

## A BIM-based supply chain model for AEC

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### Abstract

This paper proposes a model to integrate the construction Supply Chain (SC) through Building Information Modelling (BIM). The various information flows in the construction SC are vague. BIM is an aspiring integrator of information that could potentially improve such multi-disciplinary information flows. The paper presents a method to bridge information gaps and integrate the team using BIM-based SC modelling. After a literature review, the modelling method is presented. The model merges product and process models to social networks in a graph-based framework to represent a BIM-enabled SC. Although, BIM-enabled SC Management (SCM) is not widely applied, there is increasing interest from many stakeholders to engage in both BIM and SCM. The paper uses a real-world case as a proof of concept. The model analyses the actors' interactions, identifies bottlenecks and increases the collective understanding about the project.

*Keywords: supply chain (SC), building information modelling (BIM), modelling and simulation (M&S), graph-based model, case study research.*

### 1 Introduction

Currently the Architecture Engineering and Construction (AEC) industry is complex due to the fragmented delivery processes, the building challenges and the large number of project stakeholders [1]. Building Information Modelling (BIM) is able to counterbalance such organisational, operational and technical complexities in the AEC Supply Chain (SC). Simultaneously, SC Management (SCM) has already proven effective in managing the material, information, cash and work crew flows among a set of strategically aligned companies. SCM establishes long-term trusting relations among the various SC partners by



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**S. Syngellakis,A. Fabbri**



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**Ethical and Sustainable Supply Chain Management in a Global Context** Akkucuk, Ulas, 2019-04-26 The global supply chain creates environmental and social burdens during different stages of production and distribution Ethical and sustainable practices along the supply chain seek to minimize these burdens and ensure fair labor practices lower emissions and a cleaner environment Ethical and Sustainable Supply Chain Management in a Global Context uses cases qualitative studies empirical results and analyses of legal frameworks to focus on ethics and sustainability as they relate to the management of global supply chains Featuring research on topics such as production planning consumer awareness and labor laws this book is ideally designed for managers policymakers professionals researchers and students working in the field of sustainable development and related disciplines including marketing economics finance operations management supply chain management environmental science and waste management      **Management Innovations for Intelligent Supply Chains** Wang, John, 2012-11-30 The effective use of business intelligence communication and productivity applications for supply chain management are essential for the achievement and analysis of information sharing Management Innovations for Intelligent Supply Chains provides comprehensive coverage in the latest research and developments of supply chain management This reference collection provides research methodologies and frameworks of the incorporation of information systems to better support supply chain management      *Electrochemical Process Simulation III* C. A. Brebbia, Robert A. Adey, 2009 Focusing on the computer modelling of these industrial processes and techniques together with their associated electric fields this book contains papers presented at the Third International Conference on the Simulation of Electrochemical Processes      *Computational Methods and Experiments in Materials Characterization III* C. A. Brebbia, Andrea Alberto Mammoli, 2007 Until recently engineering materials could be characterized successfully using relatively simple testing procedures As materials technology advances interest is growing in materials possessing complex meso micro and nano structures which to a large extent determine their physical properties and behaviour The purposes of materials modelling are many optimization investigation of failure simulation of production processes to name but a few Modelling and characterisation are closely intertwined increasingly so as the complexity of the material increases Characterisation in essence is the connection between the abstract material model and the real world behaviour of the material in question Characterisation of complex materials therefore may require a combination of experimental techniques and computation This book publishes papers presented at the Third International Conference on Computational Methods and Experiments in Material Characterisation Topics covered include Composites Ceramics Alloys Cements and Cement Based Materials Biomaterials Thin Films and Coatings Advanced Materials Imaging Analysis Thermal Analysis New Methods Surface Chemistry Nano Indentation Continuum Methods Particle Models Damage Mechanics Innovative Techniques Stochastic Methods      **Simulation of Electrochemical Processes II** V.G. DeGiorgi, C.A. Brebbia, R.A. Adey, 2007-04-10

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developing countries Transportation Energy resources Environmental economics      Risk Analysis XII S. Syngellakis,A. Fabbri,2020-08-19 Current events help to emphasise the importance of the analysis and management of risk to planners and researchers around the world Natural hazards such as floods earthquakes landslides fires and others have always affected human societies The more recent emergence of the importance of man made hazards is a consequence of the rapid technological advances made in the last few centuries The interaction of natural and anthropogenic risks adds to the complexity of the problems Presented at the 12th International Conference on Risk Analysis and Hazard Mitigation the included research works cover a variety of topics related to risk analysis and hazard mitigation associated with both natural and anthropogenic hazards      *Building Information Modelling (BIM) in Design, Construction and Operations* L. Mahdjoubi,C.A. Brebbia,R. Laing,2015-09-09 Building Information Modelling BIM in Design Construction and Operations contains the proceedings of the first in a planned series of conferences dealing with design coordination construction maintenance operation and decommissioning The book gives details of how BIM tools and techniques have fundamentally altered the manner in which modern construction teams operate the processes through which designs are evolved and the relationships between conceptual detail construction and life cycle stages The papers contributed by experts from industry practice and academia debate key topics develop innovative solutions and predict future trends The interdisciplinary nature of the contents and the collaborative practices discussed so important within the built environment will appeal to those engaged in design surveying visualisation infrastructure real estate construction law insurance and facilities management Topics covered include BIM in design coordination BIM in construction operations BIM in building operation and maintenance BIM and sustainability BIM and collaborative working and practices BIM health and safety and BIM facilities management integration among others      Sustainable Water Resources Management XI S. Mambretti,2021-08-04 Papers presented at the 11th International Conference on Sustainable Water Resources Management are included in this volume These research works highlight recent technological and scientific developments associated with the management of surface and sub surface water resources and as well as river basin management methodologies Water is essential for sustaining life on our planet and its uneven distribution is a source of permanent conflict The growth of the human population combined with the irregularity in precipitation and water availability may restrict even further the access to water in certain regions of the world This problem is made more severe by anthropogenic activities that affect its quality River Basin Management includes all aspects of Hydrology Ecology Environmental Management Flood Plains and Wetlands Riverine systems are coming under increasing pressure due to anthropological and natural causes Prominent amongst the problems affecting them is water scarcity and quality which requires the development of improved methods for better river management This volume features research from professionals involved in sustainable water resources management and provides an insight into the state of the art in the current technology techniques and solutions in that field as they have been developed and

applied in different countries      *Urban Transport XIV* C. A. Brebbia, 2008 Transportation in cities with its related environmental and social concerns continues to be a topic of the utmost priority for urban authorities and central governments around the world Frequently the concern is not orderly but driven by the safety crises which take place regularly and even the best planned urban transport systems require considerable studies to safeguard their safety maintenance and operational use On a broader front the continuing need for better urban transport systems in general and the need for a healthier environment has led to an increased level of research around the world This is reflected in the proceedings of the Thirteenth International Conference on Urban Transport and the Environment in the 21st Century which stresses the continuous steady growth and research into the urban transport systems control aspects information and imulation systems All these topics continue to be of importance for analyzing the complex inter relation of the urban transport environment and for establishing action strategies for transport and traffic problems Of interest to engineers scientists and managers working in industry universities research organizations and government involved in the planning and management of urban transportation systems and transport policy this book contains papers within the following subject areas Environmental and ecological considerations Information systems and GPS applications Intelligent transport systems Intermodel passenger transport systems Land use and transport integration Modality in freight Public transport systems Road pricing Traffic management Transport automation Transport logistics and operations research Transport modelling and simulation Transport security and safety Transport sustainability Transport technology Urban transport planning

*Building Information Modelling (BIM) in Design, Construction and Operations IV* J. Casares, A. Galiano Garrigós, 2021-12-29 Containing papers presented at the 4th International Conference on Building Information Modelling BIM in Design Construction and Operations this volume brings together the research of experts from industry practice and academia It describes innovative solutions and predictions for future trends across key BIM related topics The modern construction industry and built environment disciplines have been transformed through the development of new and innovative BIM tools and techniques These have fundamentally altered the manner in which construction teams operate the processes through which designs are evolved and the relationships between conceptual detail construction and life cycle stages BIM is essentially value creating collaboration throughout the entire life cycle of an asset underpinned by the data attached to them BIM has far and reaching consequences on both building procurement and infrastructure This recent emergence constitutes one of the most exciting developments in the field of the Built Environment These advances have offered project teams multi sensory collaborative tools and opportunities for new communication structures The included papers cover such topics as BIM in design coordination BIM in construction operations BIM in building operation and maintenance BIM and sustainability BIM and collaborative working and practices BIM Facilities management integration BIM GIS integration BIM and automation in construction BIM and health and safety BIM standards BIM and interoperability

BIM and life cycle project management BIM and cultural heritage BIM and robotics BIM in risk analysis and management BIM in building cost control BIM and building representation Virtual design and construction VDC BIM in the execution phase BIM for infrastructure development Digital twins

**Sustainable Development and Planning X** G. Passerini, N. Marchettini, 2018-12-17 This volume contains research from the 10th International Conference on Sustainable Development and Planning The papers included in this volume form a collection of research from academics policy makers practitioners and other stakeholders from across the globe who discuss the latest advances in the field Problems related to development and planning which affect rural and urban areas are present in all regions of the world Accelerated urbanisation has resulted in deterioration of the environment and loss of quality of life Urban development can also aggravate problems faced by rural areas such as forests mountain regions and coastal areas amongst many others Taking into consideration the interaction between different regions and developing new methodologies for monitoring planning and implementation of novel strategies can offer solutions for mitigating environmental pollution and non sustainable use of available resources Energy saving and eco friendly building approaches have become an important part of modern development which places special emphasis on resource optimisation Planning has a key role to play in ensuring that these solutions as well as new materials and processes are incorporated in the most efficient manner The application of new academic findings to planning and development strategies assessment tools and decision making processes are all covered in this book

*E-manufacturing* K. Cheng, 2005 This book begins by presenting the concepts of and an engineering oriented approach to e manufacturing Next the enabling technologies and implementation issues for e manufacturing including topics such as Java programming database integration client server architecture web based 3D modelling and simulations and open computing and interaction design are reviewed There is then an exploration of application perspectives through a number of application systems Designed for final year undergraduate elective courses on e manufacturing and introductory courses on e manufacturing at postgraduate level this book can also be used as a textbook for teaching e engineering in general It will also provide a useful reference for design and manufacturing engineers company managers e business e commerce developers and IT professionals and managers

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*Safety and Security Engineering IX* G. Passerini, F. Garzia, M. Lombardi, 2022-01-18 Formed of papers originating from the 9th International Conference on Safety and Security Engineering this book highlights research and industrial developments in the theoretical and practical aspects of safety and security engineering Safety and Security Engineering due to its special nature is an interdisciplinary area of research and application that brings together in a systematic way many disciplines of engineering

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**Energy Production and Management in the 21st Century** V S. Syngellakis, E. Magaril, 2022-07-19 The future of energy production operation and management in a changing world was the focus of the 5th International Conference on Energy Production and Management Papers presented at the meeting form this volume A focus is placed on the comparison of conventional energy sources particularly hydrocarbons with a number of other ways of producing energy emphasising new technological developments based on renewable resources such as solar hydro wind and geothermal Key to sustainability is the need to convert new sustainable sources of energy into useful forms electricity heat fuel while finding efficient ways of storage and distribution In many cases the challenges lie as much with the production of such renewable energy at an acceptable cost including damage to the environment as with the integration of those resources into the existing infrastructure The changes required to progress from an economy based mainly on hydrocarbons to one taking advantage of sustainable energy resources are massive and require considerable scientific research as well as the development of advanced engineering systems Such progress demands close collaboration between different disciplines in order to arrive at optimum solutions Also discussed is the energy use of industrial processes including the embedded energy contents of materials such as those in the built environment Energy production operation distribution and usage result in environmental risks that need to be better understood They are part of energy economics and relate to human environmental health as well as ecosystems behaviour An emphasis is placed on the ways in which more efficient use can be made of conventional as well as new energy sources This relates to savings in energy consumption reduction of energy losses as well as the implementation of smart devices and the design of intelligent distribution networks

*Business Models and ICT Technologies for the Fashion Supply Chain* Rinaldo Rinaldi, Romeo Bandinelli, 2017-02-10 This book presents high quality original contributions on the fashion supply chain A wide spectrum of application domains are covered processing of big data coming from digital and social media channels fashion new product development fashion design fashion marketing and communication strategy business models and



entrepreneurship e commerce and omni channel management corporate social responsibility new materials for fashion product wearable technologies The contents are based on presentations delivered at IT4Fashion 2016 the 6th International Conference in Business Models and ICT Technologies for the Fashion Supply Chain which was held in Florence Italy in April 2016 This conference series represents a targeted response to the growing need for research that reports and debates supply chain business models and technologies applied to the fashion industry with the aim of increasing knowledge in the area of product lifecycle management and supply chain management in that industry Environmental Impact III C.A. Brebbia,J.L. Miralles i Garcia,2016-07-14 Delegates to the 3rd International Conference on Environmental and Economic Impact on Sustainable Development contributed the peer reviewed papers contained in this book The papers discuss the most serious problems affecting sustainable development They consider the impact of economic constraints on the environment taking into account the social aspects as well as the over use of natural resources Uncontrolled development can also result in damage to the environment in terms of the release of toxic substances and hazardous waste Thus attention is paid to issues related to whether some forms of development are compatible with environmental protection particularly in cases of possible serious contamination and toxicity The focus in the book is on more constructive and progressive approaches to the problems discussed to ensure sustainability The hope is that through the shared experiences of experts we can learn from past failure to avoid repeating similar mistakes while attempting to prevent emerging threats to the environmental and ecological systems Fundamental to these concepts are an analysis of the inherent risks and the development of appropriate strategies The papers in the book address such topics as Environmental policies and planning Environmental assessments Development issues Sustainable cities Economic impact Natural resources management Energy and the environment Food production systems and policies Ecosystems health Soil contamination Remediation Decommissioning of hazardous plants Brownfields rehabilitation Water resources management Air and water pollution Toxicity studies Pollution and public health Environmental health risk Community participation Legislation and regulations

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## **Table of Contents E Supply Chain Management Wit Press**

1. Understanding the eBook E Supply Chain Management Wit Press
  - The Rise of Digital Reading E Supply Chain Management Wit Press
  - Advantages of eBooks Over Traditional Books
2. Identifying E Supply Chain Management Wit Press
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an E Supply Chain Management Wit Press
  - User-Friendly Interface
4. Exploring eBook Recommendations from E Supply Chain Management Wit Press
  - Personalized Recommendations
  - E Supply Chain Management Wit Press User Reviews and Ratings
  - E Supply Chain Management Wit Press and Bestseller Lists
5. Accessing E Supply Chain Management Wit Press Free and Paid eBooks
  - E Supply Chain Management Wit Press Public Domain eBooks
  - E Supply Chain Management Wit Press eBook Subscription Services
  - E Supply Chain Management Wit Press Budget-Friendly Options

6. Navigating E Supply Chain Management Wit Press eBook Formats
  - ePub, PDF, MOBI, and More
  - E Supply Chain Management Wit Press Compatibility with Devices
  - E Supply Chain Management Wit Press Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of E Supply Chain Management Wit Press
  - Highlighting and Note-Taking E Supply Chain Management Wit Press
  - Interactive Elements E Supply Chain Management Wit Press
8. Staying Engaged with E Supply Chain Management Wit Press
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers E Supply Chain Management Wit Press
9. Balancing eBooks and Physical Books E Supply Chain Management Wit Press
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection E Supply Chain Management Wit Press
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine E Supply Chain Management Wit Press
  - Setting Reading Goals E Supply Chain Management Wit Press
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of E Supply Chain Management Wit Press
  - Fact-Checking eBook Content of E Supply Chain Management Wit Press
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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