

CURRICULUM VITAE

Michel-Alexandre Cardin

Dyson School of Design Engineering
Faculty of Engineering, Imperial College London
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Education

- Ph.D. Massachusetts Institute of Technology (MIT), Cambridge, MA, USA. February 2011
Engineering Systems. CGPA: 4.9/5.0
Advisor: R. de Neufville
- S.M. Massachusetts Institute of Technology, Cambridge, MA, USA. June 2007
Technology and Policy. CGPA: 5.0/5.0
- M.A.Sc. University of Toronto, Toronto, ON, Canada. November 2003
Aerospace Science and Engineering. CGPA: 3.9/4.0
- S.S.P. International Space University, Illkirch-Graffenstaden, France. September 2003
- B.Sc. McGill University, Montreal, QC, Canada. June 2001
Physics (First Class Honors). CGPA: 3.5/4.0

Professional Experience

- 2019-Now Senior Lecturer (Associate Professor) in Computational Aided Engineering, Dyson School of Design Engineering, Imperial College London
Member, Centre for Systems Engineering and Innovation; Centre for Process Systems Engineering; Space Lab; Energy Futures Lab (Affiliate)
- 2017-Now Research Collaborator, Interuniversity Research Centre on Enterprise Networks, Logistics, and Transportation (CIRRELT), Canada
- 2011-Now Research Affiliate, Institute for Data, Systems, and Society (IDSS), MIT
- 2018 Quantitative Researcher, Global Macro Fund, Fairtide Pte Ltd
- 2011-2018 Assistant Professor of Industrial Systems Engineering and Management, National University of Singapore (NUS)
Head, Strategic Engineering Laboratory, NUS
Collaborator and Co-Principal Investigator, Energy and Environmental Sustainability Solutions (E2S2) project for Mega-Cities, in collaboration with Shanghai Jiao Tong University
Research Affiliate, Institute of Real Estate Studies (IRES), NUS
- 2015-2018 Principal Investigator, Singapore-ETH Centre (SEC) Future Resilient Systems (FRS) project, in collaboration with ETH Zurich
- 2016 Visiting Scholar, Swiss Federal Institute of Technology (ETH), Switzerland
Professional Coach, Centre of Excellence on Systems Architecture, Management, Economy, and Strategy (CESAMES), Singapore
- 2012-2015 Principal Investigator, Singapore-MIT Alliance for Research and Technology (SMART) Future Mobility project, in collaboration with MIT
- 2007-2011 Teaching-Assistant, ESD and Center for Real Estate (CRE), MIT
- 2005-2011 Research-Assistant, Engineering Systems Division (ESD), MIT
- 2010 Visiting Scholar, Singapore University of Technology and Design
Visiting Scholar, Delft University of Technology, Netherlands
- 2006, 2009 Visiting Scholar, University of Cambridge, United Kingdom
- 2004-2005 Research Engineering and Physicist, Sunnybrook Research Institute, Canada

Honors and Awards

- Best Application Paper Award on Design and Manufacturing, *IISE Transactions*, “An Approach Based on Robust Optimization and Decision Rules for Analyzing Real Options in Engineering Systems Design” (2019)
 - Article also featured in July 2017 issue of *ISE Magazine*
- Commendable Teaching Award, NUS Temasek Defence Systems Institute (TDSI) (2016)
- Grand Prize Winner Team Member, Next Generation Container Port Challenge, Maritime Port Authority and Singapore Maritime Institute (2013)
 - USD \$1,000,000 shared among several collaborators
- ICED13 Reviewers' Favourite Award for Paper “An Integrated Screening Framework to Analyze Flexibility in Engineering Systems Design”, International Conference on Engineering Design (ICED), Seoul, Korea (2013)
- Post Graduate Scholarship, Natural Sciences and Engineering Research Council (NSERC, Canada) (2008-2011)
 - CDN \$60,000 over 36 months
- Canada Graduate Scholarship, NSERC (2007-2010)
 - CDN \$105,000 over 36 months – Ranked 4th in Canada (declined offer)
- Graduate Scholarship, Fond Québécois de la Recherche sur la Nature et les Technologies (Canada) (2008-2009)
 - CDN \$20,000 over 12 months – Ranked 1st for Engineering and Applied Sciences
- Graduate Scholarship, Fondation Desjardins (Canada), (2005-2006)
 - CDN \$10,000 over 24 months

Consulting

- Keppel Offshore and Marine, Singapore (2019)
 - Professional training on uncertainty, flexibility and real options analysis in offshore maritime systems
- Fairtime Pte. Ltd., Singapore (2017-2018)
 - System evaluation of deep learning approaches for quantitative and algorithmic trading at hedge fund
- Centre of Excellence on Systems Architecture, Management, Economy, and Strategy (CESAMES), France and Singapore (2016)
 - Professional training in enterprise and systems architecture
- Keppel Offshore and Marine Technology Centre, Singapore (2012-2013)
 - Development of decision-support system for flexibility analysis in LNG systems
- Appraisal Institute, United States (2010)
 - Invited panelist at 2010 XXV Congress of the Union of Pan-American Valuers on real option and uncertainty analysis in real estate appraisal
- MIT CRE Professional Development Institute, United States (2009)
 - Professional training on real option and uncertainty analysis in real estate
- Far East Organization, Singapore (2007)
 - Development of policy strategy to convert family-run real estate development company into real estate investment trust (largest private property developer in Singapore with SGD \$1.7B AUM)

Professional Activities

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| 2019-Present | Guest Editor, <i>ASME Journal of Mechanical Design</i> , Special Issues on AI in Design (forthcoming – 2021); Special Issue on Analysis and Design of Socio-Technical Systems (2020) |
| 2017-Present | PhD Thesis Defense Committee at Centrale Supélec, Université Paris-Saclay (07/2019) |

	PhD Thesis Defense Committee at TU Delft (05/2017)
	Invited Expert, ETH Zurich Research Commission (04/2017)
	United Nations Sustainable Development Goals Impact Finance (UNSIF) Research Council, UN General Assembly, (09/2017)
2014-Present	Invited Session Chair, IIE Conference & Expo; ASME International Design Engineering Technical Conferences
2013-Present	Associate Editor, <i>Systems Engineering</i>
2012-Present	Program and Organizing Committee Member, Conference on Complex Systems Design and Management (CSD&M), Paris, France
2012-Present	Editorial Review Board Member, <i>IEEE Transactions on Engineering Management</i>
2012-Present	Reviewer, <i>Artificial Intelligence for Engineering Design, Analysis and Manufacturing (AIEDAM)</i> ; <i>ASCE Journal of Infrastructure Systems</i> ; <i>ASME Journal of Mechanical Design</i> ; <i>IEEE Systems</i> ; <i>IEEE Transactions on Engineering Management</i> ; <i>IEEE Transactions on Systems, Man, and Cybernetics: Systems</i> ; <i>IIE Transactions</i> ; <i>Journal of Design Research</i> ; <i>Journal of Engineering Design</i> ; <i>Journal of Simulation</i> ; <i>Network and Spatial Economics</i> ; <i>Research in Engineering Design</i> ; <i>Risk Analysis</i> ; <i>Systems Engineering</i>
2018	Certificate, Course Specialization in Deep Learning, Coursera
2017-2018	Program Committee Member, 2018 Resilience Conference, ETH Zurich
2012-2018	Chairman, Organizing Committee, CSD&M Asia 2014, 2018
2016-2018	Program Committee Member, 4 th -5 th International Conference on Design Creativity
2013-2018	Editor, Proceedings of the 1 st to 3 rd editions of Asia-Pacific Conference on Complex Systems Design and Management (CSD&M) Asia 2014, 2016, 2018
2017	Certificate, Advanced Risk and Portfolio Management (ARPM) program, New York University
2014-2016	Chairman, Program Committee (Academic), CSD&M Asia 2016
2014	Passed Chartered Financial Analyst (CFA) Examination Level I
2013	Invited Session Chair, IEEE Conference on Systems, Man, and Cybernetics

Administrative Work

Examination Officer, Design Engineering MEng Program, Imperial College (2019-Present)
Coordinator, Special Interest Group on Systems Engineering (appointed by Dean of Engineering, NUS) (2015-2018)
Coordinator, Undergraduate Research Opportunities Program (NUS) (2015-2018)
ISEM Taskforce on Research Benchmarking (NUS) (2012-2013)
ISEM Taskforce on Revising Master of Science Curriculum (NUS) (2013-2014)
ISEM Taskforce on Case Study Writing (NUS) (2012)
ISEM PhD and Masters Thesis Committees (NUS) (2011-2018)

Professional Society Membership

Member, Institute of Industrial and Systems Engineers (IIE) (2019-2020)
Member, American Society of Mechanical Engineers (ASME) (2017-2018, 2020-Present)
Member, Chartered Financial Analysts (CFA) Institute (2017-2018)
Member, International Council On Systems Engineering (INCOSE) (2012-2017)

Research Grants

Imperial College European Partners Fund 2019, “Exploring the Role of Machine Learning in Architecture, Design, and Management of Complex Engineering Systems”, Principal Investigator, £5,000 (2019-2021)

Energy Market Authority, “Advanced Solar Power Forecasting for Safe and Reliable PV Grid Integration in Singapore”, Co-Principal Investigator, SGD \$6,236,409 (2018-2022)

Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-112-114, “An Integrated Decision Support System (DSS) for Emergency Infrastructure Systems”, Principal Investigator, SGD \$160,000 (2017-2020)

National Research Foundation, Campus for Research Excellence And Technological Enterprise, Singapore-ETH Centre, “Future Resilient Systems”, Principal Investigator, SGD \$824,000 (2014-2017)

National Research Foundation, Singapore-MIT Alliance for Research and Technology Subaward Agreement 48, 48a, Future Mobility IRG, “Studying Uncertainty Management and Design Decision-Making in Mobility On-Demand Systems”, Principal Investigator, SGD \$153,400 (2014-2015)

Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-079-112, “Simulation Gaming in Flexible Emergency Medical Service System”, Principal Investigator, SGD \$180,000 (2014-2017)

National Research Foundation, Singapore-MIT Alliance for Research and Technology Subaward Agreement 37, Future Mobility IRG, “Engineering Systems and Flexibility Analysis for Strategic Design and Management of Mobility On-Demand Systems Under Uncertainty”, Principal Investigator, SGD \$72,500 (2013-2014)

Engineering and Physical Sciences Research Council, “Management of Nuclear Risk Issues: Environmental, Financial and Safety (NREFS)”, Collaborator, GBP £5,000 (2012-2013)

National Research Foundation, Singapore-MIT Alliance for Research and Technology Subaward Agreement 25, Future Mobility IRG, “Engineering Systems Analysis of Mobility On-Demand Transportation and Network Disruption”, Co-Principal Investigator, SGD \$120,000 (2012-2013)

Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-067-112, “Designing and Managing Engineering Systems for Flexibility: Experiments with a Role-Playing Game”, Principal Investigator, SGD \$150,000 (2012-2014)

National Research Foundation, Campus for Research Excellence And Technological Enterprise, “Energy and Environmental Sustainability Solutions for Megacities”, Collaborator, (2012-2017)

Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-061-133, “Design of Engineering Systems for Uncertainty and Flexibility”, Principal Investigator, SGD \$180,000 (2011-2014)

Invited Talks

Best Paper Award Session, IISE Conference and Expo, Orlando, United States (2019)
Management, Technology and Entrepreneurship, College of Management of Technology, Swiss Federal Institute of Technology (EPFL), Switzerland (2016)

Laing O’Rourke Centre for Systems Engineering and Innovation, Imperial College London, United Kingdom (2015)

Conference on Complex Systems Design and Management, Paris, France (2015)

Quantum Black, London, United Kingdom (2014)

Texas A&M University, Department of Industrial and Systems Engineering (2014)

University of Manchester, Manchester Business School (2013)

Ecole Centrale Paris, Industrial Engineering Laboratory, France (2013)
Open University, Design Group (2012)
European Space Research and Technology Centre, Leiden, Netherlands (2012)
XXV Congress of the Union of Pan-American Valuers, Miami, FL, USA (2010)

Selected Journal Articles

- [1] E. Kuznetsova, M.-A. Cardin, M. Diao, and S. Zhang, "Integrated Decision-Support Methodology for Combined Centralized-Decentralized Waste-to-Energy Management Systems Design," *Renewable & Sustainable Energy Reviews*, vol. 103, pp. 477-500, 2019.
- [2] Y. Deng and M.-A. Cardin, "Integrating Operational Decisions into the Planning of Mobility-on-Demand Systems under Uncertainty," *Transportation Research Part C: Emerging Technologies*, vol. 86, pp. 407-424, 2018. doi: <https://doi.org/10.1016/j.trc.2017.11.018>
- [3] A. M. Caunhye and M.-A. Cardin, "Towards More Resilient Integrated Power Grid Capacity Expansion: A Robust Optimization Approach with Operational Flexibility," *Energy Economics*, vol. 72, pp. 20-34, 2018. doi: 10.1016/j.eneco.2018.03.014
- [4] S. Zhao, W. Haskell, and M.-A. Cardin, "Decision Rule Based Method for Flexible Multi-Facility Capacity Expansion Problem," *IIEE Transactions*, vol. 50, pp. 553-569, 2018. doi: 10.1080/24725854.2018.1426135
- [5] M.-A. Cardin, Y. Deng, and C. Sun, "Real Options and Flexibility Analysis in Design and Management of One-Way Mobility-on-Demand Transportation Systems Using Decision Rules," *Transportation Research Part C: Emerging Technologies*, vol. 84, pp. 265-287, 2017. doi: 10.1016/j.trc.2017.08.006
- [6] S. Zhang and M.-A. Cardin, "Flexibility and Real Options Analysis in Emergency Medical Services Systems Using Decision Rules and Multi-Stage Stochastic Programming," *Transportation Research Part E: Logistics and Transportation Review*, vol. 107, pp. 120-140, 2017/11/01/ 2017. doi: <https://doi.org/10.1016/j.trc.2017.09.003>
- [7] A. M. Caunhye and M.-A. Cardin, "An Approach Based on Robust Optimization and Decision Rules for Analyzing Real Options in Engineering Systems Design," *IIEE Transactions*, vol. 49, pp. 753-767, 2017. doi: 10.1080/24725854.2017.1299958 - 2019 BEST APPLICATION PAPER AWARD ON DESIGN AND MANUFACTURING
- [8] M.-A. Cardin, S. Zhang, and W. J. Nuttall, "Strategic Real Option and Flexibility Analysis for Nuclear Power Plants Considering Uncertainty in Electricity Demand and Public Acceptance," *Energy Economics*, vol. 64, pp. 226-237, 2017. doi: 10.1016/j.eneco.2017.03.023
- [9] M.-A. Cardin, Q. Xie, T. S. Ng, S. Wang, and J. Hu, "An Approach for Analyzing and Managing Flexibility in Engineering Systems Design Based on Decision Rules and Multistage Stochastic Programming," *IIEE Transactions*, vol. 49, pp. 1-12, 2017/01/02 2017. doi: 10.1080/0740817X.2016.1189627
- [10] M.-A. Cardin and J. Hu, "Analyzing the Tradeoffs between Economies of Scale, Time-Value of Money, and Flexibility in Design under Uncertainty: Study of Centralized Vs. Decentralized Waste-to-Energy Systems," *ASME Journal of Mechanical Design*, vol. 138, pp. 011401-011401-11, 2016. doi: 10.1115/1.4031422
- [11] M. P. De Lessio, M.-A. Cardin, A. Astaman, and V. Djie, "A Process to Analyze Strategic Design and Management Decisions under Uncertainty in Complex Entrepreneurial Systems," *Systems Engineering*, vol. 18, pp. 604-624, 2015. doi: 10.1002/sys.21330
- [12] M.-A. Cardin, R. de Neufville, and D. M. Geltner, "Design Catalogs: A Systematic Approach to Design and Value Flexibility in Engineering Systems," *Systems Engineering*, vol. 18, pp. 453-471, 2015. doi: 10.1002/sys.21323
- [13] M.-A. Cardin, Y. Jiang, H. K. H. Yue, and H. Fu, "Training Design and Management of Flexible Engineering Systems: An Empirical Study Using Simulation Games," *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, vol. 45, pp. 1268-1280, 2015. doi: 10.1109/TSMC.2015.2392072
- [14] J. Hu and M.-A. Cardin, "Generating Flexibility in the Design of Engineering Systems to Enable Better Sustainability and Lifecycle Performance," *Research in Engineering Design*, vol. 26, pp. 121-143, 2015. doi: 10.1007/s00163-015-0189-9

- [15] M.-A. Cardin, M. Ranjbar Bourani, and R. de Neufville, "Improving the Lifecycle Performance of Engineering Projects with Flexible Strategies: Example of on-Shore Lng Production Design," *Systems Engineering*, vol. 18, pp. 253-268, 2015. doi: 10.1002/sys.21301
- [16] J. Zhang, M.-A. Cardin, N. Kazantzis, S. K. K. Ng, and Y. H. Ma, "Economic Evaluation of Flexibility in the Design of Igcc Plants with Integrated Membrane Reactor Modules," *Systems Engineering*, vol. 18, pp. 208-227, 2015. doi: DOI 10.1002/sys.21300
- [17] M.-A. Cardin, "Enabling Flexibility in Engineering Systems: A Taxonomy of Procedures and a Design Framework," *ASME Journal of Mechanical Design*, vol. 136, pp. 1-14, 2014. doi: 10.1115/1.4025704
- [18] Y. Deng, M.-A. Cardin, V. Babovic, D. Santhanakrishnan, P. Schmitter, and A. Meshgi, "Valuing Flexibilities in the Design of Urban Water Management Systems," *Water Research*, vol. 47, pp. 7162-7174, 2013. doi: 10.1016/j.watres.2013.09.064
- [19] M.-A. Cardin, G. L. Kolfshoten, D. D. Frey, R. Neufville, O. L. Weck, and D. M. Geltner, "Empirical Evaluation of Procedures to Generate Flexibility in Engineering Systems and Improve Lifecycle Performance," *Research in Engineering Design*, vol. 24, pp. 277-295, 2013. doi: 10.1007/s00163-012-0145-x
- [20] S. J. Steer, M.-A. Cardin, W. J. Nuttall, G. T. Parks, and L. V. N. Gonçalves, "Minimizing the Economic Cost and Risk to Accelerator-Driven Subcritical Reactor Technology: The Case of Designing for Flexibility: Part 1," *Nuclear Engineering and Design*, vol. 243, pp. 135-147, 2012. doi: 10.1016/j.nucengdes.2011.11.027
- [21] M.-A. Cardin, S. J. Steer, W. J. Nuttall, G. T. Parks, L. V. N. Gonçalves, and R. de Neufville, "Minimizing the Economic Cost and Risk to Accelerator-Driven Subcritical Reactor Technology: The Case of Designing for Flexibility: Part 2," *Nuclear Engineering and Design*, vol. 243, pp. 120-134, 2012. doi: 10.1016/j.nucengdes.2011.11.026
- [22] A. Babajide, R. de Neufville, and M.-A. Cardin, "Integrated Method for Designing Valuable Flexibility in Oil Development Projects," *SPE Projects, Facilities, and Construction*, vol. 4, pp. 3-12, 2009. doi: 10.2118/122710-PA
- [23] M.-A. Cardin, R. de Neufville, and V. Kazakidis, "A Process to Improve Expected Value in Mining Operations," *Mining Technology: IMM Transactions, Section A*, vol. 117, pp. 65-70, 2008. doi: 10.1179/174328608X362631
- [24] D. Broniatowski, M.-A. Cardin, S. Dong, M. Hale, N. C. Jordan, D. R. Laufer, C. Mathieu, B. D. Owens, M. G. Richards, and A. L. Weigel, "A Framework for Evaluating International Cooperation in Space Exploration," *Space Policy*, vol. 24, pp. 181-189, 2008. doi: 10.1016/j.spacepol.2008.09.012

Selected Conference Papers and Proceedings

- [1] C. Caputo and M.-A. Cardin, "A Machine Learning Based Framework for the Design and Evaluation of Flexible, Sustainable and Resilient Energy Systems under Uncertainty," in *Supergen Energy Networks Hub Risk Day*, Glasgow, United Kingdom, 2020.
- [2] S. Zhao, W. B. Haskell, and M.-A. Cardin, "A Flexible Multi-Capacity Expansion Problem with Risk Aversion," paper presented at the IISE Conference and Expo, New Orleans, LA, United States, 2020.
- [3] S. O. P. Blume, M.-A. Cardin, and G. Sansavini, "Dynamic Disruption Simulation in Large-Scale Urban Rail Transit Systems," in *Complex Systems Design & Management*, Paris, France, 2020, pp. 129-140.
- [4] S. O. P. Blume, M.-A. Cardin, and G. Sansavini, "A Simulation-Based Approach to Modelling Disruptions and Quantifying Uncertainties in a Large-Scale Urban Transit System," paper presented at the INFORMS Annual Meeting, Seattle, WA, United States, 2019.
- [5] A. M. Caunhye and M.-A. Cardin, "An Approach Based on Robust Optimization and Decision Rules for Analyzing Real Options in Engineering Systems Design," in *Best Paper Award Session, IISE Conference and Expo*, Orlando, FL, United States, 2019.
- [6] W. H. Mak, Z. Liu, M.-A. Cardin, and P. J. Clarkson, "Towards the Design of Resilient Waste-to-Energy Systems Using Bayesian Networks," paper presented at the ASME 2018 International

- Design Engineering Technical Conferences and Computers & Information in Engineering Conference, Quebec City, Quebec, Canada, 2018.
- [7] Y. Jiang, A. M. Caunhye, and M.-A. Cardin, "Development of a Simulation Game Platform for Flexible Generation Expansion Planning and Design of Power Grid Systems," paper presented at the IISE Conference and Expo, Orlando, FL, United States, 2018.
- [8] S. Blume, G. Sansavini, and M.-A. Cardin, "Measuring the Fragility of Large-Scale Transport Systems," paper presented at the 6th International Symposium on Reliability Engineering and Risk Management, Singapore, 2018.
- [9] M. Rahmat, A. M. Caunhye, and M.-A. Cardin, "Flexibility and Real Options Analysis in Design for Long-Term Generation Expansion Planning of Power Grids," paper presented at the ASME 2017 International Design Engineering Technical Conferences and Computers & Information in Engineering Conference, Cleveland, OH, United States, 2017.
- [10] Q. Xie and M.-A. Cardin, "A Framework for Designing and Managing Flexibility and Real Options in Engineering Systems Based on Decision Rules," paper presented at the ASME 2017 International Design Engineering Technical Conferences and Computers & Information in Engineering Conference, Cleveland, OH, United States, 2017.
- [11] M. Diao, M.-A. Cardin, S. Zhang, and E. Kuznetsova, "Development of a Waste-to-Energy Decision Support System (Wtedss)," paper presented at the IISE Conference and Expo, Pittsburgh, PA, United States, 2017.
- [12] E. Kuznetsova, T. S. Ng, M.-A. Cardin, and Z. He, "A Stochastic Programming Approach for the Design of Multi-Storey Recycling Facility," paper presented at the IISE Conference and Expo, Pittsburgh, PA, United States, 2017.
- [13] M.-A. Cardin, Y. Jiang, and T. Lim, "Empirical Studies in Decision Rule-Based Flexibility Analysis for Complex Systems Design and Management," paper presented at the Conference on Complex Systems Design & Management, Paris, France, 2017.
- [14] M. Ranjbar Bourani and M.-A. Cardin, "Strategic, Tactical, and Operational Flexibility in Design and Evaluation of a Decentralized on-Shore Lng Production System," in *46th Conference on Computers and Industrial Engineering (CIE46)* Tianjin, China, 2016.
- [15] M.-A. Cardin, Y. Jiang, and T. Z. W. Lim, "Study on the Design and Management of Flexible Engineering Systems Using Decision Rules," in *Council of Engineering Systems Universities (CESUN) 5th International Symposium on Engineering Systems* Washington, DC, United States, 2016.
- [16] A. M. Caunhye and M.-A. Cardin, "Robust Optimization with Operational Flexibility for Resilient Power Grid Capacity Expansion," in *IISE Conference and Expo*, Anaheim, CA, United States, 2016.
- [17] Q. Xie and M.-A. Cardin, "Embedding Flexibility and Decision Rules in the Design of Multi-Storey Recycling Facility," in *IISE Conference and Expo*, Anaheim, CA, United States, 2016.
- [18] T. Xia, M.-A. Cardin, M. Ranjbar Bourani, and A. M. Caunhye, "A Decision-Making Tool to Design a Flexible Liquefied Natural Gas System under Uncertainty," in *IEEE International Conference on Systems, Man and Cybernetics*, Hong Kong, China, 2015.
- [19] J. Hu and M.-A. Cardin, "The Value of Flexible Capacity Expansion Strategies in Design of Complex Decentralized Engineering Systems," paper presented at the ASME 2015 International Design Engineering Technical Conferences and Computers & Information in Engineering Conference, Boston, MA, United States, 2015.
- [20] M.-A. Cardin, Y. Jiang, H. K. H. Yue, and H. Fu, "Studying Flexible Design and Management Decision-Making in Engineering Systems Using Simulation Games," paper presented at the 25th Symposium of the International Council on Systems Engineering, Seattle, WA, United States, 2015.
- [21] S. Zhang and M.-A. Cardin, "Multi-Stage Stochastic Programming for Design and Management of Emergency Medical Services Systems," in *IIE Conference and Expo*, Nashville, TN, United States, 2015.
- [22] M.-A. Cardin, M. Ranjbar Bourani, and R. de Neufville, "Design and Management of Flexible on-Shore Lng Production Engineering Systems," paper presented at the Conference on Complex Systems Design & Management Asia, Singapore, 2014.
- [23] Y. Deng and M.-A. Cardin, "Design and Management of Mobility-on-Demand Systems (Mod) under Uncertainty," in *INFORMS*, San Francisco, CA, United States, 2014.

- [24] J. Zhang, M. A. Cardin, N. Kazantzis, S. K. K. Ng, and Y. H. Ma, "Economic Evaluation of Flexible Igcc Plants with Integrated Membrane Reactor Modules," paper presented at the IEEE International Conference on Systems, Man and Cybernetics, San Diego, CA, United States, 2014.
- [25] M. A. Cardin, "Taxonomy of Procedures and Design Framework to Enable Flexibility in Engineering Systems," in *International Conference on Advanced Design Research and Education, ICADRE 2014*, Singapore, 2014, pp. 5-9.
- [26] M.-A. Cardin, M. Ranjbar Bourani, and R. de Neufville, "Quantifying the Value of Flexibility in Design and Management of Onshore Lng Production System," paper presented at the 24th Symposium of the International Council on Systems Engineering, Las Vegas, NV, United States, 2014.
- [27] M.-A. Cardin, Y. Jiang, H. K. H. Yue, H. Fu, L. C. Tang, and B. Huang, "Using Simulation Games to Study Design and Management Decision-Making in Engineering Systems Operating under Uncertainty," in *Council of Engineering Systems Universities (CESUN) 4th International Symposium on Engineering Systems* Hoboken, NJ, United States, 2014.
- [28] Q. Xie, M.-A. Cardin, T. S. Ng, S. Wang, and J. Hu, "Analyzing Flexibility in Design of Waste-to-Energy Systems," in *IIE Conference and Expo*, Montréal, Québec, Canada, 2014.
- [29] S. Zhang and M.-A. Cardin, "Design and Management of Flexible Emergency Medical Services Systems," in *IIE Conference and Expo*, Montréal, Québec, Canada, 2014.
- [30] M. A. Cardin, H. K. H. Yue, H. Fu, L. C. Tang, Y. Jiang, S. Zhang, and H. Boray, "Simulation Gaming to Study Design and Management Decision-Making in Flexible Engineering Systems," paper presented at the IEEE International Conference on Systems, Man, and Cybernetics, Manchester, United Kingdom, 2013.
- [31] M.-A. Cardin, H. K. H. Yue, Y. Jiang, Y. Deng, and D. Santhanakrishnan, "Empirical Evaluation of Flexible Design Concept Generation Procedures: A Study in Emergency Services " paper presented at the International Conference on Engineering Design, Seoul, Korea, 2013.
- [32] M. P. De Lessio, M.-A. Cardin, A. Astaman, and V. Djie, "A Methodology to Support Strategic Design and Management Decision-Making in Entrepreneurial Systems: A Case Study in Mobility on Demand (Mod) Transportation," paper presented at the International Conference on Engineering Design, Seoul, Korea, 2013.
- [33] J. Hu, M.-A. Cardin, K. L. Poh, and E. S. Chia, "An Approach to Generate Flexibility in Engineering Design of Sustainable Waste-to-Energy Systems," paper presented at the International Conference on Engineering Design, Seoul, Korea, 2013.
- [34] M. Ranjbar Bourani, M.-A. Cardin, W. S. Chong, R. Atapattu, and K. S. Foo, "An Integrated Screening Framework to Analyze Flexibility in Engineering Systems Design," paper presented at the International Conference on Engineering Design, Seoul, Korea, 2013.
- [35] M.-A. Cardin, R. de Neufville, D. Geltner, and Y. Deng, "Design Catalogs: A Practical Real Options Valuation Tool for Real Estate Design and Development Planning," paper presented at the Real Options Conference, Tokyo, Japan, 2013.
- [36] M.-A. Cardin and R. de Neufville, "Design Catalogues: An Efficient Search Approach for Improved Flexibility in Engineering Systems Design," paper presented at the 23rd Symposium of the International Council on Systems Engineering, Philadelphia, PA, United States, 2013.
- [37] M.-A. Cardin, "An Organizing Taxonomy of Procedures to Design and Manage Complex Systems for Uncertainty and Flexibility," paper presented at the 3rd International Conference on Complex Systems Design and Management, Berlin, Heidelberg, Germany, 2013.
- [38] M.-A. Cardin, G. Kolfschoten, D. D. Frey, R. de Neufville, O. L. de Weck, and D. M. Geltner, "An Experimental Methodology to Evaluate Concept Generation Procedures Based on Quantitative Lifecycle Performance," paper presented at the 22nd Symposium of the International Council on Systems Engineering, Rome, Italy, 2012.
- [39] M.-A. Cardin and R. de Neufville, "A Direct Interaction Approach to Identify Real Options 'in' Large-Scale Infrastructure Systems," paper presented at the Real Options Conference, Braga (Portugal), Santiago (Spain), 2009.
- [40] M.-A. Cardin, W. J. Nuttall, R. de Neufville, and J. Dahlgren, "Extracting Value from Uncertainty: A Methodology for Engineering Systems Design," paper presented at the 17th Symposium of the International Council on Systems Engineering, San Diego, CA, United States, 2007.

- [41] M.-A. Cardin, R. de Neufville, and J. Dahlgren, "Extracting Value from Uncertainty: Proposed Methodology for Engineering Systems Design," paper presented at the 5th Annual Conference on Systems Engineering Research, Hoboken, NJ, United States, 2007.
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Other Contributions

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Research Staff

<u>Name</u>	<u>Period</u>	<u>Recent Affiliation</u>	<u>Prior Position</u>
Wyeon Chan	2017-2018	Micron	Post-Doc Research Fellow
Elizaveta Kuznetsova	2016-2018	Polytechnique Montréal	Post-Doc Research Fellow
Aakil Caunhye	2014-2018	University of Edinburgh	Post-Doc Research Fellow
Jiang Yixin	2013-2018	NUS	Research Associate
Diao Mingzhen	2015-2017	NUS	Research Engineer
Zhang Sizhe	2015-2016	Grab	Post-Doc Research Fellow
Deng Yinghan	2015-2016	Facebook	Post-Doc Research Fellow
Sun Chang	2014-2015	NUS	Post-Doc Research Fellow
Hu Junfei	2012-2015	Northwestern Polytech	Post-Doc Research Fellow
Mark De Lessio	2013-2014	New York University	Post-Doc Research Fellow
Simon K. K. Ng	2013-2014	Hong Kong University	Post-Doc Research Fellow
Howard K.-H. Yue	2012-2013	Adaptive Insights	Research Associate

Doctoral Students

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Cesare Caputo	07/2023	Imperial College London	Student
Steffen Blume	11/2020	ETH Zurich	Candidate
Zhao Sixiang [†]	07/2019	Grab	Graduated, Data Scientist
Jonathan Mak	12/2018	University of Cambridge	Candidate, Visiting
David Allaverdi	12/2016	TU Munich	Graduated, Consultant

Xie Qihui*	12/2016	PropertyGuru	Graduated, Data Scientist
Mehdi Ranjbar-Bourani*	12/2015	University of Tehran	Graduated, Post-doc
Zhang Sizhe*	06/2016	Grab	Graduated, Data Scientist
Deng Yinghan*	03/2016	Facebook	Graduated, Trader
Ashwani Kumar†	04/2015	Government of India	Graduated, Civil Servant

Teaching

<u>Course</u>	<u>Topic</u>	<u>Institution</u>
DESE-95007‡	Data Science	Imperial College
DESE-96009	Optimisation	Imperial College
DTS5726	Fundamentals of Systems Engineering and Architecting	NUS
IE2140‡	Engineering Economy	NUS
IE5003‡	Cost Analysis and Engineering Economy	NUS
IE5402‡	Introduction to Systems Engineering and Architecture	NUS
IE5407‡	Flexibility in Engineering Systems Design	NUS
IE6099‡	ISE Research Methodology	NUS
ESD.70‡	Engineering Economy Module	MIT

Other Developments

Licensed Technology, National Environment Agency (NEA), “Non-Commercial Software License Agreement with NEA – Waste to Energy Decision Support System (WTEDSS)”, Non-exclusive license, 11/15/2017, TechID 2017-098

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