

Christopher Mabey

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Research Interests

Engineering for Global Development, Data-Driven Design, Predictive Modeling, Mechanical Design, Product Development, Human-Centered Design, Systems Engineering, Design Theory and Methodology

Education

PhD Mechanical Engineering

BRIGHAM YOUNG UNIVERSITY

Provo, Utah

Expected April 2023

- Dissertation Title: Computational Methods for Modeling, and Simulating the Impact of Engineered Products in Dynamic Sociotechnical Systems
- Dissertation defence scheduled for April 26, 2023
- Advisor: Dr. Christopher Mattson

BS Mechanical Engineering

BRIGHAM YOUNG UNIVERSITY

Provo, Utah

2014

Work Experience

PhD Candidate

BRIGHAM YOUNG UNIVERSITY

Provo, Utah

2019 - Present

- Create predictive models to increase the potential for positive social impact of engineered products
- Aid in NSF grant proposal preparation
- Extend the usefulness of agent-based models to include the impact of products
- Extract large data sets from databases for statistical analysis and machine learning algorithms
- Improve public relations efforts of research groups through the development of the BYU Global Development Initiative and the Design Exploration Research Group websites

Senior Research Fellow, Research Fellow

ENGINEERING FOR CHANGE

Remote

2021 - 2023

- Analyzed survey data to inform ASME climate action decisions
- Performed research to aid in the growth of the engineering for global development community
- Researched the needs of early career engineers
- Created framework and standard procedure for visualizing the career pathways of engineers
- Collaborated with global network of research fellows

Adjunct Faculty

BRIGHAM YOUNG UNIVERSITY

Provo, Utah

2015 - 2020

- Courses: ME EN 475 & ME EN 476 Product Development
- Taught students the product development process through experiential learning
- Mentored engineering students on their senior product development project
- Assessed and provided feedback on students' work
- Managed expectations for project with the sponsor
- Coordinated curriculum between students and the Mechanical Engineering Capstone Group

Teaching Assistant

BRIGHAM YOUNG UNIVERSITY

Provo, Utah

2019

- Course: Crocker Innovation Fellowship
- Taught students principles of innovation and product development in two semester course
- Aided in developing classroom activities to achieve learning objectives
- Prepared and taught lecture on supply chain and manufacturing products

Marketing and Project Manager

FEZZARI BICYCLES

Lindon, Utah

2016 - 2018

- Created test plans for new products
- Created and implemented strategies for the launch of new products
- Managed marketing team working across various platforms
- Implemented project management and automation systems to streamline organization tasks

Co-founder & Director of Product Development

Provo, Utah
2014-2016

CAPTURE BEYOND LIMITS LLC.

- Generated over \$100k in revenue with products sold to 31 different countries
- Developed innovative photography and video equipment for outdoor photographers.
- Developed road map of future products and future development strategy
- Coordinated manufacturing and supply chain of products

Founder

Provo, Utah
2013 - 2016

CHRIS MABEY PHOTOGRAPHY

- Created visual stories
- Work was featured by brands such as the BBC, The North Face, REI, Montbell and Pearl Izumi
- Worked on assignment with the National Parks Conservation Association to document government shutdown's effects on National Parks and surrounding communities

Undergraduate Research Assistant

Provo, Utah
2013 - 2014

BRIGHAM YOUNG UNIVERSITY

- Directed efforts in high speed photography
- Implemented sensors for precise timing of photographic experiments
- Created test apparatus for photography experiments

Honors & Awards

Paper of Distinction, ASME 2022 International Design Engineering Technical Conferences, August, 2022.

Research Fellowship, Engineering for Change, November, 2021 and November, 2022.

Student Leadership Grant, Weidman Center for Global Leadership, Brigham Young University College of Engineering, October, 2021.

3rd Place, OMEGA Research Poster Presentation, Brigham Young University Department of Mechanical Engineering, November, 2020.

Milton Van Dyke Gallery of Fluid Motion Award, Annual Meeting American Physical Society Division of Fluid Dynamics, November, 2014.

Most Innovative Design, University Rover Challenge, Mars Society, June, 2014.

Finalist, International Science Visualization Challenge (Vizzy), 2013.

Research

JOURNAL PUBLICATIONS

1. Liechty, J., **Mabey, C.**, Mattson, C., Salmon, J., Weaver, J., "Trade-off Characterization Between Social and Environmental Impacts Using Agent-Based Models and Life-Cycle Assessment," *ASME Journal of Mechanical Design*, doi: 10.1115/1.4056006, 2022.
2. Armstrong, A., Suk, H., **Mabey, C.**, Mattson, C., Hall, J., Salmon, J., "Systematic Review and Classification of the Engineering for Global Development Literature Based on Design Tools and Methods for Social Impact Consideration," *ASME Journal of Mechanical Design*, doi: 10.1115/1.4055325, 2022.
3. MacDonald, L., Thomas, E., Javernick-Will, A., Austin-Breneman, J., Aranda, I., Salvinelli, C., Klees, R., Walters, J., Parmentier, M., Schaad, D., Shahi, A., Bedell, E., Platais, G., Brown, J., Gershenson, J., Watkins, D., Obonyo, E., Oyanedel-Craver, V., Olson, M., Lau, R., Rao, G., Arzon, A., Krishnaswamy, K., Pickering, A., **Mabey, C.**, Johnson, A., Gehr, R., Linden, K., "Aligning learning objectives and approaches in global engineering graduate programs: Review and recommendations by an interdisciplinary working group," *Development Engineering*, vol. 7, p. 100095, doi: 10.1016/j.deveng.2022.100095, 2022.
4. **Mabey, C.**, Mattson C., Dahlin E. (October 1, 2021), "Assessing Global Needs When Identifying Potential Engineering for Global Development Projects." *ASME Journal of Mechanical Design*, 144(3): 031402, doi: 10.1115/1.4052223, March 2022.
5. **Mabey, C.**, Armstrong, A., Mattson, C., Salmon, J., & Hatch, N., "A computational simulation-based framework for estimating potential product impact during product design," *Design Science*, vol. 7, p. e15 doi: 10.1017/dsj.2021.16, 2021.

- Hurd, R., Fanning, T., Pan, Z., **Mabey, C.**, Bodily, K., Hacking, K., Speirs, N., Truscott, T., "Matryoshka cavity." *Physics of Fluids*, 27(9), 091104, doi: 10.1063/1.4930902, 2015.

JOURNAL PUBLICATIONS UNDER REVIEW OR IN FINAL PREPARATION

- Mabey, C.**, Mattson, C., Salmon, J. "Agent-Based Product-Social-Impact-Modeling: A Systematic Literature Review and Modeling Process." Status: Under review at the *Journal of Mechanical Design*.
- Mabey, C.**, Peiffer, E., MacCarty, N., Mattson, C., Salmon, J., "Simulating the Adoption and Social Impact of Improved Cookstoves in Uganda Using Agent-Based Modeling." Under review at the *Journal of Mechanical Design*.
- Burleson, G., Lajoie, J., **Mabey, C.**, Sours, J., Ventrella, J., Peiffer, E., Stine, E., Stettler Kleine, M., MacDonald, L., Austin-Breneman, J., Javernick-Will, A., Winter, A., Lucena, J., Knight, D., Daniel, S., Thomas, E., Mattson, C., Aranda, I. "Advancing sustainable development: Emerging factors and futures for the engineering field." Status: Under review at *Sustainability*.
- Mabey, C.**, Dickerson, T., Mattson, C., Salmon, J., "A Method for Navigating Social, Environmental, and Economic Product Impacts in Engineering Design." Status: Expected submission to *Journal of Mechanical Design*, April 2023.

PEER-REVIEWED CONFERENCE PROCEEDINGS

- Mabey, C.**, Mattson, C., Salmon, J. "Exploring the Usefulness of Agent-Based Product Social Impact Modeling Through a Systematic Literature Review." Proceedings of the ASME 2022 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. *In Press*
- Liechty, J., **Mabey, C.**, Mattson, C., Salmon, J., Weaver, J., "Trade-Off Characterization Between Social and Environmental Impacts Using Agent-Based Models and Life-Cycle Assessment." Proceedings of the ASME 2022 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. *In Press*
- Armstrong, A., Suk, H., **Mabey, C.**, Mattson, C., Hall, J., Salmon, J. "Systematic Review and Classification of Design Tools and Methods in the Engineering for Global Development Literature" Proceedings of the ASME 2022 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. **Paper of Distinction**, *In Press*
- Mabey, C.**, Armstrong, A., Mattson, C., Salmon, J., & Hatch, N., "A Framework For Predicting Potential Product Impact During Product Design." Proceedings of the Design Society, 1, 101-110. doi: 10.1017/pds.2021.11.
- Mabey, C.**, Mattson, C., & Dahlin, E. "Assessing Global Needs When Identifying Potential Engineering for Global Development Projects." Proceedings of the ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 11B: 46th Design Automation Conference (DAC). Virtual, Online. August 17–19, 2020. V11BT11A001. ASME. doi: 10.1115/DETC2020-22062.

TECHNICAL PRESENTATIONS

- Invited Presentation, International faculty research group, "Predictive Social and Environmental Impact Modeling and Trade-Off Analysis," Virtual, 2022.
- ASME 2022 International Design, Engineering, and Technical Conferences and Computers and Information in Engineering Conference, "Exploring the Usefulness of Agent-Based Product Social Impact Modeling Through a Systematic Literature Review," St. Louis, MO, August, 2022.
- ASME 2022 International Design, Engineering, and Technical Conferences and Computers and Information in Engineering Conference, Engineering for Global Development Poster Session, "Trade-Off Characterization Between Social and Environmental Impacts Using Agent-Based Models and Life-Cycle Assessment," St. Louis, MO, August, 2022.
- International Conference on Engineering Design 21, "A Framework for Predicting Potential Product Impact During Product Design," Virtual Conference, August, 2021.
- ASME 2021 International Design, Engineering, and Technical Conferences and Computers and Information in Engineering Conference, Engineering for Global Development Poster Session, "A Simulation-Based Framework for Estimating Potential Product Impact During Product Design," Virtual Conference, August, 2021.

6. OMEGA Research Poster Presentation, "A Framework for Maximizing the Potential Positive Impact of a Product Through Iterative Modeling of Product Parameters." Brigham Young University Department of Mechanical Engineering, November, 2020.
7. ASME 2020 International Design, Engineering, and Technical Conferences and Computers and Information in Engineering Conference "Assessing Global Needs When Identifying Potential Engineering for Global Development Projects," Virtual Conference, August, 2020.

PEER-REVIEWED CONFERENCE POSTERS

1. Fanning, T., **Mabey, C.**, Bodily, K., Hurd, R., Pan, Z., Boyer, M., & Truscott, T.T., "Matryoshka cavity", 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA. November 23-25, 2014. Milton Van Dyke winner
2. Hurd, R., **Mabey, C.**, Bodily, K., Jafek, Z., Hacking, K., & Truscott, T.T., "Confessions of a Sitzpinkler." 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.
3. Hurd, R., Bodily, K., **Mabey, C.**, Townsend, E., Belden, J. & Truscott, T.T., "Squishy spheres spawn sinuous sub-surfaces", 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburg, PA. November 24-26, 2013.

Professional Service

WORKSHOPS AND EVENTS

Design Justice Pedagogy Summit, Developed ways to incorporate diversity, equity, and inclusion principles into engineering curriculum, Cambridge, MA, August 24-26 2022.

ASME IShow Hardware Social Innovation Competition, Reviewed applications and facilitated competition sessions on customer knowledge, Virtual, July 19-22 2022.

The Design Society Africa Design Group Baraza, Considering the Social Impacts of Design, Presented on what types of social impact a product can have, Virtual, April 20 2022.

Engineering for Global Development Stakeholder Summit, Recorded insights from conversations on the future of Engineering for Global Development, ASME Engineering for Change, Virtual, January 2022.

Aligning Global Engineering Graduate Program Priorities Workshop, Developed learning outcomes for global engineering programs, University of Colorado Boulder, Virtual, February 18-19 2021.

JOURNAL AND CONFERENCE REVIEWS

Journal of Mechanical Design, Trans. ASME.

Proceedings of the ASME International Design Engineering Technical Conferences.

MEMBERSHIPS

Member, American Society of Mechanical Engineers (ASME).

Member, The Design Society.

Member, Engineering for Change.

Community Service and Outreach

Editor-in-Chief, "The BYU Design Review," review articles, develop strategy for community outreach through design articles, Brigham Young University, Provo, UT, <https://designreview.byu.edu>. August 2020 - July 2022.

Contributor, "The BYU Design Review," author design articles for a general audience, Brigham Young University, Provo, UT, <https://designreview.byu.edu>. October 2019 - July 2022.

Virtual Hour of Code Event, Code.org, taught elementary students basic programming, Cape Elizabeth, ME, December 2020.

Lab-o-Ween, hosted high school and undergraduate students to educate them about research in engineering, Brigham Young University, Provo, UT, October 2013, 2019.

Bicycle Maintenance Workshop, taught bicycle maintenance skills to a community youth group, Bountiful, UT, July 2017.

Science Sprouts, taught elementary school students about science through weekly activities, University of Utah, Salt Lake City, UT, October 2016-February 2017.

Utah Underwater Robotics, taught middle school students about engineering through an ROV competition, Brigham Young University, Provo, UT, March 2012, 2013.

Ironman St. George Triathlon, volunteer lifeguard at triathlon with 2000 participants, St. George, UT, May 2011.

Missionary Volunteer, full-time service volunteer living in Palau, Guam, and the Northern Mariana Islands, also managed travel for 80 volunteers across Micronesia region, Micronesia Guam Mission, Guam, USA, June 2008- June 2010