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## Chih-Hang John Wu, Ph.D.

### Education

- Aug 1989 – May 1993* **Pennsylvania State University**  
Doctor of Philosophy, Operations Research  
University Park, PA, United States  
*Dissertation: Solving Large-Scale Nonlinear Network Problems with Relaxation and Decomposition Algorithms. 06/1993, Degree: Ph.D., Supervisor: Jose A. Ventura*
- Aug 1989 – Feb 1992* **Pennsylvania State University**  
Master of Science, Operations Research  
University Park, PA, United States  
*Thesis: Automated Inspection of Elliptical Profiles. 01/1992, Degree: Master of Science, Supervisor: Jose A. Ventura*
- Aug 1988 – May 1989* **University of Missouri, Columbia**  
Industrial Engineering  
Columbia, MO, United States
- Aug 1980 – Jun 1984* **National Cheng Kung University**  
Bachelor of Science, Industrial Management  
Tainan, Taiwan

### Research Experience

- July 2007 – present* **Co-Director**  
Healthcare Operations Research Center, Kansas State University  
Manhattan, KS, United States
- July 1999 – present* **Associate Professor**  
Department of Industrial and Manufacturing Systems Engineering,  
Kansas State University,  
Manhattan, KS, United States
- Aug 1993 – June, 1999* **Assistant Professor**  
Department of Industrial and Manufacturing Systems Engineering,  
Kansas State University,  
Manhattan, KS, United States
- Aug 1989 – May 1993* **Research Assistant**  
Department of Industrial and Manufacturing Engineering,  
Pennsylvania State University,  
University Park, PA, United States

## AWARDS

### Teaching:

Kansas State University	Gisela and Warren Kennedy – Carl and Mary Ice Cornerstone Teaching Scholar	Aug-2019 – June-2024	47,500
Kansas State University	Outstanding Teacher Award - Department of Industrial and Manufacturing Systems Engineering	May-2019	\$500
Kansas State University	Outstanding Teacher Award - Department of Industrial and Manufacturing Systems Engineering	May-2015	\$500
Kansas State University	Outstanding Teacher Award - Department of Industrial and Manufacturing Systems Engineering	Apr-2012	\$500
Mercy Regional Medical Center, Manhattan, KS	Process Improvement Training for Leaders	May-2010	\$5,000
Kansas State University	Outstanding Teacher Award - Department of Industrial and Manufacturing Systems Engineering	Apr-2004	\$500
Kansas State University	Hollis Teaching Award - Finalist	Apr-1997	

### Research:

National Level Award			
2018 IISE Research Conference	Best Paper Award – Simulation and Modeling	May-2018	\$1,000
2016 IISE Research Conference	Best Paper Award – Healthcare Engineering	May-2016	\$1,000
Pre-stress Concrete Institution (PCI)	Daniel P. Jenny Research Fellowship	Aug-2004	\$18,000
Institute of Industrial Engineering	IIE Dissertation Award	Feb-1994	
University Level Awards			
University Transportation Center, Kansas State University	Graduate Scholarship Award	Jan-2014	\$2,500
University Transportation Center, Kansas State University	Graduate Scholarship Award	Aug-2013	\$2,500
University Transportation Center, Kansas State University	Graduate Scholarship Award	Aug-2012	\$5,000
Mercy Regional Medical Center, Manhattan, KS	Process Improvement Training for Leaders	May-2010	\$5,000

**Funded Research Grants** (Total: \$6,409,449; My Portion: \$2,456,368.71)  
(Federal funded projects are in **bold**)

Funding Agent, Title, Time Period, Amount, Role, Percent, My Portion

1. Department of Transportation (DOT) Federal Railroad Administration (FRA), Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties, 03/01/2018 - 06/30/2019, \$318,648, Co-PI,25%, \$79,662.00
2. Department of Transportation (DOT) Federal Railroad Administration (FRA), Developing Qualification Tests to Ensure Proper Selection and Interaction of Pretensioned Concrete Railroad Tie Materials, 03/01/2016 - 02/28/2017, \$306,903.00, Co-PI,25%, \$76,725.75
3. Department of Transportation (DOT) Federal Railroad Administration (FRA), Developing Qualification Tests to Ensure Proper Selection and Interaction of Pretensioned Concrete Railroad Tie Materials,03/01/2015 - 02/28/2016, \$622,083.00, Co-PI,25%, \$155,520.75
4. Department of Transportation (DOT) Federal Railroad Administration (FRA), Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties (2nd Project Extension), 05/01/2011 - 03/31/2016, \$24,937.00, Co-PI,28%, \$6,982.36
5. Department of Transportation (DOT) Federal Railroad Administration (FRA), Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties (2nd Project Extension), 05/01/2011 - 12/31/2015, \$656,686, Co-PI,28%, \$183,872.08
6. Via Christi, Wichita, KS, Modeling Core Processes at Mercy Regional Hospital at Manhattan,01/01/2013 - 12/31/2013, \$96,017, Co-PI,50%, \$48,008.50
7. Children Mercy Hospital, Kansas City, MO, Predictive Scheduling Model, 01/01/2013 - 12/31/2013, \$46,472, Co-PI, 50%, \$23,236.00
8. Manhattan Mercy Hospital, Manhattan, KS, Improved ER Workflow and Supplies Inventory Management, 08/01/2012 - 12/31/2012, \$3,000, Co-PI,50%, \$1,500.00
9. Department of Transportation (DOT) Federal Railroad Administration (FRA), Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties (Project Extension),05/01/2011 - 12/31/2014, \$506,726, Co-PI,28%, \$141,883.28
10. Hays Medical Center, Hays, KS, Improved In-Patient Floors Workflows for Nurses,01/01/2012 - 12/31/2012, \$18,000, Co-PI,50%, \$9,000.00
11. Department of Transportation (DOT) Federal Railroad Administration (FRA), Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties,05/01/2011 - 10/31/2013, \$1,236,284, Co-PI, 28%, \$346,159.52
12. Children's Mercy Hospital, Kansas City MO, Improved In-Patient Discharging Processes,03/01/2010 - 07/01/2010, \$24,000, Co-PI,50%, \$12,000.00
13. University transportation Center (UTC) (\$61,308), Kansas Department of Transportation (KDOT) (\$35,351), Implementation of Non-Contact Strain Measurement Device for Bridges and Piers,01/01/2010 - 08/31/2010, \$96,659, Co-PI,33%, \$31,897.47
14. U.S. Department of Veterans Affairs, VA Hospital in Kansas City, Model Patient Flow and Facility Design,01/01/2010 - 12/31/2010, \$60,000, Co-PI,50%, \$30,000.00
15. Advanced Manufacturing Institute, Kansas State University, An "EKG" for Gear Manufacturing Diagnostics and Non-Contact Pre-Stressed Concrete Beam Strain Measurement,08/15/2004 - 08/21/2005, \$60,000, PI,50%, \$30,000.00
16. Kansas Department of Transportation KDOT, Non-Contact Diagnostics in Pre-Stressed Concrete Elements, 07/01/2004 - 06/30/2005, \$12,000, Co-PI,50%, \$6,000.00

17. Advanced Manufacturing Institute, Kansas State University, An “EKG” for Gear Manufacturing Diagnostics,07/15/2003 - 06/30/2004, \$42,000, PI, 50%, \$21,000.00
18. Advanced Manufacturing Institute, Kansas State University, Non-Contact Pre-Stressed Concrete Beam Strain Measurement,07/15/2003 - 06/30/2004, \$28,000, Co-PI,50%, \$14,000.00
19. Kansas Department of Transportation KDOT, Non-Contact Diagnostics in Pre-Stressed Concrete Elements,07/01/2003 - 06/30/2004, \$56,000, Co-PI,50%, \$28,000.00
20. Advanced Manufacturing Institute, Kansas State University, Non-Contact Pre-Stressed Concrete Beam Strain Measurement,07/01/2002 - 06/30/2003, \$40,445, PI,50%, \$20,222.50
21. Advanced Manufacturing Institute, Kansas State University, An “EKG” for Gear Manufacturing Diagnostics,07/01/2002 - 06/30/2003, \$55,315, Co-PI, 50%, \$27,657.50
22. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection of Gear Profiles,07/01/2001 - 06/30/2002, \$65,935, PI,50%, \$32,967.50
23. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection of Gear Profiles,07/01/2000 - 06/30/2001, \$56,635, PI, 50%, \$28,317.50
24. Advanced Manufacturing Institute, Kansas State University, Ultra Digital Imaging Compression Method using Wavelet Techniques, 07/01/2000 - 06/30/2001, \$10,280, PI,100%, \$10,280.00
25. Advanced Manufacturing Institute, Kansas State University, Optical Stylus – Non-contact Inspection of Surface Roughness,07/01/1999 - 06/30/2000, \$10,280, PI, 50%, \$5,140.00
26. Advanced Manufacturing Institute, Kansas State University, Computer Vision Inspection of Geometrical Profiles,07/01/1999 - 06/30/2000, \$26,935, PI, 100%, \$26,935.00
27. Advanced Manufacturing Institute, Kansas State University, Optical Stylus – Non-contact Inspection of Surface Roughness,07/01/1998 - 06/30/1999, \$11,810, PI, 50%, \$5,905.00
28. Kansas Technology Enterprise Corp (KTEC), State of Kansas, Online Non-Contact Inspection Of Gear Profiles,07/01/1998 - 06/30/1999, \$50,000, PI, 50%, \$25,000.00
29. Kansas Technology Enterprise Corp (KTEC), State of Kansas, Non-contact Evaluation of Nodularity in Casting Ductile Irons,07/01/1998 - 06/30/1999, \$50,000, PI, 100%, \$50,000.00
30. Advanced Manufacturing Institute, Kansas State University, Computer Vision Inspection of Geometrical Profiles,07/01/1998 - 06/30/1999, \$36,315, PI, 100%, \$36,315.00
31. Advanced Manufacturing Institute, Kansas State University, Wavelet Based Methods in Computer Vision and Image Analysis,08/01/1997 - 06/30/1998, \$12,662, PI, 100%, \$12,662.00
32. Advanced Manufacturing Institute, Kansas State University, Computer Vision Inspection of Feature-Based Designed Parts,08/01/1997 - 06/30/1999, \$23,617, PI, 100%, \$23,617.00
33. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection Of Sand Casting Products,05/18/1997 - 05/17/1998, \$44,109, PI,100%, \$44,109.00
34. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection of Gear Profiles,05/18/1997 - 05/17/1999, \$51,652, PI,50%, \$25,826.00
- 35. National Science Foundation (NSF) EPSCoR/DMMI, Non-Contact Diagnostics in Manufacturing: A New Precision Measurement Laboratory,03/01/1998 - 05/31/1999, \$2,356,000, Co-PI, 25%, \$589,000.00**
36. Advanced Manufacturing Institute, Kansas State University, Non-Contact On-Line Surface Measurement Using OPTOSTYLUS,05/18/1996 - 05/17/1997, \$36,711, PI,100%, \$36,711.00
37. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection of Geometrical Profiles,05/18/1996 - 05/17/1997, \$25,214, PI, 100%, \$25,214.00

38. Advanced Manufacturing Institute, Kansas State University, Strategic Outsourcing in a Distributed Manufacturing Environment, 05/18/1996 - 05/17/1997, \$12,523, PI, 100%, \$12,523.00
39. Advanced Manufacturing Institute, Kansas State University, A New Wavelet based Image Compression/Decompression Technique, 05/18/1995 - 05/17/1996, \$17,351, PI, 100%, \$17,351.00
40. Advanced Manufacturing Institute, Kansas State University, Non-Contact Inspection of Geometrical Profiles, 05/18/1995 - 05/17/1996, \$27,097, PI, 100%, \$27,097.00
41. Advanced Manufacturing Institute, Kansas State University, Dynamic Control of A Distributed Manufacturing Environment, 05/18/1995 - 05/17/1996, \$25,005, PI, 100%, \$25,005.00
42. Advanced Manufacturing Institute, Kansas State University, Computer Vision Inspection of Geometrical Profiles, 05/18/1994 - 05/17/1995, \$103,066, PI, 100%, \$103,066.00

## Publication Highlights (Selected Publications listed)

## Referred Journal Publications

\*\* Graduate Student Co-Authors under my supervision are underlined

1. Marzieh Soltanolkottabi, David Ben-Arieh \*, Chih-Hang Wu "Game Theoretic Modeling of Infectious Disease Transmission with Delayed Emergence of Symptoms," Special Issue: Non-Imitative Dynamics in Evolutionary Game Theory, Games, Accepted, March 2020.
2. Kaiming Bi, Yuyang Chen, Songnian Zhao, Chih-Hang Wu, "A New Zoonotic Visceral Leishmaniasis Dynamic Transmission Model with Age-Structure," Chaos, Solitons and Fractals, Vol.133, April 2020, 109622, DOI: <https://doi.org/10.1016/j.chaos.2020.109622>.
3. Aaron A. Robertson, B. Terry Beck, Robert J. Peterman, Kyle A. Riding, John Wu, "Transfer Length Characterization of Entire Cross-tie Plant Casting Bed using Non-contact Optical Strain Sensors and 3D Scanning Technology," Draft submitted to ASCE Journal of Engineering Mechanics, 2019 (under review).
4. Kaiming Bi, YuYang Chen, Chih-Hang-Hang J. Wu, David Ben-Arieh, "A Memetic Algorithm for Solving Optimal Control Problems of Zika Virus Epidemic with Equilibriums and Backward Bifurcation Analysis," Communications in Nonlinear Science and Numerical Simulation, 01/2020, DOI: <https://doi.org/10.1016/j.cnsns.2020.105176>
5. Beck, B.T., Peterman, R.J., Wu, Chih-Hang John, "The Uncertainty in Solutions to Implicit Equation Systems," Journal of Fluids Engineering, 01/2020, 142(1), <https://doi.org/10.1115/1.4044668>
6. Yuyang Chen, Kaiming Bi, Chih-Hang John Wu, David Ben-Arieh, "A New Evidence-Based Optimal Control in Healthcare Delivery: A Better Clinical Treatment Management for Septic Patients," Computers & Industrial Engineering, 08/2019, DOI: <https://doi.org/10.1016/j.cie.2019.106010>
7. Marzieh Soltanolkottabi, David Ben-Arieh, C-W Wu: "Spatial competitive games with disingenuously delayed positions," Journal of Dynamics & Games, 07/2019; <https://doi.org/10.3934/jdg.2019017>
8. Marzieh Soltanolkottabi, David Ben-Arieh, Chih-Hang Wu: Modeling Behavioral Response to Vaccination Using Public Goods Game. IEEE Transactions on Computational Social Systems, 03/2019; PP(99):1-9., DOI: <https://doi.org/10.1109/TCSS.2019.2896227>
9. Kaiming Bi, Yuyang Chen, Songnian Zhao, Yan Kuang, Chih-Hang John Wu: Current Visceral Leishmaniasis Research: A Research Review to Inspire Future Study. BioMed Research International, 07/2018; 2018(5):1-13., DOI: <https://doi.org/10.1155/2018/9872095>



10. Songnian Zhao, Yan Kuang, Chih-Hang Wu, Kaiming Bi, David Ben-Arieh: *Risk Perception and Human Behaviors in Epidemics*. IISE Transactions on Healthcare Systems Engineering, 04/2018; DOI: <https://doi.org/10.1080/24725579.2018.1464085>
11. Kaiming Bi, Yuyang Chen, Songnian Zhao, David Ben-Arieh, Chih-Hang (John) Wu: *Modeling Learning and Forgetting Processes with the corresponding impacts on Human Behaviors in Infectious Disease Epidemics*. Computers & Industrial Engineering, 04/2018; Vol. 129: 563-577 DOI: <https://doi.org/10.1016/j.cie.2018.04.035>
12. Yan Kuang, David Ben-Arieh, Songnian Zhao, Chih-Hang Wu: *Using spatial games to model and simulate tomato spotted wilt virus-western flowers thrips dynamic system*. International Journal of Modelling and Simulation 02/2018;, DOI:10.1080/02286203.2018.1442547
13. Yan Kuang, David Ben-Arieh, Chih-Hang Wu, Songnian Zhao: *Using spatial games to model dynamic evolutionary systems*. Mathematical and Computer Modelling of Dynamical Systems 02/2018;, DOI:10.1080/13873954.2018.1437548
14. Amir F. Momeni, Robert J. Peterman, B. Terry Beck, Chih-Hang Wu, "A Prediction Model for Development Length of Indented Prestressing Wires," American Concrete Institute (ACI) Structural Journal; Volume 115, Issue 2, pp 525-534, March 2018.
15. Yuyang Chen, Kaiming Bi, Songnian Zhao, David Ben-Arieh, Chih-Hang John Wu, "Modeling individual fear factor with optimal control in a disease-dynamic system," Chaos Solitons & Fractals 11/2017; 104:531-545., DOI:10.1016/j.chaos.2017.09.001
16. Yan Kuang, David Ben-Arieh, Songnian Zhao, Chih-Hang Wu, David Margolies, James Nechols: *Mathematical Model for Two-Spotted Spider Mites System: Verification and Validation*. Open Journal of Modelling and Simulation 01/2017; 05(01):13-31., DOI:10.4236/ojmsi.2017.51002
17. Chih-Hang J. Wu, Zhenshen Shi, David Ben-Arieh, Steven Q. Simpson: *Mathematical Modeling of Innate Immunity Responses of Sepsis: Modeling and Computational Studies: From Data to Knowledge to Healthcare Improvement*. Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, 08/2016, pp.221-259.
18. Zhenzhen Shi, Stephen K. Chapes, David Ben-Arieh, Chih-Hang Wu: *An Agent-Based Model of a Hepatic Inflammatory Response to Salmonella: A Computational Study under a Large Set of Experimental Data*. PLoS ONE 08/2016; 11(8). DOI:10.1371/journal.pone.0161131
19. Zhenzhen Shi, David Ben-Arieh, Chih-Hang John Wu: *A preliminary study of sepsis progression in an animal model using agent-based modeling*. International Journal of Modelling and Simulation 04/2016; DOI:10.1080/02286203.2016.1172951
20. Songnian Zhao, Yan Kuang, Chih-Hang Wu, David Ben-Arieh, Marcelo Ramalho-Ortigao, Kaiming Bi (2016), *Zoonotic visceral leishmaniasis transmission: modeling, backward bifurcation, and optimal control*. Journal of Mathematical Biology, 73(6), 1525-1560; DOI:10.1007/s00285-016-0999-z
21. Zhenzhen Shi, Chih-Hang J. Wu, David Ben-Arieh, Steven Q. Simpson: *Mathematical Model of Innate and Adaptive Immunity of Sepsis: A Modeling and Simulation Study of Infectious Disease*. BioMed Research International Vol 2015 (2015), Article ID 504259, 31 pages, 04/2015. DOI:10.1155/2015/504259
22. Songnian Zhao, Chih-Hang J. Wu, David Ben-Arieh: *Modeling infection spread and behavioral change using spatial games*. Health System 11/2014; 4(1). DOI:10.1057/hs.2014.22
23. Chih-Hang J. Wu, Songnian Zhao, Yan Kuang, David Ben-Arieh, James Necholes, David Margolis: *New Mathematical Models for Vector-Borne Disease: Transmission of Tomato Spotted Wilt Virus*. Bridging Research and Good Practices towards Patients Welfare, 11/2014: pp. 259-268.

24. Zhenzhen Shi, Chih-Hang J. Wu, David Ben-Arieh, *Agent-Based Model: A Surging Tool to Simulate Infectious Diseases in the Immune System*. Open Journal of Modelling and Simulation 01/2014; 2(1). DOI:10.4236/ojmsi.2014.21004
25. Mark D Haynes, Levi DeLissa, Chih-Hang John Wu, Terry B Beck, Robert J Peterman: *Design of a Non-Contact Surface Profilometry System for Automated Geometrical Dimensioning and Tolerancing*. International Journal of Engineering Inventions, e-ISSN: 2278-7461, p-ISSN: 2319-6491, Volume 3, Issue 2 (September 2013) PP: 15-19.
26. Chih-Hang J. Wu, David Ben-Arieh, Zhenzhen Shi: *An Autonomous Multi-Agent Simulation Model for Acute Inflammatory Response*. Investigations into Living Systems, Artificial Life, and Real-World Solutions, 04/2013, pp.218-233
27. Matthew L Arnold, Robert J Peterman, B Terry Beck, John Wu: *Development of a Standard Bond Test for Indented Prestressing Wires*. PCI Journal 05/2013;
28. Weixin Zhao, Kyle Larsan, Robert J. Peterman, Terry Beck, and Chih-Hang J. Wu.: *Development of a laser-speckle imaging device to determine the transfer length in pretensioned concrete members*. PCI Journal 12/2012; 57(1) pp. 135-143. DOI:10.15554/pcij.01012012.135.143
29. Gitae Kim, Chih-Hang Wu: *A pegging algorithm for separable continuous nonlinear knapsack problems with box constraints*. Engineering Optimization 10/2012; 44(10). DOI:10.1080/0305215X.2011.646263
30. Gitae Kim, Chih-Hang Wu, Sungmook Lim, Jumi Kim: *Modified matrix splitting method for the support vector machine and its application to the credit classification of companies in Korea*. Expert Systems with Applications 08/2012; 39(10). DOI:10.1016/j.eswa.2012.02.007
31. Weixin Zhao, Chih-Hang J. Wu, Robert J. Peterman, Terry Beck, Pelle Doung: *Noncontact Inspection Method to Determine the Transfer Length in Pretensioned Concrete Railroad Ties*. Journal of Engineering Mechanics 04/2012; 139(3). DOI:10.1061/(ASCE)EM.1943-7889.0000449
32. Gitae Kim, Chih-Hang Wu: *Scenario aggregation for supply chain quantity-flexibility contract*. International Journal of Systems Science 11/2013; Vol.44 Issue 11 pp.2166-2182. DOI: <http://doi.org/10.1080/00207721.2012.702237>
33. Zhenzhen Shi, Chih-Hang J. Wu, David Ben-Arieh, *An Autonomous Multi-Agent Simulation Model for Acute Inflammatory Response*. International Journal of Artificial Life Research Volume 2 Issue 2, April 2011 pp. 105-121, 01/2011. DOI:10.4018/jalr.2011040106
34. Gitae Kim, Chih-Hang Wu, Yoon-Sung Jung: *A New  $\nu$  SVM Model for Classification*. 10/2011. Engineering Optimization.
35. George Demiris, Neil Charness, Elizabeth Krupinski, David Ben-Arieh, Karla Washington, Chih-Hang J. Wu, Bonne Farberow: *The Role of Human Factors in Telehealth*. Telemedicine and e-Health 05/2010; 16(4). DOI:10.1089/tmj.2009.0114
36. David Ben-Arieh, D.-K. Gullipalli, Chih-Hang Wu: *DEA Analysis of Kansas Clinics with Sparse Data*. Computers & Industrial Engineering, Volume: 63, Issue: 1, pp. 13-21.
37. Chih-Hang J. Wu, Weixin. Zhao, Terry Beck, Robert Peterman: *Optical Sensor Developments for Measuring the Surface Strains in Prestressed Concrete Members*. Strain. 03/2009 (online); 06/2011 (printed), Vol. 47, Issue s1 DOI:10.1111/j.1475-1305.2009.00621.x, e376-e386
38. David Ben-Arieh, and Chih-Hang Wu: *Analogy-Based Multiple Process Planning System with Resource Conflicts*. International Journal of Flexible Manufacturing Systems 02/1999; 11(1). DOI:10.1023/A:1008044723365

39. Chih-Hang Wu, Jose A. Ventura, Sharon Browning: *Computational comparisons of dual conjugate gradient algorithms for strictly convex networks*. Computers & Operations Research 04/1998; 25(4-25), pp. 333-349. DOI:10.1016/S0305-0548(97)00056-7
40. Kun-Li Wen, Fan-Hsiung Chen, John C.H. Wu: The selection of optimal project based on the grey relational grade. 01/1998; 6(3).
41. ChiBin Cheng, Chih-Hang Wu: *Solving the FMS Part-Tool Grouping Problem Using Lagrangian Relaxation Approach*. 03/1997, International Journal of Production Research. 10(3) pp.209-231
42. Jen-Ming Chen, Jose A. Ventura, Chih-Hang Wu: *Segmentation of planar curves into circular arcs and line segments*. Image and Vision Computing 02/1996; 14(1-14), pp.71-83. DOI:10.1016/0262-8856(95)01042-4
43. Jincan Chen, Chih-Hang Wu: Finite-time thermodynamic analysis of a two-stage combined heat pump system. International Journal of Ambient Energy 10/1995; 16(4-4), pp.205-208.
44. Chung-Yaw Ching, Ching-Jong Liao, C. John Wu: *Scheduling a Bottleneck Facility for Two Production Lines*. Engineering Optimization 07/1994; Vol. 23(1-1), pp.45- 47.
45. S.T. Huang, K.C. Fan, John H. Wu: *A new minimum zone method for evaluating straightness errors*. Precision Engineering 07/1993; Vol. 15(3), pp. 158-165.
46. Kuang-Chao Fan, John H. Wu: *Parallel beam scanning system for flatness measurements of thin plates*. Proceedings of SPIE - The International Society for Optical Engineering 09/1993.
47. S.T. Huang, John H. Wu, K.C. Fan: *A minimum zone method for evaluating flatness error of gage blocks measured by phase -shifting interferometry*. Journal- Chinese Institute of Engineers 07/1993; 16(5-5) pp.641-650
48. Jose A. Ventura, Chih-Hang Wu: *Computer vision inspection of elliptical profiles*. Applied Artificial Intelligence 10/1992; 6(4), pp.511-528.
49. Jose A. Ventura, F. Frank Chen, Chih-Hang J. Wu: *Grouping Parts and Tools in Flexible Manufacturing Systems Production Planning*. International Journal of Production Research 06/1990; 28(6), pp.1039-1056.
50. S.T. Huang, K.C. Fan, John C. Wu: *A new minimum zone method for evaluating straightness errors*. Precision Engineering 07/1993; 15(3):158-165.
51. S.T. Huang, John C. Wu, K.C. Fan: *A minimum zone method for evaluating flatness error of gage blocks measured by phase-shifting interferometry*. Journal of the Chinese Institute of Engineers 07/1993; 16(5-5):641-650.

## Book Chapters

52. Chih-Hang J. Wu, Zhenshen Shi, David Ben-Arieh, Steven Q. Simpson: *Mathematical Modeling of Innate Immunity Responses of Sepsis: Modeling and Computational Studies: From Data to Knowledge to Healthcare Improvement*. Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, 08/2016; ISBN: 9781118919392
53. Chih-Hang J. Wu, Songnian Zhao, Yan Kuang, David Ben-Arieh, James Necholes, David Margolis: *New mathematical models for vector-borne disease: transmission of tomato spotted wilt virus*. Bridging Research and Good Practices towards Patients Welfare, Edited by Yuh-Chuan Shih, Sheau-Farn Max Liang, 11/2014: chapter 32; CRC Press., ISBN: 978-1-138-02716-9
54. Chih-Hang J. Wu, David Ben-Arieh, Zhenzhen Shi: *An Autonomous Multi-Agent Simulation Model for Acute Inflammatory Response*. Investigations into Living Systems, Artificial Life, and Real-World



Solutions, Edited by George D. Magoulas, 04/2013: chapter 18; IGI Global, Hershey, PA., ISBN: 9781466638907

55. David Ben-Arieh, Chih-Hang Wu: *Reducing Patient Waiting Time at an Ambulatory Surgical Center*. Management Engineering for Effective Healthcare Delivery: Principles and Applications, Edited by Alexander Kolker, Pierce Story, 07/2011: chapter Chapter 12; IGI Global., ISBN: 9781609608729

## Patents

Weixin Zhao, Terry Beck, Robert Peterman, John Wu: *Portable High-Resolution Non-Contact Modular Sensor for Surface Strain Measurement*. Ref. No: US 8,917,384 B2, Year: 12/2014

## Referred Conference Proceedings (Past 5 years)

1. Kaiming Bi, Yuyang Chen, Chih-Hang Wu: Memetic Algorithm for Optimal Control of Zika with Bifurcation Analysis, 563758, Proceedings of the 2019 IISE Annual Conference, Orlando; 05/2019
2. Yuyang Chen, Kaiming Bi, Chih-Hang Wu: A New Targeted-Jump Gradient Descent Algorithm for Global Optimal Control in Non-Convex Disease Optimization, 582997, Proceedings of the 2019 IISE Annual Conference, Orlando; 05/2019
3. Amir Farid Momeni, Robert J Peterman, B Terry Beck, Chih-Hang John Wu: *Effect of Strand Indentation Types on the Development Length and Flexural Capacity of Concrete Railroad Ties Made With Different Prestressing Strands*. 2019 Joint Rail Conference; 05/2019, DOI:10.1115/JRC2019-1233
4. B. Terry Beck, Aaron A. Robertson, Robert J. Peterman, Adrijana Savic, Chih-Hang John Wu, Kyle A. Riding, John Bloomfield: *A High Resolution Automated Prestressing Wire Indent Profiling System for Verification of Wire-Concrete Mix Compatibility*. 2019 Joint Rail Conference; 04/2019, DOI:10.1115/JRC2019-1269
5. Yuyang Chen, Kaiming Bi, Chih-Hang Wu, David Ben-Arieh: *A New Zoonotic Visceral Leishmaniasis Dynamic Transmission Model with Age-Structure*. Proceedings of the 2018 IISE Annual Conference, Orlando; 05/2018
6. Kaiming Bi, Yuyang Chen, Chih-Hang Wu, David Ben-Arieh: *An Agent-based Model of Individual Forgetting and Learning Behavior in Epidemics*. Proceedings of the 2018 IISE Annual Conference, Orlando; 05/2018
7. James D. Scott, Robert J. Peterman, B. Terry Beck, Aaron A. Robertson, Kyle A. Riding, Chih-Hang John Wu: *Determining the Remaining Prestress Force in a Prestressed Concrete Railroad Tie Through Loading in Direct Tension*. 2018 Joint Rail Conference; 04/2018, DOI:10.1115/JRC2018-6168
8. Adrijana Savic, B. Terry Beck, Aaron A. Robertson, Robert J. Peterman, Jeremiah Clark, Chih-Hang (John) Wu: *Effects of Cover, Compressive Strength, and Wire Type on Bond Performance in Prismatic Prestressed Concrete Members*. 2018 Joint Rail Conference; 04/2018, DOI:10.1115/JRC2018-6153
9. Kaiming Bi, Yuyang Chen, Chih-Hang Wu, David Ben-Arieh, Songnian Zhao, Yan Kuang: *A New Evidence Based Optimal Control (EBOC) Method for Better Sepsis Clinical Treatment*. Industrial and Systems Engineering Research Conference (ISERC), At Pittsburgh, PA; 05/2017
10. Yuyang Chen, Kaiming Bi, Chih-Hang Wu, David Ben-Arieh, Songnian Zhao, Yan Kuang: *A Individual Fear Factor model for Information Transmission and Human behavior with Stability Analysis*. Industrial and Systems Engineering Research Conference (ISERC), At Pittsburgh, PA; 05/2017

11. B. Terry Beck, Aaron A. Robertson, Robert J. Peterman, Kyle A. Riding, John Wu: *Transfer Length Characterization of Entire Crosstie Plant Casting Bed Using Continuously Traversing Dual-Camera Non-Contact Optical Strain Sensors*. 2017 Joint Rail Conference; 04/2017, DOI:10.1115/JRC2017-2297
12. James D. Scott, Aaron A. Robertson, Robert J. Peterman, B. Terry Beck, Kyle A. Riding, John Wu: *Determining the Remaining Prestress Force in a Prestressed Concrete Crosstie*. 2017 Joint Rail Conference; 04/2017, DOI:10.1115/JRC2017-2287
13. B. Terry Beck, Aaron A. Robertson, Robert J. Peterman, Kyle A. Riding, John Wu: *Accuracy of High Resolution 3D Optical Scanning of Crosstie Geometry for Assessment of Cross-Sectional Parameters and Long-Term Abrasion and Wear*. 2017 Joint Rail Conference; 04/2017, DOI:10.1115/JRC2017-2296
14. Aref Shafiei, Kyle A. Riding, Robert J. Peterman, Chris Christensen, B. Terry Beck, Aaron A. Robertson, Chih-Hang John Wu: *Suitability and Variability of Non-Destructive Testing Methods for Concrete Railroad Tie Inspection*. 2016 Joint Rail Conference, Columbia, South Carolina, USA; 04/2016
15. Amir Farid Momeni, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu, Naga Narendra B. Bodapati: *Effect of Prestressing Wire Indentation Type on the Bond Performance and Flexural Capacity of Pretensioned Concrete Crossties Subjected to Cyclic Loading*. 2016 Joint Rail Conference; 04/2016
16. B. Terry Beck, Aaron A. Robertson, Robert J. Peterman, Chih-Hang John Wu: *Performance of a Continuously Traversing 2-Camera Non-Contact Optical Strain Sensor for In-Plant Assessment of Prestressed Concrete Railroad Crosstie Transfer Length*. 2016 Joint Rail Conference; 04/2016
17. Naga Narendra B. Bodapati, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu: *Comparison of Transfer Lengths in Pretensioned Concrete Railroad Ties Subjected to Different Magnitudes of Rail Loads*. 2016 Joint Rail Conference, Columbia, South Carolina, 04/2016
18. B. Terry Beck, Aaron A. Robertson, Naga Narendra B. Bodapati, Robert J. Peterman, Chih-Hang John Wu, Kyle A. Riding: *Utilization of High-Resolution 3D Optical Scanning of Crossties to Assess Cross-Sectional Parameters and the Effects of Long-Term Abrasion and Wear*. 2016 Joint Rail Conference; 04/2016
19. Mark D. Haynes, Chih-Hang John Wu, Matthew Arnold, Naga Narendra B. Bodapati, B. Terry Beck, Robert J. Peterman: *Bond Index Numbers of Prestressed Concrete Reinforcement Wires and Their Relationships to Transfer Lengths and Pull-Out Forces*. 2016 Joint Rail Conference; 04/2016
20. Amir Farid Momeni, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu, Naga Narendra B. Bodapati: *Effect of Concrete Release Strength on the Development Length and Flexural Capacity of Members Made With Different Prestressing Strands*. 2016 Joint Rail Conference; 04/2016
21. Yan Kuang, Songnian Zhao, David Ben-Arieh, Chih-Hang Wu, David Margolies, James Nechols: *Using System Dynamics to Analyze a Predator-Prey System*. Proceedings of the 23rd International Conference of Production Research, Manila, Philippines; 08/2015
22. Yan Kuang, David Ben-Arieh, Songnian Zhao, John Wu, David Margolies, James Nechols: *Validation and Comparison of Two Spotted Spider Mites System*. Proceedings of the ISERC 2015, Nashville, Tennessee; 05/2015
23. Songnian Zhao, John Wu, Yan Kuang, David Ben-Arieh: *Information Dissemination and Human behaviors in epidemics*. Proceedings of the ISERC 2015, Nashville, Tennessee; 05/2015
24. B Terry Beck, Robert J Peterman, Chih-Hang John Wu: *Experimental Investigation of the Influence of Surface Contaminants on the Transfer Length of Smooth and Indented Prestressing Reinforcements Used in the Manufacture of Concrete Railroad Ties*. 2015 Joint Rail Conference, San Jose, California, USA; 04/2015

25. B Terry Beck, Robert J Peterman, Chih-Hang John Wu: *In-Plant Testing of a New Multi-Camera Transfer Length Measurement System for Monitoring Quality Control of Railroad Crosstie Production*. 2015 Joint Rail Conference, San Jose, California, USA; 04/2015
26. B Terry Beck, Robert J Peterman, Chih-Hang John Wu: *Transfer Length Measurements in Pretensioned Concrete Railroad Ties Under Rail Loads*. 2015 Joint Rail Conference, San Jose, California, USA; 04/2015
27. Robert J Peterman, B Terry Beck, Chih-Hang John Wu: *Long-Term End-Slip Measurements and Corresponding Transfer Lengths in Pretensioned Concrete Railroad Ties Fabricated with 15 Different Reinforcements*. 2015 Joint Rail Conference, San Jose California, USA; 03/2015
28. Mark D. Haynes, John Wu, B Terry Beck, Robert J Peterman: *Modeling the Behavior of Pre-Stressed Concrete Railroad Ties*. 2015 Joint Rail Conference, San Jose, California, USA; 03/2015
29. Amir Farid, Robert J Peterman, B Terry Beck, Chih-Hang John Wu: *Effect of Prestressing Wire Indentation Type on the Development Length and Flexural Capacity of Pretensioned Concrete Crossties*. 2015 Joint Rail Conference, San Jose, California, USA; 03/2015
30. Amir Farid, Robert J Peterman, B Terry Beck, Chih-Hang John Wu: *Effect of Concrete Release Strength on the Development Length and Flexural Capacity of Members Made with Different Prestressing Wires Commonly Used in Pretensioned Concrete Railroad Ties*. 2015 Joint Rail Conference, San Jose, California, USA; 03/2015
31. Terry Beck, Weixin Zhao, Robert J Peterman, Chih-Hang John Wu, Joseph Holste: *EFFECT OF SURFACE-STRAIN SAMPLING INTERVAL ON THE RELIABILITY OF PRETENSIONED CONCRETE RAILROAD TIE TRANSFER LENGTH MEASUREMENTS*. 2014 PCI Convention and National Bridge Conference, Washington D.C.; 09/2014
32. Bodapati, Peterman, Zhao, Beck, Wu, Holste, Arnold, Benteman, Robert J Peterman, Weixin Zhao, B Terry Beck, Chih-Hang John Wu, Joseph R Holste, Matthew L Arnold, Ryan Benteman, Robert Schweiger: *Pci/Nbc Long-Term Transfer-Length Measurements on Pretensioned Concrete Rail Road Ties* Naga Narendra B. 2014 PCI Convention and National Bridge Conference, Washington D.C.; 09/2014
33. Holste, Beck Haynes, Joseph Holste, Robert Peterman, B Terry Beck, Chih-Hang John Wu: *Application of Tensioned Pullout Tests to Investigate The Effect of Prestressing Wire Indent Geometry on Bond and Splitting Characteristics*. 2014 PCI Convention and National Bridge Conference, Washington D.C.; 09/2014
34. Yan Kuang, John Wu, David Ben-Arieh, Songnian Zhao, David Margolies: *Mathematical Models for Two-spotted Spider Mites and Phytoseiulus Persimilis*. Proceedings of the 2014 Industrial and Systems Engineering Research Conference; 05/2014
35. Songnian Zhao, John Wu, David Ben-Arieh, Yan Kuang, David Margolies: *Analysis of Vector-borne Disease Model with Time Delay and Age-Structures*. Proceedings of the 2014 Industrial and Systems Engineering Research Conference, Montreal, Canada; 05/2014
36. Mark Haynes, Chih-Hang John Wu, B Terry Beck, Robert J Peterman: *An Investigation into Non-Linear Search Modifications for Minimizing Objective Function Computations*. 2014 Joint Rail Conference, Colorado Spring, Colorado; 04/2014
37. Mark Haynes, Chih-Hang John Wu, B Terry Beck, Robert J Peterman: *An Investigation into Non-Linear Search Modifications for Minimizing Objective Function Computations*. 2014 Industrial & Systems Engineering Research Conference (ISERC) Conference; 04/2014

38. Joseph R. Holste, Mark Haynes, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu: *Tensioned Pullout Test Used to Investigate Wire Splitting Propensity in Concrete Railroad Ties*. 2014 Joint Rail Conference; 04/2014
39. Weixin Zhao, B. Terry Beck, Robert J. Peterman, Chih-Hang John Wu, Naga Narendra B. Bodapati, Grace Lee: *Reliable Transfer Length Assessment for Real-Time Monitoring of Railroad Crosstie Production*. 2014 Joint Rail Conference; 04/2014
40. Naga Narendra B. Bodapati, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu: *Effect of Concrete Properties on Transfer Lengths in Concrete Rail-Road Ties*. 2014 Joint Rail Conference; 04/2014
41. Mark Haynes, Chih-Hang John Wu, Robert J. Peterman, B. Terry Beck: *Prestressing Steel Reinforcement Wire Measurement Protocol*. 2014 Joint Rail Conference; 04/2014
42. Zhenzhen Shi, John Wu, David Ben-Arieh: *A Modeling Comparative Study on Sepsis*. Proceedings of the Industrial and Systems Engineering Research Conference; 01/2014
43. Weixin Zhao, B. Terry Beck, Robert J. Peterman, Chih-Hang John Wu, Grace Lee, Naga Narendra B. Bodapati: *Determining Transfer Length in Pre-Tensioned Concrete Railroad Ties: Is a New Evaluation Method Needed?*. ASME 2013 Rail Transportation Division Fall Technical Conference; 10/2013
44. Joseph R. Holste, Robert J. Peterman, Naga Narendra B. Bodapati, B. Terry Beck, Chih-Hang John Wu: *Transfer Bond Test Used to Predict Transfer Length of Concrete Railroad Ties*. ASME 2013 Rail Transportation Division Fall Technical Conference; 10/2013
45. Bodapati, Peterman, Zhao, Beck, Wu, Holste, Arnold, Benteman, Naga Narendra, B Bodapati, Robert J Peterman, Weixin Zhao, B Terry Beck, Chih-Hang John Wu, Joseph R Holste, Matthew L Arnold: *Transfer-Length Measurements On Concrete Railroad Ties Fabricated with 15 Different Prestressing Reinforcements*. 2013 PCI Convention and National Bridge Conference, Grapevine, Texas; 09/2013
46. Chih-Hang Wu, Songnian Zhao, David Ben-Arieh: *Using Spatial Games to model Human Mobility and Spread of Epidemics*. 2013 IIE Annual Conference. Proceedings; 06/2013
47. Mark Haynes, Chih-Hang John Wu, B. Terry Beck, Robert J. Peterman: *Automated Real-Time Search and Analysis Algorithms for a Non-Contact 3D Profiling System*. SPIE Optical Metrology 2013; 05/2013
48. Mark Haynes, Chih-Hang John Wu, B Terry Beck, Robert J Peterman: *3D Non-Contact Profilometry for Reinforcement Steel Quality Control*. 2013 Industrial and Systems Engineering Research Conference, San Juan, Puerto Rico; 05/2013
49. Matthew L Arnold, Robert J Peterman, B Terry Beck, John Wu: *Development of a Standard Bond Test for Indented Prestressing Wires*. Proceedings of the 2013 Joint Rail Conference, Knoxville,TN; 05/2013
50. Mark Haynes, Chih-Hang John Wu, B. Terry Beck, Naga Narendra B. Bodapati, Robert J. Peterman: *Prestressing Steel Reinforcement Wire Bond Index Number*. 2013 Joint Rail Conference; 04/2013
51. Weixin Zhao, B. Terry Beck, Robert J. Peterman, Robert Murphy, Chih-Hang John Wu, Grace Lee: *A Direct Comparison of the Traditional Method and a New Approach in Determining 220 Transfer Lengths in Prestressed Concrete Railroad Ties*. 2013 Joint Rail Conference; 04/2013
52. John Wu, Weixin Zhao, Terry Beck, Robert J. Peterman: *Development of a 5-Camera Transfer Length Measurement System for Real-Time Monitoring of Railroad Crosstie Production*. doi:10.1115/JRC2013-2468, 2013 Joint Rail Conference, Knoxville, Tennessee, USA, April 15-18, 2013.



53. Naga Narendra B. Bodapati, Weixin Zhao, Robert J. Peterman, Chih-Hang John Wu, B. Terry Beck, Mark Haynes, Joseph R. Holste: *Influence of Indented Wire Geometry and Concrete Parameters on the Transfer Length in Prestressed Concrete Crossties*. 2013 Joint Rail Conference; 04/2013
54. Weixin Zhao, B Terry Beck, Robert J Peterman, Robert L Murphy, Chih-Hang John Wu, John Bloomfield: *An Automated Transfer Length Measurement System for Use On Concrete Railroad TieS*. 2012 PCI Convention and National Bridge Conference, Nashville, TN; 09/2012
55. John Wu, Chih-Hang Wu, Mark Haynes, Terry Beck, Robert Peterman: *Non-Contact Measurement of Wire Indent Profiles on Prestressing Reinforcement Steel*. 2012 AREMA Conference, Chicago, Illinois; 09/2012
56. Weixin Zhao, B. Terry Beck, Robert J. Peterman, Chih-Hang John Wu: *A Portable Modular Optical Sensor Capable of Measuring Complex Multi-Axis Strain Fields*. Proceedings of SPIE - The International Society for Optical Engineering 10/2012; 8466. DOI:10.1117/12.929931
57. John Wu, Gitae Kim: *Solving Support Vector Classification problem using Augmented Lagrangian method and Incomplete Cholesky Decomposition*. IERC conference 2010, Cancun, Mexico; 06/2010
58. Chih-Hang J. Wu, ZhenZhen Shi, David Ben-Arieh, Steven Q. Simpson, Douglas Peterson: *Agent-Based Model with Embedded System Dynamics: A Simulation Tool for Modeling Progression Of Acute Inflammatory Responses*. American Thoracic Society 2010 International Conference, May 14-19, 2010 • New Orleans; 05/2010
59. Weixin Zhao, John Wu, B. Terry Beck: *A Novel Optical Technique for Measuring 5-Axis Surface Movement*. Proceedings of SPIE - The International Society for Optical Engineering 12/2004; 5606. DOI:10.1117/12.571463
60. Jose Ventura, Xiaohua Wang, John Wu: *Lower bound for the single-machine completion time variance problem*. Proceedings of the 2nd Industrial Engineering Research Conference; Los Angeles, CA, USA, Los Angeles, CA, USA; 05/1993

## Technical Reports

Kyle Larson, Weixin Zhao, Robert Peterman, PE Terry Beck, John Wu: *Development of a Laser-speckle Imaging Device to Determine the Transfer Length in Pre-tensioned Concrete Members with SCC and Conventional Concrete*. Affiliation: Kansas Department of Transportation

## Scholar Presentations (Past 5 years):

1. "Using System Dynamics to Analyze a Predator-Prey System," Proceedings of the 23rd International Conference of Production Research 2015– Manila, Philippines, Aug 02 – 05, 2015.
2. "Information Dissemination and Human Behaviors in Epidemics", Proceedings of the ISERC 2015 – Nashville, Tennessee, May 30 – June 2, 2015
3. "Validation and Comparison of Two Spotted Spider Mites System", Proceedings of the ISERC 2015 – Nashville, Tennessee, May 30 – June 2.
4. "Mathematical Analysis for Tomato Spotted Wilt Virus Transmission", Informs 2015, Philadelphia, Nov 02.
5. "Study of Optimal Control Strategies for Visceral Leishmaniasis", Informs 2015, Philadelphia, Nov 03.
6. Naga N.B. Bodapati, Weixin Zhao, Robert J. Peterman, John C.-H. Wu, B. Terry Beck, Mark Haynes and Joseph R. Holste, "Effect of Concrete Properties On Transfer Lengths In Concrete Rail-Road Ties" Proceedings of the 2014 Joint Rail Conference, JRC2014-3859 April 2-4, 2014, Colorado Spring, Colorado, USA.
7. Robert J. Peterman, Naga Narendra B. Bodapati, B. Terry Beck, John C.-H. Wu, "Long-Term End-Slip Measurements and Corresponding Transfer lengths in Pretensioned concrete Railroad Ties fabricated



- with 15 Different Reinforcements,” Paper Number: JRC2015-5678, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
8. B. Terry Beck, Naga Narendra B. Bodapati, Robert J. Peterman, Amir Farid Momeni, Chih-Hang John Wu, “Transfer length Measurements in Pretensioned Concrete Railroad Ties Under Rail Loads,” Paper Number: JRC2015-5690, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  9. Mark Haynes, Chih-Hang John Wu, Naga Narendra B. Bodapati, B. Terry Beck, Robert J. Peterman, “Modeling the Behavior of Prestressed concrete Railroad Ties,” Paper Number: JRC2015-5703, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  10. Amir Farid Momeni, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu, Naga Narendra B. Bodapati, “Effect of Concrete Release Strength on the Development Length and Flexural capacity of Members Made with different Prestressing Wires Commonly Used in Pretensioned concrete Railroad Ties,” Paper Number: JRC2015-5736, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  11. Amir Farid Momeni, Robert J. Peterman, B. Terry Beck, Chih-Hang John Wu, Naga Narendra B. Bodapati, “Effect of Prestressing Wire Indentation Type on the Development Length and Flexural Capacity of Pretensioned Concrete Crossties,” Paper Number: JRC2015-5739, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  12. B. Terry Beck, Robert J. Peterman, John C.-H. Wu, Naga Narendra B. Bodapati, “In-Plant Testing of a New Multi-Camera Transfer length Measurement system for Monitoring Quality Control of Railroad Crosstie Production,” Paper Number: JRC2015-5749, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  13. B. Terry Beck, Robert J. Peterman, John C.-H. Wu, Steve Mattson, “Experimental Investigation of the Influence of Surface Contaminants on the Transfer Length of Smooth and Indented Prestressing Reinforcements Used in the Manufacture of Concrete Railroad Ties, Paper Number: JRC2015-5751, Proceedings of the 2015 Joint Rail Conference, San Jose, CA, March 23-26, 2015.
  14. Yan Kuang, David Ben-Arieh, Songnian Zhao, Chih-Hang Wu, David Margolies, and James Nechols, “Using System Dynamics to Analyze a Predator-Prey System,” Proceedings of the 23rd International Conference of Production Research 2015– Manila, Philippines, Aug 02 – 05, 2015.
  15. Songnian Zhao, Chih-Hang Wu, Yan Kuang, David Ben-Arieh,, “Information Dissemination and Human Behaviors in Epidemics”, Proceedings of the ISERC 2015 – Nashville, Tennessee, May 30 – June 2, 2015
  16. Yan Kuang, David Ben-Arieh, Songnian Zhao, Chih-Hang Wu, David Margolies, and James Nechols, “Validation and Comparison of Two Spotted Spider Mites System”, Proceedings of the ISERC 2015 – Nashville, Tennessee, May 30 – June 2.
  17. Zhenzhen Shi, Chih-Hang Wu, David Ben-Arieh, "Modeling Comparative Study on Sepsis, Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3..
  18. Naga N.B. Bodapati, Weixin Zhao, Robert J. Peterman , John C.-H. Wu, B. Terry Beck, Mark Haynes and Joseph R. Holste, "Effect of Concrete Properties On Transfer Lengths In Concrete Rail-Road Ties" Proceedings of the 2014 Joint Rail Conference, JRC2014-3859 April 2-4, 2014, Colorado Spring, Colorado, USA.
  19. Weixin Zhao, B. Terry Beck, Robert J. Peterman, John C.-H. Wu, Naga N.B. Bodapati, and Grace Lee, "Reliable Transfer Length Assessment For Real-Time Monitoring Of Railroad Cross-Tie Production," Proceedings of the 2014 Joint Rail Conference, JRC2014-3830 April 2-4, 2014, Colorado Spring, Colorado, USA.
  20. Mark Haynes, John C.-H. Wu, B. Terry Beck, Naga N.B. Bodapati, and Robert J. Peterman " Prestressing Steel Reinforcement Wire Measurement Protocol," Proceedings of the 2014 Joint Rail Conference, JRC2014-3800 April 2-4, 2014, Colorado Spring, Colorado, USA.
  21. Joseph R. Holste, Mark Haynes, Robert J. Peterman, B. Terry Beck, John C.-H. Wu, "Tensioned Pullout Test used to Investigate Wire Splitting Propensity in Concrete Railroad Ties," Proceedings of the 2014 Joint Rail Conference, JRC2014-3799 April 2-4, 2014, Colorado Spring, Colorado, USA.
  22. Mark Haynes, John C.-H. Wu, B. Terry Beck, Naga N.B. Bodapati, and Robert J. Peterman "An Investigation into Non-Linear Search Modifications for Minimizing Objective Function Computations," Proceedings of the 2014 Industrial & Systems Engineering Research Conference (ISERC) Conference, ISERC2014-I393 May 31-June 3 2014, Montréal, Canada.

23. B. Terry Beck, Weixin Zhao, John C.-H. Wu, Robert J. Peterman, "Development of an Automated Transfer Length Measurement System for Quality Control of Railroad Cross-Tie Production," Presented at the 2014 International Crosstie & Fastening System Symposium, Univ of Illinois at Urbana-Champaign, Urbana, IL, 3-5 June 2014.
24. B. Terry Beck, Weixin Zhao, Robert J. Peterman, John C.-H. Wu, Joseph R. Holste, Naga N.B. Bodapati, and Grace Lee, "Effect of Surface-Strain Sampling Interval on the Reliability of Pretensioned Concrete Railroad Tie Transfer Length Measurements," Proceedings of the 2014 PCI Convention and National Bridge Conference, September 6-9, 2014, Washington DC, USA.
25. Naga N.B. Bodapati, Robert J. Peterman, Weixin Zhao, B. Terry Beck, John C.-H. Wu, Joseph R. Holste, Matthew L. Arnold, Ryan Benteman, Robert Schweiger, "Long-Term Transfer Length Measurements of Pretensioned Concrete Railroad Ties," Proceedings of the 2014 PCI Convention and National Bridge Conference, September 6-9, 2014, Washington DC, USA.
26. Songnian Zhao, Chih-Hang (John) Wu, David Ben-Arieh, Yan Kuang, David Margolies, and James Nechols, "Analysis of Vector-borne Disease Model with Time Delay and Age Structures", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
27. David Ben-Arieh, Chih-Hang Wu, Adrew Waldman, Livi Delissa, Johnathan Weiss, "Optimizing Surgery Schedule with PICU Nursing Constraints," Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
28. Yan Kuang, Chih-Hang(John) Wu, David Ben-Arieh, Songnian Zhao, David Margolies, and James Nechols, "Mathematical Models for Two-spotted Spider Mites and Phytoseiulus Persimilis", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
29. Zhenzhen Shi, Chih-Hang Wu, David Ben-Arieh, "Modeling Comparative Study on Sepsis, Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3..
30. "New mathematical models for vector-borne disease: transmission of tomato spotted wilt virus", The 4<sup>th</sup> International conference on Healthcare Systems Ergonomics and Patient Safety (HEPS) 2014, TU-PA1, June 23-26, 2014, Taipei, Taiwan.
31. "Impacts of Human Behaviors in an Epidemic Model Based on Spatial Game," INFORMS Annual Conference 2014, WD51, Nov. 9-12, 2014, San Francisco, California.
32. "Comparison and Validation for Twospotted Spider Mites System," INFORMS Annual Conference 2014, WD75, Nov. 9-12, 2014, San Francisco, California.
33. "Analysis of Vector-borne Disease Model with Time Delay and Age Structures", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
34. "Mathematical Models for Two-spotted Spider Mites and Phytoseiulus Persimilis", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3. Kansas Hospital Association, "Healthcare System Center at Kansas State University", Nov. 13-15, 2013, Wichita, KS.
35. In addition, there were professional presentation on each of the Proceedings listed in publication section Items (5) – (16).
36. "Mathematical Model and Agent-based Model: A Comparison Study on the Performance of Sepsis", INFORMS Annual Conference 2013, WB60, Oct. 6-9, 2013, Minneapolis, Minnesota.
37. "A Stochastic Model for Epidemics Using Spatial Games," INFORMS Annual Conference 2013, WB60, Oct. 6-9, 2013, Minneapolis, Minnesota.
38. Kansas Hospital Association, "Healthcare System Center at Kansas State University", Nov. 13-15, 2013, Wichita, KS. Mark Haynes, John C.-H. Wu, B. Terry Beck, Naga N.B. Bodapati, and Robert J. Peterman " Prestressing Steel Reinforcement Wire Bond Index Number" Proceedings of the 2013 Joint Rail Conference, JRC2013-2422 April 15-18, 2013, Knoxville, Tennessee, USA. DOI: 10.1115/JRC2013-2422.
39. Matthew L. Arnold, Robert J. Peterman, Naga N.B. Bodapati, B. Terry Beck and John C.-H. Wu "Development of A Standard Bond Test For Indented Prestressing Wires " Proceedings of the 2013 Joint Rail Conference, JRC2013-2461 April 15-18, 2013, Knoxville, Tennessee, USA. doi: 10.1115/JRC2013-2461
40. Naga N.B. Bodapati, Weixin Zhao, Robert J. Peterman, John C.-H. Wu, B. Terry Beck, Mark Haynes and Joseph R. Holste, "Influence Of Indented Wire Geometry And Concrete Parameters On The Transfer Length In Prestressed Concrete Crossties " Proceedings of the 2013 Joint Rail Conference, JRC2013-2463 April 15-18, 2013, Knoxville, Tennessee, USA. doi: 10.1115/JRC2013-2463.

41. Weixin Zhao, B. Terry Beck, Robert J. Peterman, and John C.-H. Wu, "Development Of A 5-Camera Transfer Length Measurement System For Real-Time Monitoring Of Railroad Crosstie Production " Proceedings of the 2013 Joint Rail Conference, JRC2013-2468 April 15-18, 2013, Knoxville, Tennessee, USA. doi: 10.1115/JRC2013-2468.
42. Weixin Zhao, B. Terry Beck, Robert J. Peterman, Robert Murphy, John C.-H. Wu, and Grace Lee, "A Direct Comparison Of The Traditional Method And A New Approach In Determining 220 Transfer Lengths In Prestressed Concrete Railroad Ties" Proceedings of the 2013 Joint Rail Conference, JRC2013-2469 April 15-18, 2013, Knoxville, Tennessee, USA. doi: 10.1115/JRC2013-2469.
43. Mark Haynes, John C.-H. Wu, B. Terry Beck, Naga N.B. Bodapati, and Robert J. Peterman "Automated Real-Time Search and Analysis Algorithms for a Non-Contact 3D Profiling System " Proceedings of the 2013 SPIE Optical Metrology, May 13-16, 2013, Munich, Germany.
44. Weixin Zhao, B. Terry Beck, Robert J. Peterman, John C.-H. Wu, Grace Lee, and Naga N.B. Bodapati, " Determining Transfer Length In Pre-Tensioned Concrete Railroad Ties: Is Anew Evaluation Method Needed?" Proceedings of the 2013 ASME Rail Transportation Division Fall Technical Conference, RTDF2013-4727 October 15-17, 2013, Altoona, Pennsylvania, USA.
45. Joseph R. Holste, Robert J. Peterman, Naga, N.B. Bodapati, B.Terry Beck, and C.-H. John Wu, "Transfer Bond Test User to Predict Transfer Length of Concrete Railroad Ties" Proceedings of the 2013 ASME Rail Transportation Division Fall Technical Conference, RTDF2013-4726 October 15-17, 2013, Altoona, Pennsylvania, USA.
46. Naga Bodapati, R.J. Peterman, W. Zhao, T. Beck, C.-H. Wu, J. Holste, M. Arnold, R. Benteman, R. Schweiger, "Transfer-Length Measurements On Concrete Railroad Ties Fabricated With 15 Different Prestressing Reinforcements" 2013 PCI Convention and National Bridge Conference, Sept. 21 – 24 , Gaylord Texan Resort in Grapevine, Texas.
47. Mark Haynes, Chih-Hang John Wu, B. Terry Beck, and Robert J. Peterman, "3D Non-Contact Profilometry for Reinforcement Steel Quality Control", Proceedings of the 2013 Industrial and Systems Engineering Research Conference, May18-22, 2013, San Juan, Puerto Rico.
48. Zhao W., Murphy, R.L., Peterman, R. J., Beck, T., Wu, C.-H. Wu, Duong, P. A Non-Contact Inspection Method to Determine the Transfer Length in Pre-tensioned Concrete Railroad Ties, ASCE, Journal of Engineering Mechanics, Special Issue, "Experimental Methods in Damage Detection and Wind Engineering." doi: 10.1061/(ASCE)EM.1943-7889.0000449 ([http://dx.doi.org/10.1061/\(ASCE\)EM.1943-7889.0000449](http://dx.doi.org/10.1061/(ASCE)EM.1943-7889.0000449)).
49. Kim, G. and Wu, C. (2012). Scenario aggregation for Supply Chain Quantity-Flexibility Contract, International Journal of Systems Science, 43(1) 1-17 online publication same time. doi: 10.1080/00207721.2012.702237 (<http://www.tandfonline.com/doi/pdf/10.1080/00207721.2012.702237>)
50. Kim, G., Wu, C., Lim, S., & Kim, J. (2012). Modified matrix splitting method for the support vector machine and its application to the credit classification of companies in Korea. Expert Systems with Applications, 39(10), 8824-8834.
51. Zhao,W., Beck, T., Peterman, R.J., Wu, C.-H. (2012) A Portable Modular Optical Sensor Capable of Measuring Complex Multi-Axis Strain Fields, SPIE – Optics & Photonics, 2012, San Diego, CA.
52. Haynes,M., Wu, C.-H., Beck, T., Peterman, R.J., (2012) Non-Contact Measurement of Wire Indent Profiles on Prestressed Reinforcement Steel, AREMA 2012 Annual Conference and Exposition. Sept. 16-19, 2012 Chicago, IL.
53. Zhao, W., Beck, T., Peterman, R.J., Wu, C.H., Murphy, R.L., Bloomfield, J., Lee, G. An Automated Transfer Length Measurement System for use on Concrete Railroad Ties, The 2012 PCI Convention and National Bridge Conference, September 29 - October 3, 2012.
54. "Modeling and Simulation of Sepsis: Explore the Therapeutic Agents in Intensive Care Unit", INFORMS Conference 2011, Phoenix, Arizona., Oct. 2012.
55. "A Stochastic Model for Epidemics Using Spatial Games", INFORMS Conference 2011, Phoenix, Arizona., Oct. 2012.
56. American Association of Telemedicine, "Human Factors: Streamlining Telehealth Processes for Success. *Human Factors and Technology Implications*", Human Factors Special Interest Group, April 29-May 1 2012, San Jose, CA.
57. Non-Contact Measurement of Wire Indent Profiles on Prestressed Reinforcement Steel, AREMA 2012 Annual Conference and Exposition. Sept. 16-19, 2012 Chicago, IL.

58. Kansas Hospital Association, "Healthcare System Center at Kansas State University", Nov. 1, 2012, Wichita, KS.
59. An Automated Transfer Length Measurement System for use on Concrete Railroad Ties, The 2012 PCI Convention and National Bridge Conference, September 29 - October 3, 2012.
60. "Dealing with Supplier Selections Issues in the Supply Chain Environment", IERC conference 2011, Reno, Nevada, May 2011.
61. American Association of Telemedicine, "Human Factors: Streamlining Telehealth Processes for Success. *Human Factors and Technology Implications*", Human Factors Special Interest Group, May 1 2011, Tampa, FL.
62. Kansas Hospital Association, "Healthcare System Center at Kansas State University", Nov. 1, 2011, Wichita, KS.
63. "Supplier Selection using Semi-supervised learning theory ", 2009 DSI annual conference, San Diego , CA, November 2010.
64. "Solving SVM Classification Problem using Gradient Projection and Incomplete Cholesky Decomposition ", 2010 INFORMS Annual Meeting, Austin, TX, October 2010.
65. "A Simulation Study on Patient Flow Improvement Modes ", 2010 SHS Annual Meeting, Atlanta, GA, February 2010.
66. "A Predictive Agent-based Model of Acute Inflammatory Response", 2010 SHS Annual Meeting, Atlanta, GA, February 2010.
67. " Solving Support Vector Classification problem using Augmented Lagrangian method and Incomplete Cholesky Decomposition ", IERC conference 2010, Cancún, Mexico., June 2010.
68. "Modeling and Analysis of Acute Inflammatory Response", IERC conference 2010, Cancún, Mexico., June 2010.
69. "A predictive tool for H1N1s progression in the tissue level", IERC conference 2010 Poster Presentation, Cancún, Mexico., June 2010.
70. "DEA Analysis of Kansas Clinics with Sparse Data", IERC conference 2010, Cancún, Mexico., June 2010.
71. American Association of Telemedicine, "Setting the Record Straight: Human Factors and Electronic Health Records. *Human Factors and Technology Implications*", Human Factors Special Interest Group, April 5 2010, Seattle, WA.
72. Kansas Hospital Association, "Healthcare System Center at Kansas State University", Nov. 1, 2009, Wichita, KS.

## Graduate Students Supervised:

Post-Doctoral Researcher:

Weixin Zhao (2011 -- 2014)

### Chair or Co-Chair of Ph.D. Committee

1. Manoj Chopra (PhD IE, Graduated 1998) Vice President - Strategic Pricing Essilor, Dallas, TX
2. Amarnath Poola (PhD IE, Graduated 1999) Chairman at PRA Educational Foundation, India
3. Umash Arasu (PhD IE, Graduated 2000) Vice President of R&D at o9 Solutions, Dallas, TX
4. Girish Nahate (PhD IE, Graduated 2006) Senior Strategic Marketing Analyst at FedEx Services, Memphis, TN.
5. Gitae Kim (PhD IE, Graduated 2012) Assistant Professor at Hanbat National University, Korea
6. Weixin Zhao (PhD MNE, Graduated 2011)
7. Mark Haynes (PhD IE, Graduated 2015) Dimensioning & Tolerancing Engineer III at Spirit AeroSystems, Wichita, KS.
8. Zhenzhen Shi (PhD IE, Graduated 2015) Post-Doc at Rollins School of Public Health, Emory University, Atlanta, GA
9. Songnian Zhao (PhD IE, Passed Prelim, Graduated 2016) Senior Strategic Marketing Analyst at FedEx Services, Memphis, TN.

10. Yan Kuang (PhD IE, Passed Prelim, Graduated 2016) Senior Strategic Marketing Analyst at FedEx Services, Memphis, TN.
11. Aaron Robertson (PhD MNE, Graduating Summer 2020)
12. Kaiming Bi (PhD IE, Graduating Spring 2020)
13. YuYang Chen (PhD IE, Graduating Spring 2021)

**Master of Science** (More than 100 graduated only list selected below)

1. Richard Weihe Zhu (MSIE 1995) President at Apollo Future Technology, Livermore, CA
2. Jeevan Mulgund (MSIE, 1996) Sr. Director Integrated Supply Chain Transformation at Honeywell
3. Bo Li (MSIE, 1998) Principal Software Engineer at Arris, San Francisco Bay Area
4. Ye Haiwei (MSIE 1998) Technical Architect at AT&T, St. Louis, MO
5. Toby Marks (MSIE, 1999) Portfolio Reserach Consultant at American Century Investments
6. Madhavan Ramanujam (MSIE, 1999) Partner and Board Member at Simon-Kucher & Partners
7. Rhishi Pethe (MSIE, 1999) Head of Climate FieldView Platform, The Climate Corporation, San Francisco Bay Area, CA
8. Bhavesh Shah (MSIE, 2003) Vice President at Bank of America - Data Management (Data Warehousing, Business Intelligence and Analytics), Dallas, TX
9. Anup Aravind (IMSIE, 2003) Business Intelligence Applications Manager, PWC, Baltimore, Maryland
10. Sanket Sanghavi (MSIE, 2006) Sr. Principal Operations Research Consultant at Manhattan Associates
11. Sara DeHaven (MSIE, 2007) Senior Manager at Accenture, Kansas City, MO
12. Mark Neier (MSOR, 2009) Manager at Deloitte
13. Brad Fouse (MSOR, 2009) Director of Chassis – Intermodal Rail Operation at JB Hunt, Fayetteville, AK
14. Balaji Lolla (MSIE, 2011) Senior Analyst, Data Science at Petco
15. Anand Ramani (MSIE, 2011) Sr Product Manager at Amazon
16. Robert Richards (MSIE, 2012) Performance Improvement Consultant at Children's Mercy Hospital, Overland Park, KS
17. Jordan Bever (MSOR, 2013) Strategy and Operations Consultant at Deloitte
18. Christopher Maldonado-Martinez (MSIE, 2014) Manager at Grant Thornton LLP, Deltona, FL
19. Adam Robl (MSOR, 2015) Senior Supply Chain Optimization Manager at Walmart

**Services & Professional Involvements:**

- IT manager for IMSE Department, College of Engineering, 1995 – 2013.
- IT manager for IMSE Department, College of Engineering, 2015 – present.
- IT manager for Advanced Manufacturing Institute, 2015 – present.
- Co-Director of Non-Contact Precision Measurement (NCPM) Lab, Kansas State University 1996 -- present
- Co-Director of University Healthcare Operation Resource (HCOR) Center, Kansas State University, 2009 – present

**Reviewer Services:**

- IISE Transaction
- Operations Research
- Journal of Mathematical Biology



- Mathematical Program Series B
- Transportation Science
- Entropy
- International Journal of Modelling and Simulation
- Journal of Engineering Mechanics
- Precision Engineering
- International Journal of Artificial Life Research
- European Journal of Operations Research
- Journal of Manufacturing Systems
- SIAM Journal on Optimization Journal of Healthcare Engineering
- Journal of Computation
- Mathematical Biosciences and Engineering
- Structures
- Asian Journal of Research in Infectious Diseases
- IEEE Transactions on Computational Social Systems
- Journal: Journal of Epidemiology and Global Health
- Journal of Advances in Mathematics and Computer Science
- Annals of Clinical and Medical Microbiology
- Journal of Scientific Research and Reports
- Journal of Geography, Environment and Earth Science International
- Research and Reviews of Infectious Diseases
- Revista Brasileira de Farmacognosia
- International Journal of Industrial Engineering: Theory, Applications and Practice
- Archives of Current Research International
- African Journal of Mathematics and Computer Science Research
- American Journal of Operations Research

## Skills & Activities

**Skills** Production Engineering, Logistics, Production Planning, Production, Prestressed Concrete, Concrete, Classification, Optical Sensors, Support Vector Machine, Measurement, Algorithms, Innate Immunity, Adaptive Immunity, Cellular Immunology, Sepsis, Anti-Inflammatory, Segmentation, Inflammation, Macrophage, Immunology of Infectious Diseases, Cytokine Biology, Geometric Dimensioning & Tolerancing, Reinforced Concrete, Strain Analysis, Infectious Diseases, Evolutionary Game Theory, Bifurcation Analysis, Linear Stability Analysis, Simulation Modeling, Agent-Based Simulation, Modeling, Compressive Strength, Supply Chain, Rails, Optimization, Nonlinear Optimization, Simulators, Modeling and Simulation, Sensor Development, Industrial Engineering, Concrete Technologies, Laser Diagnostics in Flows and Combustion, Inflammatory Biomarkers, Financial

Risk Management, Financial Engineering, Papers, Mathematical Models, Images, Image Processing, Septic Shock

*Scientific  
Memberships*

- The Institute for Operations Research and the Management Sciences (INFORMS),
- IEEE Computers Society,
- Institute of Industrial and System Engineers (IISE),
- Mathematical Programming,
- Society of Industrial and Applied Mathematics (SIAM),
- Society of Healthcare Systems (SHS),
- American Telemedicine Association (ATA)

**Professional Society Services:**

- Conference Session Chairs for INFORMS, ISERC, SIAM on Optimization, ATA, Society of Health Systems.
- Workshops for ATA Annual Conferences for 3 years on Process Improvements, Lean and Six Sigma, Ergonomics.
- Workshop for Kansas Hospital Association.
- Participate in Tradeshow for Annual Conferences for Kansas Hospital Association to promote the HCOR center and Kansas State University efforts on out reaching,
- Various training workshops for hospitals and healthcare professionals around Kansas.
- Panel Review for NSF, US DOT, NIH proposals
- Advise 30 undergraduate students every semester
- Advise average 10 graduate students every year for the past 23 years
- Departmental committee: Equipment, Ice Professorship Search, Faculty Search, Undergraduate Curriculum
- College committee: Diversity Committee, Honor and Award committee, University Honors Program committee
- University committee: Information Resource Management Council

## Service Efforts to the University HealthCare Operation Resource (HCOR) Center

### Health-Care Resource Center Activities at the IMSE department

#### ❖ **Information Systems:**

- Develop an interface between the Emergency Department (ED) and an existing Electronic Medical Record (EMR) at a medium size hub hospital. This project developed a web based EMR that linked the ED with the existing system, adding a patient safety monitoring system implemented at a 75-bed rural hospital.

#### ❖ **Facility Planning:**

- Provide layout design and analysis for a Critical Access Hospital. In this project we designed a new layout for a small hospital that needed to expand and develop an educational facility. We proposed three alternative designs that the hospital will consider for implementation and for future expansion.

#### ❖ **Workflow Improvement / Facility Planning:**

- Layout design and process improvement in a pharmacy at a military hospital.

#### ❖ **Workflow Improvement :**

- Process improvement in a medical screening facility. This project developed an improved schedule and process that increases the flow of patients at the medical screening facility.
- In this project we improved the patient flow between the ED, the ICU units and in-patient departments at a large urban medical center. The project resulted in a better design of the Emergency Department with an improved process.
- Analyze and plan the ED Physicians workload. This project analyzes the work load on the ED physicians, the “interruption” schedule as well as the time spent at the various activity centers, and distance travelled. Issues such as communication with nurses, imaging and labs are also analyzed and an improved process and layout is proposed.

#### ❖ **Project Management / Information Systems.**

- Project sorting and prioritizing in a large IT department in an urban hospital system. In this project we developed an information system as well as algorithms that analyze the projects relative importance and resource requirements and present the decision makers

with a prioritized list of projects. The system is very flexible allowing modifying the criteria as well as their weights for sorting the projects.

❖ **Staff Scheduling:**

- Scheduling surgeries in a for-profit ambulatory surgery facility. In this project we reduced the variability of the surgeries and developed an improved schedule in order to reduce the patients waiting time and surgery delays.

❖ **Workflow Improvement / Information System:**

- Process improvement at a Pre-Admission office. Two hospitals needed to improve the surgery scheduling as well as diagnostics and pre-surgery testing operation. We developed improved processes at both hospitals with an accompanying information system that improves the communication between the clinics and the office as well as among the various functions in the office.

❖ **Logistics / Optimization**

- Optimized inventory ordering procedure for medical supplies. In this project we defined the optimal ordering size as well as safety stock for a perishable medical item such as oxygen tanks. The project developed an optimal solution and a software tool to be used by the hospital that helped decide when and how many items to order in an effort to reduce cost.

❖ **Improved Bed Management.**

- This project looks at the process of releasing and acquiring inpatient beds. The project develops a standardized and improved process that utilizes the software available at the hospital.

**Grants Generated (Total \$777,067)**

**Spring 2008:**

1. \$1,000 for Layout project at Ellsworth Critical Access Hospital.
2. \$2,500 for IT Project Management system for Alegent Health.
3. \$2,500 for Process Improvement at the Pre-Admission in Immanuel Hospital.
4. \$3,000 for Process Improvement at the Pre-Admission in Hays Medical Center.

Total for Spring 2008: \$9000

**Fall 2008:**

1. \$5,000 Improves logistics operations for Associated Purchasing Systems.
2. \$9,500 Improved patient flow in KU Medical Center.
3. \$3,000 Improved Pre-Admission process at Hays Medical System – tools installation.

**Spring 2009:**

1. Measuring and analyzing efficiency of safety net clinics, Center for Engagement and Community Development, \$18,500

**Fall 2009:**

1. \$5,000 Improves logistics operations for Associated Purchasing Systems.
2. \$60,000, Engineering Flow Model, VA Medical Center K.C, (for 12 months).

**Spring 2010:**

1. \$23,680 Improved Deployment of the Tele-Tracking BedBoard Monitoring System, Children Mercy Hospital, KC.

**Fall 2010:**

1. \$5,000; Process Improvement workshop at the Mercy Regional Health Center, Manhattan.

**Spring 2011:**

1. \$5,000; Process Improvement workshop at the Neosho Regional Medical Center Chanute, KS.
2. \$30,000, Engineering Flow Model, VA Medical Center K.C, (for 6 months).

**Fall 2011 – Spring 2012**

- Children Mercy Hospital K.C. – improving Pediatrics Clinic operations (Broadway clinic location - continuation). Budget \$26,820.
- Hays Medical Center- improving Surgical and Medical Inpatient wards continuation). (budget \$18,803)
- U.S. Department of Veterans Affairs: Operating Room IT Evaluation (Rys, M. PI, Ben-Arieh D., Co-PI), \$63,882, 10/01/2011 – 11/1/2012.
- U.S. Department of Veterans Affairs: Measuring Impact of Field Based Analytics Education (Chang, S., Douglas-Mankin K., and Ben-Arieh D.), \$62,282, 11/01/2011 – 07/31/2012.
- U.S. Department of Veterans Affairs: Readiness for Reliability in Sterile Processing Department, (Chang, S., Douglas-Mankin K., and Ben-Arieh D.), \$61,698, 11/01/2011 – 07/12/2012.
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**Spring 2013**

- Mercy Regional Manhattan: Streamlining supplies flow to the ED, Sept. 2012 – to May 2013, \$7,477.
- Creating Distance Learning Lean Training Exercises, \$65,398 (Co-PI with Dr. Chang, and Dr. Douglas-Mankin as PI), 9/12/2012 to 6/30/2013 US Department of Veterans Affairs (VERC)



- Children Mercy Hospital “Predictive Scheduling Mode” Jan 2013 to Dec. 2013, for \$46,472. Project dealing with scheduling OR and PICU to minimize cancelled surgeries.
- Via Christi, “modeling core processes at mercy regional Manhattan” Jan 2013 to Dec. 2013, \$96,017.

### **Fall 2013**

- VERC and New Mexico VA, “telemental health appointment optimization, \$57,307 from Sept. 2013 to June 2014, Ben-Arieh D. PI.
- VERC and VA system, “Enhancing our virtual learning environment, \$68,577, Sept. 2013 to June 2014, Chang S., Rys, M, and Ben-Arieh D.

Total generated in 2013: \$ 268,373.

### **Fall 2014:**

- ED process improvement, Via Christie
- Medical Building layout and support, Via Christie

Workshops and Seminar Hosted by the Center:

1. March 5, 2008: Chris Tilden, Director, Office of Local and Rural Health, KDHE. This organization provides leadership and coordination to the many Critical Access Hospitals in Kansas, as well as rural clinics and mid-size hospitals.
2. April 16, 2008: Frank Dexter, MD, Ph.D., Director, Division of Management Consulting, Departments of Anesthesia and Health Management & Policy, Univ. of Iowa. Dr. Dexter, an expert on operating room scheduling, gave a seminar titled “IE in Healthcare: Lessons from Studies of Reducing Setup and Cleanup Times in Operating Rooms”.
3. May 8, 2008: Larry Pitman, president and CEO of Kansas Foundation for Medical Care (KFMC). This organization carries the responsibility to develop quality standards, and certify providers based on CMS (Center for Medicare and Medicaid Services) requirements. KFMC is a central organization in Kansas closely collaborating with the Kansas Health Policy Authority.
4. Scott Chapman, CEO of Manhattan Surgical Center “a For Profit Healthcare Entity”
5. Dr. Cox, Medical Director, Hays Medical Center "Past, Present and Future of Tele-Health."
6. Bob Meling, CEO of Associate Purchasing Services, "IE Experiences in Healthcare."
7. Connie Satzler CEO of EnVisage LLP, "Career in Non-Profit Healthcare Industry."
8. Dr. Steven Simpson, MD. KU Med University Hospital, "Sepsis Management in ICU (Mini-Curriculum)."
9. Douglas Peterson, ICU Manager of KU Med University Hospital, "Rapid Response Team Impacts on Saving Lives" (Mini-Curriculum).
10. Dr. Zilla Sinuany-Stern, “Hospitals’ Efficiency by Size and Type of Ownership”, Oct. 3, 2008.

### **Presentations and Displays**

1. Ben-Arieh D., and Wu, J., Kansas Hospital Association Conference, October 2007, Wichita, KS.
2. Ben-Arieh D., and Wu, J., Society of Health Systems, “Improved Scheduling in a For-Profit Surgical Center” Feb, 22, 2008, Orlando, FL.

3. Ben-Arieh D., and Wu, J., American Association of Telemedicine, "Incorporating IE concepts into Telemedicine", Human Factors Special Interest Group, April 5 2008, Seattle, WA.
4. Ben-Arieh D., and Wu, J., State Network Council Meeting, "The health systems resource center: potential contributions", July 29 2008, Wichita, KS.
5. Ben-Arieh D., and Wu, J., Kansas Hospital Association Conference, November 2008, Kansas City, KS.
6. Ben-Arieh D., and Wu, J., Society of Health Systems, moderating the "Patient Flow" tracks, April 1-4, 2009, Chicago, IL.
7. Ben-Arieh D., and Wu, J., "Incorporating IE concepts into Telemedicine", Human Factors Special Interest Group, American Telemedicine Association Conference, April 26-28 2009, Las Vegas, NV.
8. Ben-Arieh D., and Wu, J., Kansas Hospital Association Conference, Nov. 13 -14, 2009, Wichita, KS.
9. Ben-Arieh D., and Wu, J., Society of Health Systems Conference, "Simulation Study of Patient Flow Improvement Models", Atlanta, GA,. Feb. 25-28, 2010.
10. Ben-Arieh D. and Wu, J., Lean Operations in Hospitals, Workshop held in Kansas State University, April 30, 2010.
11. Ben-Arieh D., and Wu, J., invited short course: Setting the Record Straight: Human Factors and Electronic Health Records (EHRs), American Telemedicine Association, 15th Annual Meeting, San Antonio, TX, May 16, 2010.
12. Ben-Arieh D., and Wu, J., American Thoracic Society: Poster presentation, New Orleans, May 19, 2010.
13. Ben-Arieh, D., Wu, J. and Gullipalli D-K, DEA analysis of Kansas clinics with sparse data, Industrial Engineering Research Conference, June 5-9, 2010, Cancun, Mexico.
14. Ben-Arieh, D., Wu, J. and Shi Z., Modeling and Analysis of Acute Inflammatory Response, Industrial Engineering Research Conference, June 5-9, 2010, Cancun, Mexico.
15. Ben-Arieh, D., Wu, J. and Shi Z., A predictive tool for H1N1s progression in the tissue level, Industrial Engineering Research Conference Poster presentation, June 5-9, 2010, Cancun, Mexico.
16. Ben-Arieh, D., Wu, J., Introduction to Lean Operations, ASHE Region 8 Fall Convention, Overland Park, Kansas, Oct. 8, 2010.
17. Ben-Arieh D. and Wu, J., Process Improvement Workshop for Leadership Circle, Dec. 8, 2010. Invited by Mercy Regional Medical Center, Manhattan, KS.
18. Ben-Arieh D., and Wu, J., Society of Health Systems Conference, "Managing the Load on Emergency Room Physicians", Orlando, FL,. Feb. 17-19, 2011.
19. Wu, J., Ben-Arieh D., and Zhezhen Shi, "Modeling the Evolution of Sepsis using Agent Based Approach", invited presentations, University of Kansas Medical Center, March 1, 2011.
20. ATA conference, short course "Human Factors: Evaluating Business Performance and Streamlining Telehealth Processes for Success", Tampa FL, May 1-3, 2011.
21. Ben-Arieh, D., and Gullipalli D., Data Envelopment Analysis of Clinics with Sparse Data: Fuzzy Clustering Approach, Industrial Engineering Research Conference, May 21-25, 2011, Reno, NV.
22. Ben-Arieh, D., Wu, J., Human Factors: Streamlining Telehealth Processes for Success, American Telemedicine Association Convention, Tampa FL, May 1-3, 2011 (with Sossong S., and Boissy P.)
23. Shi, Z., Wu, J., Ben-Arieh, D., "Modeling and Simulation of Sepsis: explore the therapeutic agents in intensive care unit", INFORMS, Phoenix AZ, Oct. 14 - 17, 2012.

24. Shi, Z., Wu, J., Ben-Arieh, D., "Acute inflammatory response and perturbation analysis of pro-inflammatory and anti-inflammatory cytokines", IERC, Orlando, FL, May 19, 2012, IIE Doctoral Colloquium, Poster Presentation.
25. Webinar The Role of Human Factors in Telemedicine – Presented the Chapter on Standards and Metrics – Feb. 29, 2012, Organized by the ATA.
26. Ben-Arieh, D., Human Factors in Telehealth: An Introduction, American Telemedicine Association Convention, San Jose, CA, April 29 – May 1, 2012 (with Boissy P., and Charnes N.).
27. Ben-Arieh, D., Modeling and Analysis of Telemedicine Processes: Plan for Success, American Telemedicine Association Convention, San Jose, CA, April 29 – May 3, 2012.
28. Ben-Arieh D., and Wu, J., Kansas Hospital Association Conference, November 14-15 2013, Wichita, KS.
29. Ben-Arieh D., and Leistner G., Understanding and Modeling Telemedicine Business Processes, half-day course, ATA Convention, May 4-7, 2013 Austin. TX.
30. Ben-Arieh, D., and Wu C-H, Organizational Culture and Strategic Process Improvement, Poster, SHS conference Feb. 28 - March 3, 2013, New Orleans.
31. Ben-Arieh D. and Wu C-H, Minimizing nurses walking distance using zoning, ICPR 22, Iguassu Fall, Brazil, July 28 – August 1, 2013.
32. Wu C-H, Zhao S., and Ben-Arieh D., Using Spatial Games to model Human Mobility and Spread of Epidemics, ISERC, San Juan, Puerto Rico, May 18 -22, 2013.
33. Shi Z., Wu C-H, Ben-Arieh D., Zhao S., Chapes S., and Simpson S., Mathematical model and agent-based model: a comparative study on the performance of sepsis, *Informatics* 2013, Minneapolis, MN, Oct. 6 - 9, 2013.
34. Zhao S., Ben-Arieh D., and Wu Chih-Hang, Impacts of Information Transmission and Human behaviors in Epidemics: A Spatial Game Model, annual INFORMS conference, Oct. 6 - Oct. 9, 2013, Minneapolis, MN:
35. Chih-Hang Wu, Zhenzhen Shi, David Ben-Arieh, Stephen Q. Simpson, Mathematical modeling of innate immunity of sepsis progression: a modeling and simulation study, Book Chapter of *Healthcare Data Analytics*, John Wiley & Sons, published in Nov., 2014.
36. Chih-Hang John Wu, David Ben-Arieh and Zhenzhen Shi. "An Autonomous Multi-Agent Simulation Model for Acute Inflammatory Response." In *Investigations into Living Systems, Artificial Life, and Real-World Solutions*, ed. George D. Magoulas, 218-233 (2013), accessed February 06, 2015. doi:10.4018/978-1-4666-3890-7.ch018.
37. Zhenzhen Shi, Chih-Hang Wu, David Ben-Arieh, "Agent-based model: a surging tool to simulate infectious disease in the immune system," *Open Journal of Modeling and Simulation* 2014, 2: 12-22.
38. Songnian Zhao, Chih-Hang (John) Wu, David Ben-Arieh, "Modeling Infection Spread and Behavioral Change Using Spatial Games". *Health Systems advance online publication* (2014), doi: 10.1057/hs.2014.22
39. Chih-Hang(John) Wu, Songnian Zhao, Yan Kuang, David Ben-Arieh, David Margolies, and James Nechols (2014) " New Mathematical Models for Vector-Borne Disease: Transmission of Tomato Spotted Wilt Virus," *Bridging Research and Good Practices towards Patient Welfare*, CRC Press, an imprint of Taylor and Francis Group. pp.. 259 – 268.

40. Songnian Zhao, Chih-Hang (John) Wu, David Ben-Arieh, Yan Kuang, David Margolies, and James Nechols, "Analysis of Vector-borne Disease Model with Time Delay and Age Structures", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
41. David Ben-Arieh, Chih-Hang Wu, Andrew Waldman, Levi Delissa, Johnathan Weiss, "Optimizing Surgery Schedule with PICU Nursing Constraints," Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
42. Yan Kuang, Chih-Hang(John) Wu, David Ben-Arieh, Songnian Zhao, David Margolies, and James Nechols, "Mathematical Models for Two-spotted Spider Mites and Phytoseiulus Persimilis", Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.
43. Zhenzhen Shi, Chih-Hang Wu, David Ben-Arieh, "Modeling Comparative Study on Sepsis, Proceedings of the IIE Annual Conference and Expo 2014 – Montreal, Canada, May 31 – June 3.

#### **Invited Scholars**

1. Prof. Zilla Sinuany-Stern, Ben-Gurion University, Sept. 2 2008 - Dec. 2, 2008.
2. Dr. Meiqing Wang, visiting scholar, Dept. of Industrial Eng., Beijing Aerospace Institute.

#### **Current Advisory Board Members:**

1. Bob Copple, Ancillary Services Executive, Immanuel Medical Center, Omaha, Nebraska.
2. Bob Cox, MD, Medical Director, Hays Medical Center, Hays, Kansas.
3. Chris Deck, Therapy Director, Via Christi – HOPE, Wichita.
4. Kathy Gooch, MD, Coffeyville Doctor's Clinic, Coffeyville, Kansas.
5. Beth Kalberg, Senior Director, Ambulatory Services, Children's Mercy Hospitals and Clinics
6. Amy Martens, P.E. Management Engineer, Blue Cross and Blue Shield of Kansas, Topeka.
7. Doug Miller, Manager, Informatics Field Support, Premier, Inc., Charlotte, NC .
8. Doug Peterson , Nurse Manager, The University of Kansas Hospital, Kansas City, Kansas.
9. Rosanne Rutkowski , Director Kansas Trauma Program, Kansas Department of Health and Environment
10. Cindy Samuelson, Vice President Member Services and Public Relations, Kansas Hospital Association, Topeka, Kansas.
11. Connie Satzler, President, EnVisage, Manhattan, Kansas.
12. Terry Siek, Chief Nursing Officer, Hays Medical Center Hays, Kansas.
13. Steve Simpson, Associate Professor of Medicine, Pulmonary and Critical Care Medicine, The University of Kansas Hospital, Kansas City, Kansas.

#### **List of Projects + Students**

2010:

- VA Hospital in KC. MO. Patient flow improvement in the ED. (completed December 2010). (3 students)
- VA Hospital in KC. MO. Design of the Central Intake facility and operation (completed May 2011). (3 students)
- Children Mercy, KC, Bed Management and teletracking (completed May 2011). (2 students).
- University of Kansas, Ed physicians project (completed May 2011) 3 students.
- Via Christie Wichita, Falls project – 1 Ph.D.

- University of Kansas Sepsis project – 2 PhDs.

2011:

- VA Hospital in KC. MO. Design of the Central Intake facility and operation (completed May 2011).
- Children Mercy Hospital K.C. – improving bed utilization using Tletracking. (\$23,600)
- Children Mercy Hospital K.C. – improving Pediatrics Clinic operations (Broadway clinic location).
- University of Kansas Medical Center – improving ED physicians productivity.
- Hays Medical Center- improving Surgical and Medical Inpatient wards (\$18,803).

2012:

- Children Mercy Hospital K.C. – improving Pediatrics Clinic operations (Broadway clinic location - continuation). Budget \$26,820.
- Hays Medical Center- improving Surgical and Medical Inpatient wards continuation). (budget \$18,803)
- U.S. Department of Veterans Affairs: Operating Room IT Evaluation (Rys, M. PI, Ben-Arieh D., Co-PI), \$63,882, 10/01/2011 – 11/1/2012.
- U.S. Department of Veterans Affairs: Measuring Impact of Field Based Analytics Education (Chang, S., Douglas-Mankin K., and Ben-Arieh D.), \$62,282, 11/01/2011 – 07/31/2012.
- U.S. Department of Veterans Affairs: Readiness for Reliability in Sterile Processing Department, (Chang, S., Douglas-Mankin K., and Ben-Arieh D.), \$61,698, 11/01/2011 – 07/12/2012.

2013:

- U.S. Department of Veterans Affairs: Creating Distance Learning Lean Training Exercises (Co-PI with Dr. Chang, and Dr. Douglas-Mankin as PI).
- Children Mercy Hospital K.C. – Scheduling Radiology Operations
- Children Mercy Hospital KC: Scheduling and staffing PICU operations (\$46,472)
- Mercy Regional Manhattan: Streamlining supplies flow to the ED (\$5,000)
- Via Christi, “modeling core processes at mercy regional manhattan” (\$96,017)
- VERC and New Mexico VA, “telehealth appointment optimization. (\$57,307)
- VERC and VA system, “Enhancing our virtual learning environment” (with Chang S., Rys, M)

2014

- Via Christi (and Mercy Regional) ED Throughput Improvement (Andrew Collins and Christopher Day) and Medical Building Layout (Alex Johnson, Tucker Styrkiewicz). (\$57,283).