

# CURRICULUM VITAE

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## Strategic Vision

I am a tenured Associate Professor (Senior Lecturer in the UK) in Computational Aided Engineering and Director of the Strategic Engineering Laboratory at the Dyson School of Design Engineering, Imperial College London.

Before joining Imperial College, I worked as a Quantitative Researcher in the hedge fund industry. From 2011 to 2018 I served as Assistant Professor at the National University of Singapore. I hold a PhD in Engineering Systems and a Master of Science in Technology and Policy from MIT, a Master of Applied Science in Aerospace Engineering from the University of Toronto, an Honors BSc in Physics from McGill University, and am a graduate of the Space Science Program at the International Space University.

These experiences have shaped my strategic vision, which builds upon principles from systems thinking, engineering design, and decision-making under uncertainty. My overarching goal is to help effect change in industry, government, and policymaking mindsets in how systems are designed today and tomorrow. I want to help system engineers, decision-makers, and business leaders think *differently* about uncertainty and risks and take it as an opportunity to deliver better value, sustainability, and resilience for society, while making appropriate use of resources and being respectful of our environment. I do this by devising, evaluating, and educating future generations of engineers on cutting-edge computational tools to support conceptual design activities for complex engineered systems operating in uncertain environments.

My research is fundamentally trans-disciplinary and broadly focuses on the development and evaluation of such computational tools, digital processes, and optimization algorithms to design and operate complex engineered systems *for* uncertainty. My work builds upon and integrates important principles from the fields of engineering design, industrial and systems engineering, machine learning, quantitative finance, stochastic and robust optimization, with applications in energy, transportation, space, and water systems design.

## Excellence and Impact

I am recognized internationally for my contributions to the development of a new engineering design paradigm known as *Flexibility and Real Options in Engineering Design*. *Flexibility in Design* captures a paradigmatic change in systems design that emerged from the theory of *Real Options*, which aims at quantifying the value of flexibility in irreversible investment projects. Flexibility enables complex engineered systems to adapt, reconfigure, and change in a value-enhancing manner in the face of uncertainty and risks. It improves significantly expected economic performance compared to standard design and project evaluation methods and generates systems that are more sustainable and resilient in the long-term.

The systematic five-phase [design framework](#) for flexibility that I have synthesized and published in the *ASME Journal of Mechanical Design* has been one of my most influential academic work. This framework used alongside [decision-support software](#) architecture that I developed have been used to guide decision-making and executive training in government (National Environment Agency of Singapore), industry (Keppel Offshore & Marine, the largest oilrig developer in Southeast Asia), and international commerce (Austrian Federal Economic Chamber). Such tools are guiding new thinking and research opportunities on decarbonization and the transition to net zero in industry, working with flagship companies like Jaguar Land

Rover (JLR) on *Sustainable Modern Luxury by Design*, on *Decarbonization and Natural Climate Solutions* with Hitachi, Price waterhouse Cooper (PwC) on design and operations of future H<sub>2</sub> infrastructures, and with Électricité de France (EDF) on resilient supply chains for energy infrastructure systems. The novel approach I have developed to perform real options analysis based on [decision rules](#) has received several international academic awards (e.g., [2019 IISE Transactions Best Application Paper](#) in Design and Manufacturing) and was featured many times in engineering magazines (*ISE Magazine*), newspapers (Business Times of Singapore), and social media (Imperial Enterprise).

Since beginning my journey as an academic in 2011, I have established a world-class reputation and research portfolio in important academic and engineering communities: the American Society of Mechanical Engineers (ASME), Institute of Industrial and Systems Engineers (IISE), and International Council On Systems Engineering (INCOSE). The quality and rigor of my work has been recognized in these communities since I have been invited to serve as Associate Editor and Guest Editor for the *ASME Journal of Mechanical Design* (JMD) since 2020, *IISE Transactions* since 2022, and INCOSE journal *Systems Engineering* (2013-2020), all flagship academic journals in these communities. I have contributed to policymaking discussions on the role of flexibility and real options in social impact project investments (United Nations SDG Impact Finance group, UN General Assembly, New York City, 2017) and new business models for mobility systems (World Economic Forum, Davos, 2023). I have published 95 papers in leading journals, books, and conferences such as *ASME JMD*, *Research in Engineering Design*, *IISE Transactions*, *Applied Energy*, *Energy Economics*, *Renewable and Sustainable Energy Reviews*, *Transportation Research*, *Acta Astronautica*, and *Water Research*. My current h-index is 20 with more than 1250 citations (Google Scholar).

I am a dedicated educator and mentor who always seeks to create an intellectually stimulating, equitable, diverse, and inclusive environment. This is shown by the Teaching Award I received from the Temasek Defense Systems Institute (TDSI) in 2016, as well as 11 PhD students (7 graduated, 4 ongoing) and dozen Post-Doctoral Research Associates (PDRA) and research engineers supervised and who now occupy leading positions in academia (e.g., University of Edinburgh Business School) and industry (Facebook, Tencent).

My expertise on systems design is highly sought-after as the world deals increasingly with recurring uncertainty and disruptions from climate change, healthcare emergencies, geo-political tensions, and cyber-physical terrorism. This is shown through the many ongoing research projects I am leading with global companies like JLR, Hitachi, PwC, and EDF, and numerous assignments with government (e.g., National Environment Agency of Singapore) and business leaders (e.g., Austrian Federal Economic Chamber). These initiatives confirm the view that new design thinking is urgently needed as the world seeks to decarbonize and transition to net zero carbon over the coming decades.

## Education

2007-2011	PhD in Engineering Systems, Massachusetts Institute of Technology, Cambridge, USA. CGPA: 4.9/5.0
2005-2007	Master of Science in Technology and Policy, Massachusetts Institute of Technology, Cambridge, USA. CGPA: 5.0/5.0
2001-2003	Master of Applied Science in Aerospace Science and Engineering, University of Toronto, Canada. CGPA: 3.9/4.0
2003	Space Science Program, International Space University, Illkirch-Graffenstaden, France.
1998-2001	Honors Bachelor of Science in Physics (First Class), McGill University, Montreal, Canada. CGPA: 3.5/4.0

## Professional Appointments

2019-Now	Associate Professor (Senior Lecturer in the UK) in Computational Aided Engineering, Dyson School of Design Engineering, Imperial College London, UK Director, Strategic Engineering Laboratory, Imperial College London, UK
2018	Quantitative Researcher, Global Macro Fund, Fairtime Pte Ltd, Singapore
2011-2018	Assistant Professor of Industrial Systems Engineering and Management,

	National University of Singapore (NUS), Singapore
	Director, Strategic Engineering Laboratory, NUS, Singapore
2007-2011	Teaching-Assistant, Engineering Systems Division (ESD) (now Institute for Data, Systems, and Society – IDSS) and Center for Real Estate (CRE), MIT, USA
2005-2011	Research-Assistant, ESD, MIT, USA
2004-2005	Research Engineer and Physicist, Sunnybrook Research Institute, Canada

## Other Affiliations and External Appointments

2019-Now	Affiliate, AI Network, Centre for Systems Engineering and Innovation, Data Science Institute, Energy Futures Lab, Sargeant Centre for Process Systems Engineering, Space Lab, Imperial College London, UK
2017-Now	Research Affiliate, Interuniversity Research Centre on Enterprise Networks, Logistics, and Transportation (CIRRELT), Canada
2011-Now	Research Affiliate, IDSS, MIT, USA
2011-2018	Research Affiliate, Institute of Real Estate Studies (IRES), NUS, Singapore
2017	Research Council Member (Invited), United Nations Sustainable Development Goals Impact Finance (UNSIF), United Nations General Assembly, USA
2016	Visiting Scholar, Swiss Federal Institute of Technology (ETH Zürich), Switzerland
2010	Visiting Scholar, Singapore University of Technology and Design, Singapore
	Visiting Scholar, Delft University of Technology (TU Delft), Netherlands
2006, 2009	Visiting Scholar, University of Cambridge, UK

## Esteem and Professional Activities

2022-Now	Associate Editor, <i>IISE Transactions</i> , Design and Manufacturing
2020-Now	Associate Editor, <i>ASME Journal of Mechanical Design</i> , Design Automation
2019-Now	Guest Editor, <i>ASME Journal of Mechanical Design</i> , Special Issue “AI and Engineering Design” (2021) and “Analysis and Design of Socio-Technical Systems” (2020)
2020-2021	Associate Editor, <i>Frontier in Sustainable Cities</i>
2013-2021	Associate Editor, <i>Systems Engineering</i>
2012-2021	Editorial Review Board Member, <i>IEEE Transactions on Engineering Management</i>
2014-Now	Invited Session Chair, IISE Conference & Expo; ASME International Design Engineering Technical Conferences, USA
2012-2020	Program and Organizing Committee Member, Conference on Complex Systems Design and Management (CSD&M), France
2017-2018	Program Committee Member, 2018 Resilience Conference, ETH Zürich, Switzerland
2012-2018	Chairman, Organizing Committee, CSD&M Asia 2014, 2018, Singapore
2016-2018	Program Committee Member, 4 <sup>th</sup> -5 <sup>th</sup> International Conference on Design Creativity, Singapore
2014-2016	Chairman, Program Committee (Academic), CSD&M Asia 2016, Singapore
2013	Invited Session Chair, IEEE Conference on Systems, Man, and Cybernetics, USA
2012-Now	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>IISE 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	Certificate, Advanced Risk and Portfolio Management (ARPM) program, New York University, USA
2014	Chartered Financial Analyst (CFA) Examination Level I (Passed)

## Honors and Awards

- Best Poster Award “Deploying Lunar In-Situ Resource Utilisation Plant with Explicit Consideration of Uncertainty”, Space Resources Week, organized by the European Space Resources Innovation Centre and European Space Agency, Luxembourg, (2023)
- Best Application Paper in Design and Manufacturing, *IISE Transactions*, “An Approach Based on Robust Optimization and Decision Rules for Analyzing Real Options in Engineering Systems Design” (2019)
- Commendable Teaching Award, NUS Temasek Defence Systems Institute (TDSI) (2016)
- Grand Prize Winner (USD \$1 million) Team Member, Next Generation Container Port Challenge, Maritime Port Authority and Singapore Maritime Institute (2013)
- ICED13 Reviewers' Favourite Award for Paper “An Integrated Screening Framework to Analyze Flexibility in Engineering Systems Design”, top 10% based on review scores, International Conference on Engineering Design (ICED), Seoul, Korea (2013)
- Post Graduate Scholarship (CAD \$60k, 36 months), Natural Sciences and Engineering Research Council (NSERC, Canada) (2008-2011)
- Canada Graduate Scholarship (CAD \$105k, 36 months - declined), project ranked 4<sup>th</sup> in Canada, NSERC (2007-2010)
- Graduate Scholarship (CAD \$20k, 12 months), project ranked 1<sup>st</sup> in Engineering & Applied Sciences, Fond Québécois de Recherche sur la Nature et Technologies (Canada) (2008-2009)
- Graduate Scholarship (CAD \$10k over 24 months), Fonds Desjardins (Canada), (2005-2006)

## International News and Feature Articles

- Open-Editorial, [Asia Asset Management](#), “Flexibility is Key: Costly Net Zero Projects Require Innovative Valuation and Financing Options” (2022)
- Feature article, [ISE Magazine](#), “Rethinking Power Systems Expansion Planning: How Flexibility Enables Better Economic Decisions and Sustainability in the Face of Uncertainty” (2022)
- Feature article, [Imperial Enterprise](#), “Decision-Making Under Uncertainty” (2021)
- News article, [Imperial College News](#), “Worldwide Uncertainty a Chance to be More Efficient and Resilient, say Academics” (2021)
- Feature article, [ISE Magazine](#), “Better Planning and Design for your Upcoming Power System” (2017)
- Open-Editorial, [Business Times](#), “Building Uncertainty, Flexibility into Infrastructure Mega-Projects” (2017)

## Keynotes and Plenary Lectures

- Plenary, Cybersecurity in the Lifecycle of Orbital Systems, Research Institute in Trustworthy Inter-Connected Cyber-Physical Systems (RITICS), UK National Cyber-Security Centre (NCSC) and Engineering & Physical Science Research Council (EPSRC), London, UK (2023)
- Keynote, Best Paper Session, IISE Conference and Expo, USA (2019)
- Keynote, Conference on Complex Systems Design and Management, Paris, France (2015)
- Keynote, XXV Congress of the Union of Pan-American Valuers, USA (2010)

## Invited Talks, Panels and Seminars

- Optimization Neighborhood Talk, Shell, London, UK (2023)
- Global Mobility Co-Lab Platform, World Economic Forum, Davos, Switzerland (2023)
- Data Science Seminar, Goldman Sachs, London, UK (2022)
- Sargeant Centre for Process Systems Engineering Industry Consortium Meeting, Imperial College London, UK (2020, 2022)

- Mechanical Engineering Seminar Series, McGill University, Canada (2022)
- Seminar Series on Future Proofing Engineering Systems – Theory Meets Practice, The Bartlett London of Sustainable Construction, University College London, UK (2021)
- Online Panel on [Decision-Making Under Uncertainty](#), Imperial Business Partners, UK (2021)
- Joint Seminar in Mechanical Engineering and Process Engineering (D-MAVT) and Information Technology and Electrical Engineering (D-ITET), ETH Zürich, Switzerland (2019)
- Seminar Series in 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 Seminar Series, Imperial College London, UK (2015)
- Quantum Black Seminar Series, a McKinsey Company, London, UK (2014)
- Seminar Series on Industrial and Systems Engineering, Texas A&M University, USA (2014)
- Manchester Business School Seminar Series, University of Manchester, UK (2013)
- Industrial Engineering Seminar Series, École Centrale Supélec Paris-Saclay, France (2013)
- Design Group Seminar Series, Open University, UK (2012)
- Research and Technology Seminar Series, European Space Agency, Netherlands (2012)

## **Consultancies**

- Development of flexibility and real option model for H<sub>2</sub> production and distribution infrastructure systems, PwC Germany (2023)
- Professional training on decision-making under uncertainty, Austrian Federal Economic Chamber (Advantage Austria), UK (2023)
- Professional training on uncertainty, flexibility, and real options analysis in offshore maritime systems, Keppel Offshore and Marine, Singapore (2019)
- System evaluation of deep learning approaches for quantitative and algorithmic trading at hedge fund, Fairtide Pte. Ltd., Singapore (2017-2018)
- Professional training in enterprise and systems architecture, Centre of Excellence on Systems Architecture, Management, Economy, and Strategy (CESAMES), France & Singapore (2016)
- Development of decision-support system for flexibility analysis in LNG system, Keppel Offshore and Marine Technology Centre, Singapore (2012-2013)
- Invited keynote at 2010 XXV Congress of the Union of Pan-American Valuers on real option and uncertainty analysis in real estate appraisal, Appraisal Institute, USA (2010)
- Professional training on real option and uncertainty analysis in real estate, MIT CRE Professional Development Institute, USA (2009)
- Development of policy strategy to convert largest family-run real estate development firm (SGD \$1.7 AUM) into real estate investment trust, Far East Organization, Singapore (2007)

## **External PhD Defense and Review Committees**

- Arnor Elvarsson, “Planning Transportation Corridors using Systems Dynamics and Real Options”, ETH Zürich, Switzerland (2022-Now)
- Orlando Roman, “Advancing Dynamic Planning for Infrastructure Systems under Uncertainty”, ETH Zürich, Switzerland (2021-Now)
- Adam Abdin, “Techno-economic Modeling and Robust Optimization of Power Systems Planning under a High Share of Renewable Energy Sources and Extreme Weather Events”, École Centrale Supélec, Université Paris-Saclay, France (2019)
- Yeshambel G. Melese, “Strategic Design of Multi-actor Nascent Energy and Industrial Infrastructure Networks under Uncertainty”, TU Delft, Netherlands (2017)
- Various PhD and Master’s Thesis Review Committees, NUS, Singapore (2011-2018)

## Administrative Work

- Lead, Systems Research Group (20 staff members), Imperial College London, UK (2021-2022)
- Member, Internal Management Group (10 staff members), Centre for Systems Engineering and Innovation, Imperial College London, UK (2021-Now)
- Examination Officer, Design Engineering MEng Program (38 modules), Imperial College London, UK (2019-Now)
- Member, Mitigating Circumstances Review Panel, Imperial College London, UK (2019-2020)
- Coordinator, Special Interest Group on Systems Engineering (appointed by Dean of Engineering), NUS, Singapore (2015-2018)
- Coordinator, Undergraduate Research Opportunities Program, NUS, Singapore (2015-2018)
- Member, ISEM Taskforce on Research Benchmarking, NUS, Singapore (2012-2013)
- Member, ISEM Taskforce on Master of Science Curriculum, NUS Singapore (2013-2014)
- Member, ISEM Taskforce on Case Study Writing, NUS, Singapore (2012)

## Professional Society Membership

- Member, American Society of Civil Engineers (ASCE) (2023-Now)
- Member, Institute of Industrial and Systems Engineers (IISE) (2019-Now)
- Member, American Society of Mechanical Engineers (ASME) (2017-2018, 2020-Now)
- Member, Chartered Financial Analysts (CFA) Institute (2017-2018)
- Member, International Council On Systems Engineering (INCOSE) (2012-2017)

## Research Grants

### *Principal Investigator, Imperial College London*

- Jaguar Land Rover, “Sustainable Modern Luxury by Design”, £420,000 (2023-2027)
- Imperial College Dept. of Earth Science and Engineering PhD Studentships, “Systems Design, Optimization, and Decision-Making Under Uncertainty for Lunar In-Situ Resource Utilization”, £310,000 (2021-2026)
- Électricité de France (EDF), “System Design Analysis of Energy Infrastructure Supply Chain under Uncertainty and Risks”, £10,000 (2023)
- Imperial College European Partners Fund, “Exploring the Role of Machine Learning in Architecture, Design, and Management of Complex Engineering Systems”, £5,000 (2019-2021)
- Price waterhouse Cooper (PwC) Germany, “Development of flexibility and real option model for H<sub>2</sub> production and distribution infrastructure systems, £4,000 (2023)

### *Principal Investigator, National University of Singapore*

- National Research Foundation, Campus for Research Excellence And Technological Enterprise, Singapore-ETH Centre, “Future Resilient Systems”, SGD \$824,000 (2014-2017)
- Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-079-112, “Simulation Gaming in Flexible Emergency Medical Service System”, SGD \$180,000 (2014-2017)
- Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-061-133, “Design of Engineering Systems for Uncertainty and Flexibility”, SGD \$180,000 (startup grant, 2011-2014)
- Ministry of Education, Faculty Research Committee AcRF Tier 1 R-266-000-112-114, “An Integrated Decision Support System (DSS) for Emergency Infrastructure Systems”, SGD \$160,000 (2017-2020)
- 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”, SGD \$153,400 (2014-2015)

- 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”, SGD \$150,000 (2012-2014)
- 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”, \$120,000 (2012-2013)
- 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”, SGD \$72,500 (2013-2014)

*Co-Investigator, Imperial College London*

- Hitachi Ltd. and Hitachi Europe Ltd., “Hitachi and Imperial Centre for Decarbonization and Natural Climate Solutions”, £5,500 out of £3 million (2022-2027)
- UK Engineering and Physical Sciences Research Council (EPSRC) grant EP/R513052/1, “Doctoral Training Partnership for the Dyson School of Design Engineering”, (Dyson School startup PhD studentship), £85,000 out of £15 million (2019-2023)

*Co-Investigator, National University of Singapore*

- National Research Foundation, Campus for Research Excellence And Technological Enterprise, “Energy and Environmental Sustainability Solutions for Megacities – Phase II”, (collaborator upon joining Imperial College), SGD \$500,000 out of \$32.5 million (2018-2022)
- Energy Market Authority, “Advanced Solar Power Forecasting for Safe and Reliable PV Grid Integration in Singapore”, SGD \$500,000 out of \$6.2 million (2018-2022)
- National Research Foundation, Campus for Research Excellence And Technological Enterprise, “Energy and Environmental Sustainability Solutions for Megacities”, SGD \$500,000 out of \$40 million (2012-2017)

*Collaborator*

- UK EPSRC grant EP/K007580/1, “Management of Nuclear Risk Issues: Environmental, Financial and Safety (NREFS)”, £5,000 out of £500,000, (2012-2013)
- UK Research and Innovation (UKRI) Global Challenge Research Funds, “Energy for Development – Low Carbon Energy and Industry for Economic Growth in Mongolia” (joined project after start), £0 out of £117,550 (2020-2023)
- Imperial-TUM Collaboration Fund, “TANGIBILITY for Transdisciplinary AR/VR Practice in Mobility Futures”, £0 out of £6,200 (2021-2022)

## **Journal Articles**

- [1] C. Caputo, M.-A. Cardin, P. Ge, F. Teng, A. Korre, and E. Antonio del Rio Chanona, "Design and Planning of Flexible Mobile Micro-Grids Using Deep Reinforcement Learning," *Applied Energy*, vol. 335, p. 120707, 2023/04/01/ 2023. doi: <https://doi.org/10.1016/j.apenergy.2023.120707>
- [2] S. Zhao, W. B. Haskell, and M.-A. Cardin, "A Flexible System Design Approach for Multi-Facility Capacity Expansion Problems with Risk Aversion," *IIE Transactions*, vol. 55, pp. 187-200, 2023/02/01 2023. doi: 10.1080/24725854.2021.2022815
- [3] A. M. Caunhye, M. A. Cardin, and M. Rahmat, "Flexibility and Real Options Analysis in Power System Generation Expansion Planning under Uncertainty," *IIE Transactions*, 2022. doi: 10.1080/24725854.2021.1965699
- [4] J. Anderson, M.-A. Cardin, and P. Grogan, "Design and Analysis of Flexible Multi-Layer Staged Deployment for Satellite Mega-Constellations under Demand Uncertainty," *Acta Astronautica*, 2022/05/30/ 2022. doi: <https://doi.org/10.1016/j.actaastro.2022.05.022>



- [5] J. T. Allison, M.-A. Cardin, C. McComb, Y. Ren, D. Selva, C. S. Tucker, P. Witherell, and Y. F. Zhao, "Special Issue: Artificial Intelligence and Engineering Design," *ASME Journal of Mechanical Design*, pp. 1-6, 2022. doi: 10.1115/1.4053111
- [6] C. Caputo and M. A. Cardin, "Analyzing Real Options and Flexibility in Engineering Systems Design Using Decision Rules and Deep Reinforcement Learning," *ASME Journal of Mechanical Design*, vol. 144, 2022. doi: 10.1115/1.4052299
- [7] A. F. Abdin, A. Caunhye, E. Zio, and M. A. Cardin, "Optimizing Generation Expansion Planning with Operational Uncertainty: A Multistage Adaptive Robust Approach," *Applied Energy*, vol. 306, pp. 1-18, 2022. doi: 10.1016/j.apenergy.2021.118032
- [8] A. Mijic, J. Whyte, R. Myers, P. Angeloudis, M.-A. Cardin, M. Stettler, and W. Ochieng, "Reply to a Discussion of 'a Research Agenda on Systems Approaches to Infrastructure' by David Elms," *Civil Engineering and Environmental Systems*, vol. 38, pp. 295-297, 2021/10/02 2021. doi: 10.1080/10286608.2021.1980560
- [9] J. Whyte, A. Mijic, R. J. Myers, P. Angeloudis, M.-A. Cardin, M. E. J. Stettler, and W. Ochieng, "A Research Agenda on Systems Approaches to Infrastructure," *Civil Engineering and Environmental Systems*, vol. 37, pp. 214-233, 2020/10/01 2020. doi: 10.1080/10286608.2020.1827396
- [10] B. Heydari, Z. Szajnfarder, Panchal, J., , M.-A. Cardin, K. Holtta-Otto, and G. E. Kremer, "Special Issue: Analysis and Design of Sociotechnical Systems," *ASME Journal of Mechanical Design*, vol. 142, 2020. doi: 10.1115/1.4048699
- [11] 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.
- [12] 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>
- [13] 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 2018. doi: 10.1016/j.eneco.2018.03.014
- [14] S. Zhao, W. B. Haskell, and M.-A. Cardin, "Decision Rule-Based Method for Flexible Multi-Facility Capacity Expansion Problem," *IIEE Transactions*, vol. 50, pp. 553-569, 2018/07/03 2018. doi: 10.1080/24725854.2018.1426135
- [15] 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
- [16] 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.tre.2017.09.003>
- [17] 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
- [18] 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
- [19] 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
- [20] 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
- [21] 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



- [22] 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
- [23] 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
- [24] 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
- [25] 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
- [26] 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
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## Software

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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Sizhe Zhang†	06/2016	NUS	Lead Data Scientist, Tencent
Yinghan Deng†	03/2016	NUS	Data Science Lead, Airwallex
Ashwani Kumar†	04/2015	NUS	Senior Civil Servant, Gov. of India
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Davis Bigestan*	11/2022	Imperial College	MSc, Sustainable Energy Futures
Alexander Gibson*	11/2022	Imperial College	MEng, Design Engineering
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Alexandre Sayegh*	11/2022	Imperial College	MEng, Design Engineering
Christina-G. Serghides*	11/2022	Imperial College	MEng, Design Engineering
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Rachel Brown*	11/2021	Imperial College	MEng, Design Engineering
Trevor Fung†	11/2021	Imperial College	MEng, Design Engineering
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Jingui Wu*	11/2021	Imperial College	MSc, Computing
Amine Benchrif*	11/2020	Imperial College	MSc, Sustainable Energy Futures
Aaron Carver†	11/2020	Imperial College	MSc, Sustainable Energy Futures
Bruno Cameran†	11/2020	Imperial College	MSc, Sustainable Energy Futures
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## Teaching

<u>Undergraduate</u>	<u>Topic</u>	<u>Institution</u>
DESE-50001†	Data Science	Imperial College
DESE-60001	Design Engineering Futures	Imperial College
DESE-60004§	Optimisation (3 <sup>rd</sup> and 4 <sup>th</sup> years)	Imperial College
DESE-60007§	Consultancy for Mars Settlement Design	Imperial College

† Sole supervisor

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§ Co-instructor



DESE-60011 <sup>‡</sup>	Economics and Finance for Systems Design	Imperial College
DESE-70002	Master's Project	Imperial College
DESE-97001	Industry Placement	Imperial College
IE2140 <sup>§</sup>	Engineering Economy	NUS

<u>Graduate</u>	<u>Topic</u>	<u>Institution</u>
GID <sup>§</sup>	Context in Engineering	Imperial College
GID	Gizmo V	Imperial College
GID	Major Project	Imperial College
DTS5726 <sup>‡</sup>	Fundamentals of Systems Eng. & Architecting	NUS
IE5003 <sup>‡</sup>	Cost Analysis and Engineering Economy	NUS
IE5402 <sup>‡</sup>	Introduction to Systems Eng. & Architecture	NUS
IE5407 <sup>‡</sup>	Flexibility in Engineering Systems Design	NUS
IE6099 <sup>‡</sup>	ISE Research Methodology	NUS
ESD.70 <sup>‡</sup>	Engineering Economy Module	MIT