



Deepak Bajaj
Editor

Handbook of Construction Project Management



Springer

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With 228 Figures and 109 Tables

 Springer

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Deepak Bajaj
Insightworks
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This book is dedicated to Late Dr. Ghanshyam Das Bajaj, whose vision and values have been a constant source of inspiration. His enduring legacy continues to guide our work and strengthen our pursuit of knowledge.

Preface

The construction industry in emerging economies, particularly its significant unorganized sector, forms the backbone of infrastructure development and employment. This segment, often characterized by small-scale, informal operations operating without structured management practices, faces unique challenges that demand context-specific strategies. This *Handbook on Construction Industry: Construction Project Management: Organizing the Unorganized Sector* is conceived as a comprehensive guide to address these intricacies, offering practical insights and methodologies to elevate the efficiency, sustainability, and overall performance of construction projects within this vital sector.

This handbook aims to establish a robust educational foundation in construction project management by elucidating core principles and practices essential for effective project execution. It prioritizes the provision of practical solutions and strategies meticulously tailored to the distinct needs of the unorganized sector, with a strong focus on enhancing project delivery, optimizing cost management, and improving operational efficiency. Recognizing the imperative of sustainable development, the book underscores the significance of integrating innovative technologies and promoting environmentally conscious practices and digital transformation within the industry.

Adopting a holistic perspective, this handbook integrates socioeconomic considerations, emphasizes proactive stakeholder engagement, and advocates for capacity building initiatives to foster sector-wide advancements. To bridge the gap between theory and practice, it incorporates real-world case studies and illustrative examples that showcase the successful application of diverse methodologies and highlight invaluable lessons learned from actual construction scenarios.

In the first section, “Construction Project Management Essentials,” the foundational aspects of managing construction projects are explored, specifically within the context of the unorganized sector. This part begins by providing a crucial understanding of the unorganized construction sector itself, delving into its unique socioeconomic context and the distinct challenges it presents. As this sector often operates with informal structures and limited resources, grasping these nuances is paramount. Following this, the section categorizes the diverse typologies of construction projects encountered within this sector, recognizing that management approaches may need to vary based on project scale and nature. The fundamental principles of

construction project management are then laid out, establishing a solid theoretical base for practitioners and academics alike. The critical stages of strategic planning and project initiation are thoroughly examined, providing guidance on how to effectively set the direction and lay the groundwork for successful project outcomes, even in resource-constrained environments. Different project delivery methods and techniques that are particularly relevant and adaptable to the unorganized sector are also discussed, offering practical choices for project execution. Furthermore, the section provides essential knowledge on project planning and scheduling, crucial for organizing and sequencing construction activities. The importance of robust design management and comprehensive documentation is highlighted, ensuring clarity and accountability throughout the project lifecycle. Finally, this initial section equips readers with vital risk management strategies tailored to the uncertainties often encountered in the unorganized construction landscape.

In the second section, “Commercial Management,” the financial and contractual underpinnings of construction projects are addressed with a specific lens on the unorganized sector. This part commences by exploring the principles of construction economics and the assessment of financial feasibility, providing a framework for making informed investment decisions in often volatile markets. The long-term perspective is then introduced through life cycle cost assessment and value engineering, emphasizing the importance of optimizing costs over the entire lifespan of a project. A detailed examination of material procurement, including effective selection and pricing strategies that consider the unique supply chain dynamics of the unorganized sector, is provided. This is followed by a parallel exploration of the procurement of services, a critical aspect often managed informally. The crucial stages of pre-tender cost estimation and bid pricing are analyzed, equipping stakeholders with the skills to navigate competitive bidding processes. Post-tender cost management and essential negotiation tactics are then discussed, providing practical guidance for managing contracts and costs effectively. The section further delves into cost control techniques and their direct impact on project profitability, a key concern for smaller operations. A comprehensive overview of contract administration is provided, addressing the formal and informal agreements that govern construction projects. To illustrate these commercial principles in practice, case studies on the cost management and financial feasibility of infrastructure projects, as well as a comparative analysis of different contract costs, are included. The section concludes with an exploration of cost performance analysis and benchmarking, enabling continuous improvement in financial management.

In the third section, “Construction Operations,” the practicalities of executing construction projects on the ground within the unorganized sector are examined in detail. This section begins with a focus on site logistics and efficient layout planning, recognizing the challenges of often constrained and dynamic work environments. Strategies for resource optimization are explored, addressing the critical need to maximize the use of limited labor, equipment, and materials. Effective approaches to subcontractor and vendor management, a common practice in the unorganized sector, are discussed. Comprehensive guidance on monitoring and control strategies and evaluation techniques is provided, enabling better tracking of project progress

and performance. A dedicated case study on best practices in monitoring and control offers valuable real-world examples. The crucial aspects of health, safety, and environment management on construction sites, often overlooked in informal settings, are thoroughly addressed. This is followed by a detailed discussion on quality assurance and quality control processes to ensure construction standards are met. The section also examines change management strategies, supported by a relevant case study that highlights the complexities of adapting to unforeseen circumstances. Furthermore, it provides guidance on claims and dispute management, essential for resolving conflicts that may arise in less formal contractual arrangements. The section also covers risk monitoring and response mechanisms during the operational phase, concluding with the important processes of commissioning and handover.

In the fourth section, “Advancing Construction Technologies and Principles,” the potential of modern technologies and innovative management principles to transform the construction industry, including its unorganized segment, is explored. This section begins by outlining current technology trends and the ongoing digital transformation that is gradually impacting even informal construction practices. Emerging construction methods and technologies that could be adapted for use in the unorganized sector are discussed, offering pathways for modernization. The increasing role of data management in improving efficiency and decision-making is highlighted. An exploration of Building Information Modeling (BIM) and its potential applications, even in smaller-scale projects, is included. The integration of robotics and automation, while perhaps aspirational for some parts of the unorganized sector, is introduced as a future direction. Similarly, the concepts of Artificial Intelligence and Machine Learning and their potential to optimize construction processes are discussed. The section then delves into Lean Construction principles and practices, which can be particularly beneficial for resource-constrained environments by focusing on waste reduction and efficiency. Finally, Agile Construction Management methodologies, emphasizing flexibility and collaboration, are presented as adaptable frameworks for managing projects in dynamic and often unpredictable settings.

In the fifth section, “Team Dynamics in Construction Management,” the critical human and organizational factors that influence project success within the construction industry, including the often close-knit teams in the unorganized sector, are examined. This section begins by exploring organizational behavior and culture within construction teams, recognizing the impact of informal hierarchies and relationships. The concept of stewardship in enhancing project performance, where individuals take ownership and responsibility, is discussed. Relevant Human Resource Management (HRM) practices that can be adapted to the specific context of the unorganized sector are explored. The section then covers human resource planning strategies, even in informal labor markets, to ensure adequate workforce availability. Leadership principles and the importance of corporate governance, even in smaller entities, are examined. An analysis of how variations in input matrices (e.g., skills, experience) can impact communication, coordination, and collaboration within project teams is provided. Strategies for managing organizational conflicts and fostering effective resolution are discussed, recognizing the

potential for interpersonal issues in close working environments. The section concludes with a case study on systems thinking, integrating holistic approaches for broader sector development by considering the interconnectedness of various stakeholders and processes.

In the sixth section, “Foundations of Sustainable Construction Management,” the underlying principles and frameworks for environmentally and socially responsible construction practices, relevant even to the unorganized sector, are established. This part begins by defining the fundamental concepts of sustainability in the context of the built environment. The section then delves into sustainability metrics, frameworks, and performance measurement tools that can be adapted for use in assessing the environmental impact of construction activities. Strategies for mitigation, adaptation, and resilience in the face of environmental challenges, such as resource scarcity and climate change, are explored. An overview of emerging policies for sustainable construction, which may eventually influence even the unorganized sector, is provided. Green building standards and certifications, while perhaps more applicable to formal projects, are introduced as benchmarks for best practices. The importance of stakeholder engagement and capacity building to promote sustainability awareness and adoption across the entire sector is highlighted. The section includes a case study on the application of Sustainable Development Goals (SDGs), Environmental, Social, and Governance (ESG) criteria, and Net Zero strategies, demonstrating their relevance even in the context of broader development goals. Finally, green procurement practices are examined as a way to promote sustainable supply chains, even for smaller-scale operations.

In the seventh section, “Sustainable Practices in Construction,” the practical application of sustainability principles across the various stages of the construction lifecycle, with a focus on how these can be implemented even within the constraints of the unorganized sector, is explored. This part begins by addressing sustainable site development and selection processes, aiming to minimize environmental impact from the outset. The section then examines environmental and social impact assessment methodologies, adapted for the scale and resources of typical unorganized sector projects. Strategies for materials efficiency, including the selection and use of locally sourced and sustainable materials, are discussed. This is followed by an exploration of the life cycle assessment of materials to understand their long-term environmental footprint. Energy management and optimization techniques, including low-cost and practical solutions for reducing energy consumption on construction sites, are covered. Comprehensive approaches to construction waste management, a significant challenge in the unorganized sector, are addressed. The crucial aspect of pollution prevention at construction sites, focusing on air and water quality, is emphasized. The section concludes with a case study showcasing innovations in sustainable construction projects that may offer scalable solutions for the unorganized sector.

Through this structured approach, the handbook endeavors to provide tailored solutions that directly address the unique socioeconomic challenges and operational intricacies prevalent in the unorganized construction sector of emerging economies. It offers insights into cutting-edge technological advancements, including digital

transformation, Building Information Modeling (BIM), Artificial Intelligence (AI), robotics, lean construction, and agile methodologies, thereby equipping readers with the knowledge to stay abreast of evolving industry trends. Furthermore, the handbook places a strong emphasis on sustainability by integrating relevant metrics, green building standards, life cycle assessments, and pollution prevention practices, aligning with global sustainability objectives and Environmental, Social, and Governance (ESG) frameworks.

This handbook is envisioned as an indispensable resource for a diverse readership, including university libraries, professional association libraries, corporate libraries, technical and trade school libraries, government libraries, and research institute libraries. It is also tailored for individual professionals such as construction project managers, commercial managers, site engineers, sustainability consultants, construction firm executives, students, academics, and technology innovators within the construction domain. We are confident that this comprehensive guide will serve as a cornerstone for knowledge and practice in navigating and organizing the unorganized sector of the construction industry.

Gurgaon, India
October 2025

Deepak Bajaj

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The successful realization of this *Handbook on Construction Industry: Construction Project Management: Organizing the Unorganized Sector* is a testament to the collaborative spirit and dedication of numerous individuals and organizations. We extend our sincere appreciation to:

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We deeply appreciate the dedication and expertise of our **Section Editors**, who played a crucial role in curating and refining the content within their respective areas:

- **Construction Project Management Essentials:** Dr. Deepak Bajaj
- **Commercial Management:** Dr. Marimuthu Kannimuthu
- **Construction Operations:** Asst. Prof. Triveni Prasad Nanda, Prof. Deepak Bajaj
- **Advancing Construction Technologies and Principles:** Dr. Jyoti Singh
- **Team Dynamics in Construction Management:** Dr. Ameet Sao
- **Foundations of Sustainable Construction Management:** Dr. Saurabh Verma
- **Sustainable Practices in Construction:** Dr. Ashmita Rupal

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About the Editor



Dr. Deepak Bajaj is currently serving as Professor, Academic & Campus Director at Deakin University GIFT City Campus, India. He is a distinguished academic and industry leader with over three decades of extensive experience in real estate, construction, project management, and facility management. He previously served as the Director and Head of Institution at the RICS School of Built Environment, Amity University, Noida, India, where he was instrumental in shaping the future of the built environment sector in the country. He had been associated with RICS SBE since 2016, holding the positions of Professor and Mentor, guiding Ph.D. scholars and master's degree students.

An alumnus of MIT, Manipal, he holds a Bachelor of Engineering (Mechanical) and a Master of Construction Management from the University of New South Wales, Australia. He earned his Ph.D. from the University of Technology Sydney (UTS), where he was recognized for his outstanding academic achievements. His strong academic foundation has underpinned a remarkable career with significant contributions to both academia and the construction industry.

His professional journey encompasses key leadership roles in national and international organizations within the real estate and construction sectors. He is a Fellow of the Royal Institution of Chartered Surveyors (RICS) for the past 12 years and currently chairs the RICS Assessment Panel in India and the UK. His influence extends beyond academia into the industry, where he has been pivotal in the development and implementation of risk management systems, project management training programs, and facility management strategies across Australia, China, and India.

Prior to his tenure at RICS SBE, he held senior management positions at the Unitech Group, where he led teams in investment, project analysis, and facility management. As the CEO of Unibild Engineering and Construction Company, he demonstrated exceptional leadership and project management acumen. His consulting portfolio includes collaborations with international entities such as AXA Australia and AUSAID, contributing to projects focused on enhancing construction industry practices and vocational education in China.

His commitment to education and knowledge dissemination is evident in his adjunct professorships at SKEMA Business School, France, and Chongqing Jianzhu College, China. He has actively supervised numerous Ph.D. and master's students and has held academic leadership roles at the University of Technology Sydney. It's at the University of New South Wales where he started his academic journey. His research has been recognized with prestigious awards, including the FMA Knowledge Achievement Award for research excellence and multiple teaching accolades.

Beyond his academic and professional achievements, he founded Insightworks, for consulting with specialization in risk management, project and portfolio management, and education. His ongoing contributions to the built environment sector continue to inspire and guide future leaders. He is dedicated to mentoring the next generation of professionals, fostering a culture of excellence and ethical leadership, and aspires to shape industry standards and policies aligned with global sustainability goals. He envisions leveraging his expertise to drive transformative change, lead innovative projects prioritizing sustainability and resilience, and set new benchmarks for excellence in the construction industry.

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Section I

Construction Project Management Essentials

Unorganized Construction Sector

1

Socioeconomic Context and Challenges

Deepak Bajaj and Ipsa Khanna

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Abstract

The construction industry in emerging economies is significantly influenced by the unorganized sector, characterized by informal employment, limited regulatory oversight, and varied project management practices. This study delves into the socioeconomic context and challenges faced by the unorganized construction sector, with a particular focus on operational dynamics, workforce issues, and the regulatory environment. The chapter examines the economic factors driving the unorganized sector, the adoption of technology, skill development initiatives, and the imperative for environmental sustainability. By exploring the interplay between these elements, the study aims to provide a comprehensive understanding of how the unorganized construction sector operates in emerging economies of India, China, Brazil, Indonesia, and Nigeria. Through a detailed analysis of the existing literature and case studies, the chapter identifies key challenges and proposes actionable strategies for enhancing project management practices, improving workforce conditions and fostering sustainable development in construction industry. The findings are expected to inform industry stakeholders, researchers, and policymakers about the critical aspects of managing unorganized construction projects and the potential pathways for integrating them into the formal economy, thereby contributing to more robust and equitable growth in the construction industry.

Keywords

Construction industry · Unorganized sector · Emerging economies · Project management

Introduction

The construction industry plays an essential role in the global economy, consisting of both organized and unorganized sectors that showcase discrete roles in developed and developing nations. This chapter discovers the challenges of the unorganized sector within the construction industry, emphasizing the need of understanding its socioeconomic context. By defining its characteristics and comparing them with the organized sector in developed nations, as well as the unorganized sector in developing nations, this chapter aims to shed light on their impacts on economies, workers, and regulatory frameworks.

The unorganized sector in the construction industry is defined by informal employment practices, where workforce typically lack official contracts, social security benefits, and reasonable labor protections. This segment operates outside regulatory frameworks, leading to poor employment conditions characterized by low wages, hazardous working environments and limited access to healthcare. Key

- Sustainable innovations, in construction (*cont.*)
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