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Book Review: *Modern Construction: Lean Project Delivery and Integrated Practices* by Lincoln H. Forbes and Syed M. Ahmed

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As the authors aptly stated in the book's preface, this book is intended to serve both as a contemporary reference for construction practitioners and as a supplementary text for students. The book starts with an overview of the construction industry and current project delivery methods. By contrasting current project delivery methods with the relational contracting used in integrated project delivery, the authors bring to the fore the very low productivity in the construction industry, which is a significant portion of the nation's economy.

For the sake of readers who are unfamiliar with integrated project delivery or lean project delivery (the authors use these two terms interchangeably), the second chapter of the book covers terms, definitions, and examples related to construction productivity and performance measurement methods. The book then goes into a deeper analysis of the Lean Construction method by providing detailed explanations of all the concepts, elements, operational aspects, and associated case studies included in the next five chapters.

The authors then discuss Building Information Modeling (BIM) and its impact on the construction industry. They dedicate an entire chapter to addressing BIM and other information and communication technology tools for design and construction management processes, as well as the significant role that the Internet plays in the administration and application of these tools. The authors then move slightly beyond the standard Lean Construction method techniques to survey other processes and productivity improvement tools such as Total Quality Management, Six Sigma in construction, and so on. They also address the modern movement of sustainability and deem it to be one of the means to implement lean construction or integrated project delivery. Since an understanding of waste seems to be the foundation for both Lean Construction methods and LEED, devoting

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a chapter to sustainability in construction makes sense for a book dealing with lean project delivery and integrated practices.

The authors acknowledge that it is not possible to implement a holistic Lean Construction method, integrated project delivery, and LEED on every construction project, so they offer a piecemeal approach in their next two chapters. The chapters cover various performance improvement techniques that project stakeholders can pick and choose from and can implement at various stages of a construction project lifecycle. These two chapters also include case studies to demonstrate quality function deployment and safety implementation at a workplace.

The authors then move on to the foundational principle of Lean Construction method and integrated project delivery – human factors in the work environment. Motivation, diversity, ergonomics, and other human behavioral elements play a significant role in a construction team's ability to maximize its performance. Especially in the lean construction method, which is the focus of the book, the ultimate goal is to maximize a project team's performance by reducing various types of waste. The authors survey a wide range of national criteria and matrices available for benchmarking elements of human performance. The Management and Worker Factors chapter of the book covers a wide array of topics including behavioral change in construction, changing management attitudes, lean thinking, managing diversity in the workforce, improving worker performance through ergonomics-based strategies, implementing OSHA guidelines, and managing environmental impacts on workers' performance. After reviewing and surveying various studies conducted by OSHA, ASHRAE, NECA, and BRT, the authors conclude that the methodology of The Last Planner System, combined with daily huddles, can be effective in optimizing work output.

As with any change, Lean Construction and integrated project delivery have to overcome significant barriers before they are widely adopted into the construction industry. In the penultimate chapter of the book -Systems Integration Approaches- the authors propose that the Lean Construction approach works best when a number of prerequisites have been met. These prerequisites include: a willingness to change, a commitment to training and learning, a quality-oriented culture, a shared vision, a commitment to reducing or eliminating waste, a commitment to cost and performance measures, a willingness to implement lean method during the design stages, collaborative relationships, and the effective use of information technology. However, recognizing that it is unrealistic to expect all the aforementioned factors to be satisfied in all cases, the authors draw on their industrial engineering experience and suggest that even in the absence of a lean culture, it is possible to improve project performance. To support this thesis, the authors proffer that industrial engineers who have successfully adopted the lean method can serve as catalysts for the same type of change in the construction industry. The authors give examples of three industrial engineers who, in the absence of a completely lean environment, managed to improve project performance measurably by implementing systems integration approaches that were not strictly based on a lean methodology. As illustration of system integration approaches borrowed from industrial engineering, the authors list: facilities layout planning, sustainable construction, work measurement, cycle time analysis, simulation techniques, ergonomics, safety management, quality management systems, Just In Time principles, and the use of checklists. The chapter includes

three case studies to illustrate the importance of utilizing industrial engineering principles into the construction industry. At the end of the chapter, the authors come back to the issue of implementation. They conclude that there is a culture of dependence on inspections and meeting codes in the construction industry, and that quality in work products has to be achieved by knowledgeable workers who are motivated to produce quality work. According to the authors, industrial engineers can change this culture, as they are highly suited to becoming lean facilitators for construction projects.

In the final chapter of the book -Learning from Projects and Enhancing Lean Project Delivery and IPD- the authors start with an overview of Post Occupancy Evaluation (POE) for continuous improvement in construction. According to the authors, POE can provide redemption from past mistakes if it is used correctly. The authors address a range of topics related to POE such as the scope of POE, categories of POE, planning for POE, POE procedures, and so on. The authors then proffer their recommendations on how to align the POE process with the lean construction method. The chapter concludes with a detailed discussion of enhancing lean project delivery by including other non-lean performance enhancing techniques. In their closing remarks, the authors cite to expert opinions on where lean construction is headed and why the construction industry around the world has not yet adopted the lean construction method with gusto. All of the authors' analyses come down to the requirement for the project owner to want and to drive the initiative.

The authors have put in great efforts to provide a comprehensive survey of the majority of the modern tools and techniques that could and should be implemented in all construction projects to reduce waste and enhance performance at all levels. The book should serve as a great reference text for students and academicians alike. The book may possibly serve as a good reference for industry practitioners, as nearly all the chapters include real-time case studies to illustrate the effective use of the modern tools and techniques discussed. However, the 490 page book leaves open the question of how to address the barriers to implementing these already available performance enhancing tools and techniques in the construction industry. Perhaps the experts and practitioners need to start questioning the project owners' choices more forcefully. Asking project owners the right questions at the very beginning of a project to help them drive these lean and sustainable initiatives seems to be the only way forward. If the project owners demand that only lean and sustainable practitioners bid on their projects, I wonder how many Designers, General Contractors, Construction Managers, Subcontractors, and Suppliers would then resist such a change. Until the leaders and experts take on this challenge of first educating, counseling, and consulting the trend-setting project owners, there is unlikely to be successful implementation of these modern construction performance enhancing tools and techniques on a wide scale. After all, what is the point of implementing lean, sustainable, and integrated project delivery on a large concrete skyscraper that should not have been built in the first place?