construction management. This provides a rigorous way of understanding the factors which determine the performance of construction projects and companies. In a distinct break with most existing construction management literature, project and company management are treated as an integrated whole. This is vital in enabling the theory to take account of the major influence company managers have on projects, and the impact of project managers on companies. Chapter 4 also describes how the complexity and uncertainty endemic in construction can be expressed in mathematical terms to provide effective indicators of the inherent difficulty of the tasks facing construction managers in practice. The website linked to this book, www.wiley.com/go/constructionmanagementstrategies, includes a basic guide for readers not familiar with mathematical terms. The mathematics introduced in Chapter 4 is straightforward but nevertheless provides a powerful tool to guide decisions about appropriate strategies for construction projects and companies. The theoretical material in Chapters 3 and 4 is designed for undergraduate students in their final years as they become familiar with construction.

Chapters 5 to 9 describe the practical implications of the theory in the major construction management approaches currently used in practice. These include traditional approaches, the various management-based approaches as well as recent developments designed to foster cooperation including partnering and strategic cooperation. The book goes further in describing a totally integrated approach capable of delivering, in the right circumstances, outstanding

performance. Each major approach has its own chapter which describes the main roles and actions and relates them to the theory of construction management. This rich mixture of theory and practice is designed for final year undergraduate students.

The first nine chapters are ideal for postgraduate students who have not studied the subject at undergraduate level. They provide a coherent and rigorous description of construction management in theoretical and practical terms. The subject matter is expressed in clear descriptions, diagrams and mathematics to make it accessible to the widest possible range of postgraduate students.

The first nine chapters provide an essential introduction to the fourth section which comprises Chapters 10 and 11. Chapter 10 describes how the theory of construction management benefits practice by providing 25 propositions about construction management actions which improve the efficiency of projects and companies. These are set out and explained in Chapter 4. The propositions provide a checklist of best practice. Practitioners who decide to act on any of the propositions will find a mass of useful advice and guidance on the strength and application of each of the propositions in the body of the book. As they consider using any of the major approaches to construction management, they will find the chapter which describes it helps ensure they are making a good choice and provides direct advice on using it effectively. All this is brought together in Chapter 10.

Chapter 11 describes the implications of the theory of construction management for future research. It then uses this analysis to propose a radical new basis for construction management research. It explains how this can be set up and developed by the construction management research community in a manner which enables individual projects and companies to use the best available knowledge and research. At present too much practice and research is isolated so that knowledge remains fragmented and lacks a robust basis for making progress with any confidence. Chapter 11 is intended to change this by proposing a major step forward for the subject. This important development is supported by the website linked to this book, www.wiley.com/go/constructionmanagementstrategies, which demonstrates the use of the proposed new knowledge base for construction management.

The book is based on the authors' very diverse knowledge and experience. It also takes account of the best of the construction management literature by including in each chapter a list of *Further Reading*. This lists the most significant books and papers which are relevant to the chapter. This approach has been adopted to avoid interrupting the text with detailed references to the sources of particular ideas. The authors fully understand why references are essential in research reports but the book is a textbook for students and a guide and checklist of best practice for construction managers. The needs of these readers are best served by guiding them towards the most outstanding construction management literature not by interrupting their focus on understanding the subject with a multitude of references.

Milan Radosavljevic
John Bennett
The University of Reading, UK

Contents

The book's companion website at www.wiley.com/go/constructionmanagementstrategies offers invaluable resources for students and lecturers as well as for practising construction managers:

- **end-of-chapter exercises + outline answers**
- **Gantt charts to accompany examples in the book**
- **PowerPoint slides for each chapter**
- **ideas for discussion topics**
- **links to useful websites**

Chapter One
Introduction and Background

Construction provides many of humanity's greatest achievements: Salisbury Cathedral (Figure 1.1); the Taj Mahal (Figure 1.2); Sydney Opera House (Figure 1.3); high rise buildings in Dubai (Figure 1.4); and incredible buildings in modern China (Figure 1.5). Construction gives us places to live, eat, sleep, work, play, entertain, worship and be cared for. It provides the basis for transport systems and sophisticated services which make modern living comfortable and efficient.

Buildings and infrastructure involve virtually every human technology which makes them the most complex of products. They include technologies like brickwork and carpentry, which have their origins in ancient times, technologies based on heavy machinery, many of which developed during the first industrial revolution, right through to highly advanced, modern technologies including the most sophisticated communication systems and intelligent materials. Ensuring this diversity of technologies is used effectively and efficiently requires highly skilled management.

This book provides a rigorous guide to the situations and decisions which face construction managers. It is based on extensive research into the most effective ways of managing construction. Much of this research has been undertaken by the authors but the book also draws on published research into all aspects of construction management. The most important sources are listed at the end of each chapter as further reading.

Practice and research have identified fundamental concepts and relationships which guide effective and efficient construction management. These are described in this book in the form of a theory of construction management because this allows the ideas to be applied to every kind of construction project. More than this a rigorous theory allows the ideas to be developed by practitioners as new situations arise and robust ways of managing them are developed. It also allows the ideas to be tested by academic research and confirmed or replaced by better management ideas.

A fundamental theory of construction management needs to be based on a generic description which answers the question: What is construction? A useful way of providing such a description is to envisage visitors from another galaxy looking at Earth. This allows the description to be based on direct observation which is not influenced by preconceptions about construction.

Construction Management Strategies: A Theory of Construction Management, First Edition. Milan Radosavljevic and John Bennett.