

CALL FOR PAPERS

Journal of Engineering Design

Special Issue on the Theory and Practice of Design Margins

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Engineered systems are the backbone of our technological society. These systems have become increasingly complex, and there is an ever-increasing demand for high resilience and adaptability. Engineers responsible for designing, upgrading, or redesigning such complex systems, therefore, must constantly manage — or find ways to cope with — frequent engineering changes, nonresolvable uncertainties and other undesirable effects arising from them. Margins have often been used by designers to counter these effects, yet the formal discussion and documentation of margins is limited.

In this special issue, we call for papers that offer advances in the perspective, philosophy, modeling, and valuation of design margins. Often emerging from the design process itself, margins can provide certain decision-making flexibility when faced with change and uncertainty. Advantages of margins include being able to potentially absorb the knock-on effects of change propagation and permitting adaptations that would otherwise be physically or economically unviable. Yet, there is also a need to ensure that margins are not used excessively, resulting in over-engineered and inefficient solutions. Further, improper allocation of margins may lead to them being unusable if designers do not understand how to use them when making a change to the system. Locating and sizing margins can especially be difficult when multiple design teams are involved, and each has their own working margins.

Margins play a critical role in the design process and the product. We see design margins as a foundational concept for effectively managing lifecycle-related challenges and for simulating the evaluation of both novel, technological products, and products which are incrementally improved. The papers published in this special issue will advance the discussion and documentation of margins in design activities across multiple domains. We also look for papers that address the significant lack of research literature surrounding the core concepts of margins including ontology, semantics and taxonomy. An increased focus on margins, combined with advancements in digital engineering, will offer new opportunities for improving the coordination and management of design changes in terms of documentation, modeling, and analyses. We also strongly encourage submissions that explore the definition and use of margins in a wide range of sociotechnical systems, such as health care. Such papers will introduce new perspectives how margins and design methods combine in delivering better value to stakeholders.

Relevant Papers Defining Margins in Engineering Design:

Toward formalizing the discussion and exploration of margins, we acknowledge the need for a consistent taxonomy. A sampling of relevant papers that establish the vocabulary and perspective around design margins include:

- Shabi, J., Reich, Y., Robinzon, R., and Mirer, T., 2021, "A Decision Support Model to Manage Overspecification in System Development Projects," *J. Eng. Des.*, 32(7): 323-345.
- Brahma, A., and Wynn, D. C., 2020, "Margin Value Method for Engineering Design Improvement," *Res. Eng. Des.*, 31(3), pp. 353–381.
- Eckert, C., Isaksson, O., Lebjoui, S., Earl, C. F., and Edlund, S., 2020, "Design Margins in Industrial Practice," *Des. Sci.*, 6.
- El Fassi, S., Guenov, M. D., and Riaz, A., 2020, "An Assumption Network-Based Approach To Support Margin Allocation And Management," *Proc. Des. Soc. Des. Conf.*, 1, pp. 2275–2284.
- Eckert, C., Isaksson, O., and Earl, C., 2019, "Design Margins: A Hidden Issue in Industry," *Des. Sci.*, 5, p. e9.
- Touboul, A., Barbedienne, R., and Edaliti, J. M., 2019, "Models of Margin: From the Mathematical Formulation to an Operational Implementation," 2019 4th International Conference on System Reliability and Safety, ICSRS 2019, Institute of Electrical and Electronics Engineers Inc., pp. 464–473.
- Cansler, E. Z., White, S. B., Ferguson, S. M., and Mattson, C. A., 2016, "Excess Identification and Mapping in Engineered Systems," *J. Mech. Des.*, 138(8), p. 81103.

Topic Areas:

The following is a non-comprehensive list of representative topics within scope of this Special Issue:

- Studies of design margins in practice and how they influence engineering design decision-making.
- Studies of designer perception of design margins and its usage in daily design practice.
- Studies on how margins are utilized as the design process progresses.
- Studies sizing and allocating suitable margins within components, products, and platforms.
- Studies that explore the definition and use of margins in a wide range of sociotechnical systems, such as health care.
- Modeling techniques for characterizing and quantifying design margins in new and existing products, including across multiple levels of hierarchy.
- Studies quantifying the value of design margins e.g., in terms of time, effort, performance or monetary cost.
- Formulation of optimization problems using design margins, including rationale for objective function creation.
- Studies that characterize the tradeoff between up-front costs and system changeability.
- Comparisons and contrasts of design margins with existing research on modularity, scalability, flexibility, changeability, design optimization etc.
- Margins in the context of mechanism design and manufacturing.
- Margins in the context of Design for X.

Publication Schedule:

Notification of Intent to Submit: October 3, 2022 (*Note: email any one of the guest editors*)

Full Papers Due for Review: January 9, 2023

Notification of Review Decision: April 10, 2023

Revised Manuscript Submission: June 12, 2023

Final Decision: August 14, 2023

Final Manuscripts: September 18, 2023

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Submission Instructions:

Please *prepare your paper* following the “Instructions for Authors” available from the Journal of Engineering Design website (<https://www.tandfonline.com/journals/cjen20>).

Please *submit your paper* directly to the journal at: <https://mc.manuscriptcentral.com/cjen>

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