

## RESUME

### Rafael Sacks

Israel ID: 015739477.

Born July 7th 1962, in Johannesburg, South Africa.

Resident in Israel since January 1984.

Married with two daughters and a son.

Licensed Engineer (Israel), No. 34051, 1984.

### ACADEMIC DEGREES

1998, D.Sc. Civil Engineering, Faculty of Civil Engineering, Technion - Israel Institute of Technology, Haifa, Israel

1985, M.S. Civil Engineering, Faculty of Civil and Environmental Eng., MIT - Massachusetts Institute of Technology, Cambridge, Mass. USA

1983, B.Sc. Civil Engineering, Faculty of Civil Engineering, University of the Witwatersrand, Johannesburg, South Africa

### ACADEMIC APPOINTMENTS

2007, Associate Professor, Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology.

2003, Senior Lecturer, Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology.

2001, Research Scientist, PhD Program, College of Architecture, Georgia Institute of Technology.

2000, Lecturer, Faculty of Civil Engineering, Technion – Israel Institute of Technology.

1998, Adjunct Lecturer, Faculty of Civil Engineering, Technion – Israel Institute of Technology.

1994, Teaching Assistant, Faculty of Civil Engineering, Technion – Israel Institute of Technology.

1985, Teaching Assistant, Faculty of Civil and Environmental Eng., MIT - Massachusetts Institute of Technology, Cambridge, Mass. USA

## PROFESSIONAL EXPERIENCE

October 1997 to September 2000, Managing Partner, Shahaf Sacks Property Development and Construction Management Ltd. Management of housing projects.

March 1989 to February 1994, Senior Engineer - Shacham Computerized Engineering Ltd. Responsible for establishment of CAD stations, management of software projects in the fields of infrastructure, town planning, GIS, architecture and construction. Consultant to large account clients (e.g. Israel Aircraft Industries, INTEL, Ministry of Construction and Housing).

March 1988 to March 1989, Military Service. Construction Unit IDF. Responsibility for setup of CADAM system on IBM Mainframe 4381.

September 1985 to February 1988, Structural Engineer at Ben-El Consulting Eng. Jerusalem. Design of Steel and Concrete structures, Site Supervision and responsibility for computers in design office, including CAD.

June 1984 to September 1984, Structural Engineer at Ben-El Consulting Eng. Jerusalem.

December 1982 to February 1983, Engineering Intern, WLPW Consulting Eng. in Johannesburg South Africa. Design of industrial reinforced concrete structures and computer programming.

## RESEARCH INTERESTS

- Information Technology (IT) in Construction: Building Information Modeling, Building Product Models and IT enabled process change in civil engineering design and construction.
- Lean Construction and Lean Design: Theory, production system design, project management, construction safety.

## TEACHING EXPERIENCE

Strategies for IT Adoption in the Building Industry, **Graduate**, College of Architecture & Dept. of Civil Engineering (Construction Management) (in collaboration with Prof. C.M. Eastman), Georgia Institute of Technology, Spring 2002.

Advanced Seminar in Construction Management, **Graduate**, Faculty of Civil and Env. Engineering, Technion, 2000-present.

Computer Methods in Construction Management, **Graduate**, Faculty of Civil and Env. Engineering, Technion, 1997-2001.

Special Topics in Construction Management, **Graduate**, Faculty of Civil and Env. Engineering, Technion, 2002-2003.

Lean Construction, Graduate, Faculty of Civil and Env. Engineering, Technion, 2004-present.

International Collaboration in Construction Management, Graduate, Faculty of Civil and Env. Engineering, Technion, in collaboration with Dept. of Civil and Env. Engineering, Carnegie-Mellon University, 2006-present.

Construction Planning and Control / Introduction to Computing in Construction Management, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2003-present.

Construction Equipment and Automation, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2003-present.

Introduction to Construction Management, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2000-2001, 2003

Final Project in Construction Management, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2000-2001.

Engineering Economics, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2003.

Construction Methods, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2004.

Engineering Information, Undergraduate, Faculty of Civil and Env. Engineering, Technion, 2006-present.

## **PUBLIC PROFESSIONAL ACTIVITIES**

### **Journal Advisory Board**

2007 to 2010, Journal of Lean Construction, Lean Construction Institute

### **Membership in International Committees**

1995 to present, Member, CIB W-78 Commission – Computer Integrated Construction.

2002 to present, Member, International Association for Automation and Robotics in Construction.

2003 to present, Member, International Group for Lean Construction

2006 to present, Member, Construction Research Council of the Construction Institute of the ASCE (American Society of Civil Engineers)

### **Referee for Journals**

2001 to present, ASCE Journal of Management in Engineering  
2002 to present, Computer-aided Civil and Infrastructure Engineering  
2002 to present, ASCE Journal of Construction Engineering and Management  
2003 to present, Journal of Lean Construction, Lean Construction Institute  
2004 to present, ASCE Journal of Computing in Civil Engineering  
2006 to present, Construction Management and Economics

### **Membership of Conference Scientific Committees**

2002, CISEMIC, 1st International Conference on Information Standardisation, Exchanges and Management in the Construction Industry, University of Salford, Salford UK, 22<sup>nd</sup>-23<sup>rd</sup> November 2002.  
2005, ICCCB2005, ASCE Conference in Computing in Civil Engineering, Cancun, Mexico, 15<sup>th</sup>-17<sup>th</sup> July, 2005.  
2005, IGLC 13, Annual Meeting of the International Group for Lean Construction, Sydney, Australia, 19<sup>th</sup>-21<sup>st</sup> July, 2005.  
2006, ICCCB XI, Joint International Conference on Computing and Decision Making in Civil and Building Engineering, Montreal, Canada, 14<sup>th</sup>-16<sup>th</sup> June, 2006.  
2007, IGLC 15, Annual Meeting of the International Group for Lean Construction, East Lansing, Michigan, USA, 17<sup>th</sup>-20<sup>th</sup> July, 2007.  
2007, ICCCB2007, ASCE International Workshop on Computing in Civil Engineering, Pittsburgh, PA, USA, 25<sup>th</sup>-28<sup>th</sup> July, 2007.

### **Editor of Conference Proceedings**

2006, "Understanding and Managing the Construction Process: Theory and Practice", Sacks, R. and Bertelsen, S. (Eds.), IGLC 14, Annual Meeting of the International Group for Lean Construction, Santiago, Chile, 25<sup>th</sup>-27<sup>th</sup> July, 2006.

### **Judge, National Construction Excellence Competition**

2004, Israel National Association of Construction Contractors and Builders, Judge for the 'Excellence in Construction' competition.

### **MEMBERSHIP IN PROFESSIONAL SOCIETIES**

Professional Member, Post-Tensioning Institute (North America).

Professional Member, Precast/Prestressed Concrete Institute (North America).

### **HONORS**

1983, Jere Jennings Medal and Postgraduate scholarship, Faculty of Engineering, University of the Witwatersrand, Johannesburg, South Africa

- 1995, Prize for Excellent Teaching, Faculty of Civil Eng., Technion
- 1996, Esther and Mordechai Rubinstein Research Grant, Faculty of Civil Eng., Technion
- 1997, Prize for Consistently Excellent Teaching, Technion
- 2001, Jacob and Ethel Feld Academic Lectureship, Technion
- 2002, Research Achievement Award, College of Architecture, Georgia Institute of Technology
- 2005, Technion Excellence in Lecturing Award.
- 2005, Arenson Prize for Excellence in Lecturing, Faculty of Civil and Env. Eng., Technion; Technion Excellence in Lecturing Award.

## **GRADUATE STUDENTS**

### **Theses Completed**

- 2004, Irina Brodetskaia, M.Sc., “An Examination of the Potential for Monitoring Construction Project Performance using an Equipment Mounted ‘Black Box’” (Assoc. Prof. Ronie Navon – primary supervisor), Civil and Env. Eng., Technion.
- 2005, Esin Ergen, PhD, “Formalization of Life-Cycle Data Management of Engineered-to-order Components Using Advanced Tracking Technologies” (Asst. Prof. Burcu Akinci – primary supervisor) Civil and Env. Eng., Carnegie-Mellon University.
- 2006, Alberto Esqenazi, M.Sc., “Evaluation of Lean Construction Improvements using Computer Simulation”, Civil and Env. Eng., Technion.
- 2007, Arie Yurovsky, M.Sc., “The Current State of Private Construction in Israel based on Lean Principles”, (Dr. Amnon Katz – secondary supervisor), Civil and Env. Eng., Technion.
- 2007, Maxim Goldin, M.Sc., “A Lean Approach to Managing Housing Construction subject to Design Changes,” Civil and Env. Eng., Technion.

### **Theses in Progress**

- 2007, Micha Harel, PhD, “A Lean Model for Two-dimensional Optimization of Process Flow in Construction Projects with Sub-contractors”, Civil and Env. Eng., Technion.
- 2007, Irina Brodetskaia, PhD, “Computer-Aided Implementation of Lean Principles for Real-Time Optimization of Flow in Construction Operations”, (Assoc. Prof. Aviad Shapira – secondary supervisor), Civil and Env. Eng., Technion.
- 2007, Ronen Barak, M.Sc., “Specification and Development of an Object Model for Building Information Modeling of Cast-in-place Reinforced Concrete Structures”, Civil and Env. Eng., Technion.

2008, Efraim Tribelsky, PhD, "Lean Design of Civil Engineering Projects: Development of Measures of Value, Measures of Value Flow, and a Methodology for Process Improvement", Civil and Env. Eng., Technion.

2008, Ophir Rozenfeld, PhD, "Lean Scheduling for Safety: Development of a Time-Dependent Risk Level Model", (Assoc. Prof. Yehiel Rosenfeld – primary supervisor), Civil and Env. Eng., Technion.

2008, Israel Kaner, M.Sc., "Interoperability and Building Information Model Exchange between Architects and Engineers for Precast Facades", Civil and Env. Eng., Technion.

2008, Rebecca Partouche, M.Sc., "A Lean Model for Construction of Tall Office/Commercial Buildings", Civil and Env. Eng., Technion.

### **Master of Engineering Students Graduated (final seminar)**

Michael Shem-Tov, M.E., "The impact of delays in off-site manufacturing processes on construction projects," February 2001.

Maskit Pe'er, M.E., "Depth of adoption of information technology in construction in Israel," March 2001.

Irit Gendler, M.E., "Electronic commerce in construction companies," May 2001.

Avi Bachar, M.E., "Lessons learned from implementation of lean design principles in design management of a military project," July 2001.

Eran Mualem, "Examination of the design process of building 'B' in the Kirya from the perspective of Lean Design," July 2001.

Miki Frenklach, "Examination of design process improvements through adoption of the Last Planner lean construction technique," July 2001.

Abraham Haber, "Lean construction in the design of a 28 story office tower above an existing underground structure – analysis of applicability and benefit," July 2001.

Emanuel Atiya, "Adoption and integration of information technology tools in structural design," July 2001.

Buddy Halabi, M.E., "Characterization and estimation of economic risk for residential property developers," December 2001.

Eitan Benisti, "Examination of the viability of use of web-based project collaboration services," July 2003.

Yossi Hadad, "The impact of intensifying factors on the probability of accident scenarios in construction," December 2006.

### **RESEARCH GRANTS**

- 2003, PCSC (North American Precast Concrete Software Consortium), \$32,000, "Precast Concrete Software Consortium Project - Phase Two", Rafael Sacks (Technion PI), Charles Eastman (Project leader at Georgia Tech under separate grant).
- 2003, PITA ICES (Institute for Complex Engineered Systems) Research Seed Fund (Carnegie-Mellon University – Lehigh University, Pennsylvania State Govt.), \$37,043, "Real-Time Tracking and Monitoring of Precast Concrete Pieces During Production, Erection, and Maintenance Phases in Support of Lean Supply-Chain Management", Rafael Sacks (Technion PI), Burcu Akinci (Carnegie-Mellon PI).
- 2004, TEKLA Corporation, Espoo Finland, €29,877 (\$38,500) "Qualitative and Quantitative Assessment of the Impact of 3D Modeling of Building Structures on Engineering Productivity", Rafael Sacks (Technion PI).
- 2004, Danya Cebus Construction Ltd., NIS 77,000 (\$17,900) "Procedures for Late Change Orders - Development of a Management Model Based on Lean Construction Principles", Rafael Sacks (Technion PI).
- 2004, PCSC (North American Precast Concrete Software Consortium), \$15,000 "Precast Concrete Software Consortium Project - Phase Three", Rafael Sacks (Technion PI), Charles Eastman (Project leader at Georgia Tech under separate grant).
- 2005, Israel Ministry of Industry, Trade and Employment, NIS 598,000 (\$133,000) "A Lean Dynamic Quantitative Method for Planning Safety Enhancement Operations in Construction", Rafael Sacks and Yehiel Rosenfeld (Technion PIs).
- 2006, Israel Ministry of Housing and Construction, NIS 190,000 (\$41,300) "Enhancing the competitiveness of prefabricated components for construction by shortening lead times using computer modeling", Rafael Sacks (Technion PI).
- 2006, TEKLA Corporation, Espoo Finland, \$51,975, "Building Information Modeling of Cast-in-place Reinforced Concrete Structures - Data Model Definition to Support Design and Construction Management", Rafael Sacks (Technion PI), Charles Eastman (Georgia Tech PI under separate grant).
- 2006, Charles Pankow Foundation, Ontario, California, USA, \$58,588, "Building Information Model (BIM) For Precast Concrete", in collaboration with Dr. Earle Kennett, National Institute of Building Science (NIBS), Dr. Richard H. J. Jackson, FIATECH, and Prof. Charles Eastman, Georgia Institute of Technology. Total grant award \$159,804.
- 2007, Israel Ministry of Housing and Construction, NIS 185,000 (\$44,000) "The potential to enhance productivity in public construction through

industrialization using Lean principles ", Rafael Sacks (Technion PI), Aviad Shapira (Technion co-PI).

## **SIGNIFICANT PROFESSIONAL PROJECTS**

- 1990, CAD policies for Jerusalem Municipality Civic Center Project, Shacham Computerized Engineering Ltd., Yossi Trigoda (project manager).
- 1991, CAD policies for Ministry of Housing, Shacham Computerized Engineering Ltd., Rafael Sacks (project manager).
- 1991 to 1994, Construction CAD software products 2BARS, TABA and others, Shacham Computerized Engineering Ltd., within the Autodesk Registered Developer Program. Rafael Sacks (project manager).
- 1992 to 1993, Jerusalem Highway 4 Visualization Project, Shacham Computerized Engineering Ltd., Rafael Sacks (project manager).

## **PUBLICATIONS**

*(Names of graduate students shown in bold)*

### **Theses**

Computer Integrated Construction: Project Data Model Representation and Use  
Doctoral Thesis, Technion – Israel Institute of Technology, 1997.

EIDOC - Expert Interactive Design of Concrete Columns  
Master's Thesis, MIT – Massachusetts Institute of Technology, 1985.

### **Refereed papers in professional journals**

1. Sacks, R., and Buyukozturk, O., (1987), 'Expert Interactive Design of Concrete Columns under Bi-axial Bending', ASCE Journal of Computing in Civil Engineering, Vol. 1 No. 2 pp. 69-81.
2. Sacks, R., and Warszawski, A., (1997), '[A Project Model for an Automated Building System; Design and Planning Phases](#)', Automation in Construction, Elsevier Science B.V., Vol. 7 pp. 21-34.
3. Sacks, R., (1998), '[Issues in the Development and Implementation of a Building Project Model for an Automated Building System](#)', International Journal of Construction Information Technology, Salford University, Salford UK Vol. 5 No. 2 pp 75-101.
4. Sacks, R., Warszawski, A., and Kirsch, U., (2000), '[Structural Design in an Automated Building System](#)', Automation in Construction, Elsevier Science B.V., Vol. 10 No. 1 pp. 181-197.

5. Sacks, R., (2002), '[Integrated AEC Information Services using Object Methods and a Central Project Model](#)', Computer-Aided Civil and Infrastructure Engineering, Blackwell Publishers, Boston USA & Oxford UK, Vol. 17 No.6 pp. 449–456.
6. Sacks, R., Navon, R., and Goldschmidt, E., (2003), '[Building Project Model Support for Automated Labor Monitoring](#)', ASCE Journal of Computing in Civil Engineering, Vol.17 No.1 pp. 19-27.
7. Sacks, R., Eastman, C.M., and Lee, G., (2003) '[Process Improvements in Precast Concrete Construction Using Top-Down Parametric 3-D Computer-Modeling](#)', Journal of the Precast/Prestressed Concrete Institute, Vol. 48 No. 3 pp. 46-55.
8. Eastman, C.M., Sacks, R., and Lee, G., (2003), '[Development and Implementation of Advanced IT in the North American Precast Concrete Industry](#)', ITCON - Electronic Journal of Information Technology in Construction, Vol. 8, pp. 247-262.
9. Sacks, R., Eastman, C.M., and Lee, G., (2004) '[Process Model Perspectives On Management and Engineering Procedures in the Precast/Prestressed Concrete Industry](#)', ASCE Journal of Construction Engineering and Management, Vol. 130 No. 2 pp. 206-215.
10. Sacks, R., Eastman, C.M., and Lee, G., (2004), '[Parametric 3D Modeling in Building Construction with Examples from Precast Concrete](#)', Automation in Construction, Elsevier Science B.V., Vol. 13 No. 3 pp. 291-312.
11. Warszawski, A., and Sacks, R., (2004), '[A Practical Multi-Factor Approach to Evaluating the Risk of Investment in Engineering Projects](#)', ASCE Journal of Construction Engineering and Management, Vol. 130 No. 3 pp. 357-367.
12. Sacks, R., (2004), '[Evaluation of the economic impact of computer-integration in precast concrete construction](#)', ASCE Journal of Computing in Civil Engineering, Vol. 18 No. 4. pp. 301-312.
13. Sacks, R., Navon, R., **Brodetskaia, I.**, and Shapira, A. (2005). '[Feasibility of Automated Monitoring of Lifting Equipment in Support of Construction Project Control](#)', ASCE Journal of Construction Engineering and Management, Vol. 131 No. 5 pp. 604-614.
14. Sacks, R., Eastman, C.M., Lee, G. and Orndorff, D. (2005). '[A Target Benchmark of the Impact of Three-Dimensional Parametric Modeling in Precast Construction](#)', Journal of the Precast/Prestressed Concrete Institute, Vol. 50 No. 4 pp. 126-139.
15. Sacks, R., Navon, R., and **Brodetskaia, I.**, (2006). '[Interpretation of Automatically Monitored Equipment Data for Project Control](#)', ASCE Journal of Computing in Civil Engineering, Vol. 20 No. 2 pp. 111-120.

16. Lee, G., Eastman, C.M., Sacks, R., and Navathe, S.B., (2006). '[Grammatical Rules for Specifying Information for Automated Product Data Modeling](#)', Advanced Engineering Informatics, Vol. 20 No. 2 pp. 155-170.
17. Sacks, R., and **Harel, M.**, (2006). '[An Economic Game Theory Model of Subcontractor Resource Allocation Behavior](#)', Construction Management & Economics, Vol. 24 No. 8 pp. 869-881.
18. Lee, G., Sacks, R., and Eastman, C.M., (2006). '[Specifying Parametric Building Object Behavior \(BOB\) for a Building Information Modeling System](#)', Automation in Construction, Vol. 15 No. 6 pp. 758-776.
19. **Ergen, E.**, Akinci, B., and Sacks, R., (2007). '[Tracking and Locating Components in a Precast Storage Yard Utilizing Radio Frequency Identification Technology and GPS](#)', Automation in Construction, Vol. 16 No. 3 pp. 354–367.
20. Navon, R., and Sacks, R., (2007). '[Assessing Research in Automated Project Performance Control \(APPC\)](#)', Automation in Construction, Vol. 16 No. 4 pp. 474-484.
21. Lee, G., Eastman, C.M., and Sacks, R., (2007). '[Twelve Design Patterns for Integrating and Normalizing Product Model Schemas](#)', Computer-Aided Civil and Infrastructure Engineering, Vol. 22 No. 3 pp. 163-181.
22. Sacks, R., and **Goldin, M.**, (2007). '[Lean Management Model for Construction of High-rise Apartment Buildings](#)', ASCE Journal of Construction Engineering and Management, Vol. 133 No. 5 pp. 374-384.
23. Lee, G., Sacks, R., and Eastman, C.M., (2007). '[Product Data Modeling using GTPPM - A Case Study](#)', Automation in Construction, Vol. 16 No.3 pp. 392-407.
24. Sacks, R., **Esquenazi, A.**, and **Goldin, M.**, (2007). '[LEAPCON: Simulation of Lean Construction of High-rise Apartment Buildings](#)', ASCE Journal of Construction Engineering and Management, Vol. 133 No. 7 pp. 529-539.
25. Lee, G., Eastman, C.M., and Sacks, R., (2007) '[Eliciting Information for Product Modeling using Process Modeling](#)', Data & Knowledge Engineering, Elsevier Science B.V., Vol. 62 No. 2 pp. 292-307.
26. **Ergen, E.**, Akinci, B., and Sacks, R., (2007). '[Life-Cycle Data Management of Engineered-to-Order Components Using Radio Frequency Identification](#)', Advanced Engineering Informatics, Vol. 21 No. 4 pp. 356-366.
27. Sacks, R., and **Barak, R.**, (2008). '[Impact of Three-dimensional Parametric Modeling of Buildings on Productivity in Structural Engineering Practice](#)', Automation in Construction, Vol. 17 No. 4 pp. 439-449.

**Refereed papers in professional journals (accepted/in press)**

28. Eastman, C. M., and Sacks, R., (2007). 'Relative Productivity in the AEC Industries in the US for On-site and Off-site Activities', ASCE Journal of Construction Engineering and Management (accepted).
29. **Kaner, I.**, Sacks, R., Kassian, W., and Quitt, T., (2007). 'Case Studies of BIM Adoption for Precast Concrete Design by Mid-sized Structural Engineering Firms,' ITCON - Information Technology in Construction (accepted).

#### **Refereed papers in professional journals (submitted)**

30. Rosenfeld, Y., Sacks, R., and **Rozenfeld, O.**, (2008). 'CHASTE - Construction Hazard Analysis with Spatial and Temporal Exposure', submitted to Construction Management & Economics.
31. **Rozenfeld, O.**, Sacks, R., Rosenfeld, Y., and Baum, H., (2008). 'Construction Job Safety Analysis', submitted to Safety Science.
32. Sacks, R., **Rozenfeld, O.**, and Rosenfeld, Y., (2007). 'Spatial and Temporal Exposure to Safety Hazards in Construction', submitted to the ASCE Journal of Construction Engineering and Management.
33. Sacks, R., **Kaner, I.**, Eastman, C.M., and Jeong, Y-S., (2008). 'The Rosewood Experiment – Building Information Modeling and Interoperability for Architectural Precast Facades', submitted to Automation in Construction.
34. Sacks, R., Treckmann, M., and **Rozenfeld, O.**, (2008). 'Computer-Aided Visualization of Work Flow to Support Lean Construction', submitted to the ASCE Journal of Computing in Civil Engineering.
35. **Barak, R.**, Jeong, Y-S., Sacks, R., and Eastman, C.M., (2008). 'Unique Requirements of Building Information Modeling for Cast-in-place Reinforced Concrete', submitted to the ASCE Journal of Computing in Civil Engineering.

#### **Books**

Sacks, R., and Bertelsen, S., (Eds.) (2006). Understanding and Managing the Construction Process: Theory and Practice, Proceedings of the 14th Conference of the International Group for Lean Construction, Catholic University of Santiago, Santiago, Chile, 641 pages.

Eastman, C. M., Teicholz, P., Sacks, R., and Liston, K., (2008). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Architects, Engineers, Contractors and Fabricators, ISBN: 978-0-470-18528-5, John Wiley and Sons, Hoboken NJ, USA 495 pages, (in press).

#### **Book Chapters**

Sacks, R., and Buyukozturk, O., “An Expert System for Design of Reinforced Concrete Structures”, in Expert Systems in Engineering, edited by D.T. Pham, ISBN: 0-387-19229-8 IFS Publications/Springer-Verlag, New York, 1988.

Sacks, R., “Production System Instability and Subcontracted Labor”, in Construction Supply Chain Management Handbook, edited by W. O’Brien, C. Formoso, K. London and R. Vrijhoef, CRC Press/Taylor and Francis, 2008 (in press).

### **Educational Management Simulation Game**

Sacks, R. (2004). Technion LEAPCON™ (Lean Apartment Construction) Game, 2<sup>nd</sup> Edition, January, 2007. <http://www.technion.ac.il/~cvsacks/tech-leap.htm>. A construction management simulation game, used by 21 universities and 14 companies in 20 countries.

### **Research Reports**

1. Warszawski, A., and Sacks, R., ‘Automation of Design and Planning in Building - the Description of the System and the Knowledge Base’, Israel National Building Research Institute Report #769, Haifa, 1997, 81 pages.
2. Sacks, R., Warszawski, A., Kirsch, U., ‘An Automated Building System - the Structural Aspect’, Israel National Building Research Institute Report #803, Haifa, 1998, 80 pages.
3. Eastman, C.M., Sacks, R., and Lee, G., ‘Specification for a Precast Concrete Design and Engineering Software Platform’, Georgia Institute of Technology, Atlanta, 2001.
4. Eastman, C.M., Sacks, R., Lee, G., and Orndorff, D., ‘PCSC Inform Task Report in Support of Development of Precast Concrete Design and Engineering Software’, Georgia Institute of Technology, Atlanta, 2003.
5. Sacks, R., and **Goldin, M.**, ‘Management Procedures for Client Changes – Development of a Management Model based on Lean Construction Principles’, Research Report #1005158, Technion Research and Development Foundation, Haifa, 2005.
6. Sacks, R., Lee, G., Eastman, C.M., and Orndorff, D., ‘PCSC Final Report – Assessing Development of Precast Concrete Design and Engineering Software’, Georgia Institute of Technology, Atlanta, and Technion Research and Development Foundation, Haifa, 2005.
7. Sacks, R., and **Barak, R.**, ‘A Qualitative and Quantitative Assessment of the Impact of 3D Modelling of Building Structures on Engineering Productivity’, Research Report #1005156, Technion Research and Development Foundation, Haifa, 2006.
8. Sacks, R., **Kaner, I.**, and **Esquenazi, A.**, ‘Improving the Competitiveness of Industrialized Components in Construction using Building Information

Modeling', Israel National Building Research Institute Report #5235239, Haifa, 2007, 168 pages.

9. Sacks, R., Rosenfeld, Y., Baum, H., and **Rozenfeld, O.**, 'A Lean Dynamic Quantitative Method for Planning Safety Enhancement Operations in Construction', Israel National Building Research Institute Report #2005902, Haifa, 2007, 121 pages.
10. Eastman, C.M., Sacks, R., Jeong, Y-S., and **Kaner, I.**, 'Building Information Modeling (BIM) for Precast Concrete', National Institute of Building Sciences, Washington DC, USA, 2007, 212 pages.
11. Sacks, R., Eastman, **Barak, R.**, and Jeong, Y-S., 'User and Functional Requirements for 3D Parametric Modeling of Cast-in-place Reinforced Concrete Structures', Georgia Institute of Technology, Atlanta, and Technion Research and Development Foundation, Haifa, 2007, 223 pages.

### **Conferences and other contributed lectures**

1. *Technical University of Berlin, Guest Lecture*, Berlin, West Germany, July 1985. "EIDOC - Expert Interactive Design of Concrete Columns."
2. *Modeling of Buildings Through their Life Cycle, CIB W78 Workshop*, Stanford, CA, USA, August 1995. "The Project Model of an Automated Building System."
3. *Information Support for Building Economics, CIB W55 Workshop*, Salford, UK September 1997. "The Development of Knowledge Modules for Automated Structural Design."
4. *IT in Construction in Africa, CIB W78 Workshop*, White River, South Africa, May 2001. "Adding Function and Behavior to Project Model Objects to Integrate AEC Information."
5. *ASCE Specialty Conference on Fully Integrated and Automated Project Processes (FIAPP) in Civil Engineering*, Blacksburg, VA, USA, January 2002. "An Automated Building System - Development, Difficulties and New Directions."
6. *Polytechnic University, guest lecture*, Brooklyn, New York, USA, April 2002. "Computer Integrated Construction Research: An Overview".
7. *CEC02 Concurrent Engineering Conference*, Berkeley, CA, USA, July 2002. "Information and Process Flow in Models of Precast Concrete Design and Construction."
8. *ISARC - Nineteenth International Symposium on Automation and Robotics in Construction*, NIST, Gaithersburg, MD, USA, September 2002. "Monitoring Construction Equipment for Automated Project Performance Control."

9. *PCI – National Convention of the Precast/Prestressed Concrete Institute*, Nashville, TN, USA, October 2002. “Can parametric 3-D computer-modeling prevent errors in Precast Construction?” *IGLC – Eleventh Meeting of the International Group for Lean Construction*, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA, July 2003. “3D Modeling and Real-time Monitoring in Support of Lean Production of Engineered-to-order Precast Concrete Buildings.”
11. *ISARC - Twentieth International Symposium on Automation and Robotics in Construction*, Technical University Eindhoven, Netherlands, September 2003. “Monitoring Lifting Equipment for Automated Progress Control: A Feasibility Study.”
12. *Third National Conference on Construction and Infrastructure*, Tel Aviv, November 2003. “Management Reporting in Construction Projects based on Computerized Monitoring of Lifting Equipment.” (in Hebrew).
13. *Grupo Dragados and Drace 3D Modeling Seminar*, Madrid, Spain, March 2004. “Background to the PCSC Project – Precast Concrete Software Consortium”; “The Benefits of 3D modeling for the Precast Concrete Industry” (invited lecture funded by hosts).
14. *Tekla Global Business Forum*, Prague, Czech Republic, June 2004. “The PCSC Project and Evaluating Economic Benefits” (invited lecture funded by hosts).
15. *IGLC – Twelfth Meeting of the International Group for Lean Construction*, Elsinore, Denmark, August 2004. “Towards a lean understanding of resource allocation in a multi-project sub-contracting environment.”
16. *Tekla Structures Seminar*, Leeds, UK, August 2004. “3D parametric modeling of precast concrete structures: Motivation, technical specifications and productivity measures.”
17. *BIBM – Amsterdam*, Netherlands, May 2005, “3D parametric modelling of precast structures - a revolutionary change.”
18. *IGLC – Thirteenth Meeting of the International Group for Lean Construction*, Sydney, Australia, July 2005. “Pull-driven construction of high-rise apartment buildings.”
19. *IGLC – Thirteenth Meeting of the International Group for Lean Construction*, Sydney, Australia, July 2005. “Lean scheduling for safety: development of a time-dependent risk level model.”
20. *Carnegie-Mellon University ICCM Meeting*, Pittsburgh PA, US, April 2006. "A Game Theory Analysis of Subcontractor Resource Allocation" (invited lecture funded by hosts).

21. *ICCCBE-XI - 11th Int'l Conference on Computing in Civil and Building Engineering*, Montreal, Canada, June 2006. " 'WORKMANAGER' - an Online Interface for Lean Flow Control in Apartment Building Construction."
22. *ICCCBE-XI - 11th Int'l Conference on Computing in Civil and Building Engineering*, Montreal, Canada, June 2006. "Quantitative Assessment of the Impact of 3D Modelling of Building Structures on Engineering Productivity."
23. *IGLC - 14th Conference of the International Group for Lean Construction*, Santiago, Chile, July 2006. "Subcontractor Resource Allocation in a Multi-project Environment – Field Study."
24. *IGLC - 14th Conference of the International Group for Lean Construction*, Santiago, Chile, July 2006. "Evaluation of Lean Improvements in Residential Construction using Computer Simulation."
25. *IGLC - 14th Conference of the International Group for Lean Construction*, Santiago, Chile, July 2006. "How Last Planner Motivates Subcontractors to Improve Plan Reliability – a Game Theory Model."
26. *Conference on Preventive Action and Research for Occupational Health and Safety*, Jerusalem, Israel, June 2007. "Lean Scheduling for Safety in Construction by Predicting Risk Levels." (in Hebrew).
27. *CME25 - Construction Management and Economics: Past, Present and Future*, University of Reading, UK, July 2007. "Measures of Information Flow for Lean Design in Civil Engineering."
28. *IGLC – 15<sup>th</sup> Conference of the International Group for Lean Construction*, East Lansing, Michigan, USA, July 2007. "Understanding Flow and Micro-variability in Construction: Theory and Practice."
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