

Uncertainty in Operations and Supply Chain Management

Overview

Uncertainty and risk have become increasingly salient constructs as global challenges, like COVID-19, geopolitical tensions, and climate change, recast the operating environment of many firms. Addressing these new sources of uncertainty and risk has required organizations to develop novel approaches to solving their operational problems, with concomitant opportunities for operations and supply chain management (OSCM) theory testing and elaboration as well as nascent theory development. This special issue seeks empirically grounded papers that capture how OSCM theory and models can aid organizations in their efforts to address different forms of uncertainty (*known, knowable, and unknowable unknowns*), and associated risks and opportunities.

Managing known uncertainties has often been the focus of the statistical methodologies, analytical models, and risk management approaches commonly used in OSCM (e.g., Ambulkar et al., 2015; Lu & Shen, 2020). This type of uncertainty centers on questions and contexts where the probability distributions that underpin outcomes or events are known. Examples of work in this domain include studies that examine uncertainty in the external environment like demand, prices, customer preferences, and government policy; as well as internal factors such as production yields and quality (e.g., Boute et al., 2021; Charpin, et al., 2021; Gao & Chen, 2015; Leung & Sun, 2021). Recent global and local challenges faced by firms offer rich opportunities to examine how extant approaches are best applied and adapted considering the breadth of feasible states that may emerge, the pace of change, and the scale with which some of the known uncertainties manifest.

OSCM also addresses contexts where uncertainty manifests in a potentially knowable manner. Like known uncertainty, with knowable uncertainty, there are underlying probability distributions driving the events, but these distributions are not identified. Reasons for this lack of identification can vary but include decisions where: the cost to know the distributions exceeds the value of knowing them; the time required to understand the distributions might surpass the time in which the knowledge would provide actionable insights; or the distributions might depend on the actions of other actors. In the face of these issues, firms might revisit choices around complexity and complicatedness, the behavioral decisions of managers, and their factual and counterfactual methods of inquiry (e.g., Browning & Ramasesh, 2015; Feduzi et al., 2021; Ramasesh & Browning, 2014).

Some events are not just unforeseen but unforeseeable. These unknowable unknowns are also referred to as black swans or ignorance (Hubbard, 2009; Taleb, 2010). While less central to the existing OSCM research, there may be opportunities to extend our knowledge base to incorporate this form of uncertainty. For example, organizational efforts to build robustness may alter the consequences of uncertainty, irrespective of whether it was foreseen or foreseeable (Chod et al., 2021; Sommer & Loch, 2009).

In all instances where uncertainty manifests, the implications for OSCM outcomes may be positive or negative. Opportunity manifests when uncertainty presents the possibility of a desirable, rewarding outcome such as innovation, growth, or other forms of success (e.g., Browning 2014). As organizations balance efficiency with sensing and responding efforts, managers may not,

however, be positioned to exploit opportunities that emerge unexpectedly (Saunders et al., 2021). Similarly, unrealized opportunities may be under-valued in the OSCM field because managers may not know ex-post that a valued opportunity was missed (e.g., de Treville et al., 2014). By contrast, risk manifests when uncertainty presents the possibility of an undesirable outcome (Hubbard, 2009). The losses associated with risk include inferior performance, misaligned strategies, or even outright dissolution. Disambiguating the risk and opportunity components from uncertainty more generally allows for more nuanced OSCM theorizing, including the identification of important moderating and mediating factors.

We seek papers that enrich the OSCM field by presenting novel theoretical and empirical insights related to the three forms of uncertainty (known, knowable, and unknowable unknowns) as well as the conditions under which uncertainty may manifest as risk or opportunity. Approaches to increasing understanding can range from mitigating risk, controlling uncertainty, incorporating uncertainty in decision-making and strategy formulation, or developing pathways to realize opportunities emerging from uncertainty. We particularly encourage manuscripts that contribute to theory, or that use uncertainty and risk as boundary-spanning objects to connect with theoretical frameworks from other fields. We are open to novel methodologies and data gathering strategies including intervention-based studies (see Chandrasekaran et al., 2020). The research presented should be empirically based. We welcome papers that examine diverse industry contexts, national or international settings, and levels of analysis.

The following list provides examples of the range of topics that would fit the theme of the special issue, grouped into two categories: 1) understanding uncertainty, and 2) the outcomes of uncertainty. Authors are encouraged to reach out to the SI team if they have questions regarding fit.

Uncertainty in OSCM and the strategies, processes, and structures best designed to accommodate it:

- *Planning and decision making in response to uncertainty.* How do OSCM executives develop a theory of action? How do different forms of uncertainty and uncertainty transitions manifest in planning and decision-making processes (e.g., Packard et al., 2017)? What new approaches have managers relied upon to source data, information, and evidence from recent, significant world events, and what heuristics and cognitive factors limit or enrich the use of such data in OSCM decision-making? What happens when knowable uncertainty transitions towards known uncertainty? For example, how have improvements in our understanding of climate change influenced decision-making and reshaped OSCM strategies?
- *Assessing and understanding uncertainties.* What are the boundary conditions that distinguish between known, knowable, and unknowable uncertainty? How can the tools of “directed recognition” best be utilized to convert unknowns from unknown to known (Browning & Ramasesh, 2015)? What managerial strategies and cognitive approaches limit the efficacy of OSCM tools and constrain organizational abilities to mitigate risk or embrace opportunity? How do more flexible technologies help firms operate with partial knowledge, such as in contexts where knowledge on some but not all states or their probabilities exist? How do firms modify their processes when their knowledge of uncertainty improves? What are the relative merits of managerial perceptions of uncertainty and ‘objective’ metrics for

studies of OSCM practice and interventions (e.g., Charpin et al., 2021), and what are the drivers of superior organizational awareness and capabilities for assessing and understanding uncertainty?

- *Structuring organizations and their assets.* How do we value and use organizational structures and routines, and configure organizational assets, to respond to uncertainty (Lampert et al., 2020; Osadchiy et al., 2021)? This could include strategies for redeploying manufacturing and sourcing assets to meet environmental opportunities (e.g., demand for personal protection equipment) and address emergent problems (e.g., re-shoring or dual sourcing to respond to supply-chain discontinuities, Goldschmidt et al., 2020).

The factors that lead to uncertainty being a source of opportunity versus risk, and mediating and moderating influences. Examples include:

- *Value of reducing uncertainty.* What tradeoffs exist between the time and effort required to mitigate uncertainty and the gains from knowing, predicting, or understanding the uncertainty better (e.g., Elmachtoub & Grigas, 2021)? What is the value of learning to reduce uncertainty (e.g., Browning 2019), through for example, more flexible resources in digitalized design, manufacturing, services? What are the unforeseen outcomes of resolving an uncertainty?
- *Embracing uncertainty or reducing the risk associated with uncertainty.* Can uncertainty contribute to new goals and purposes? What role does creation, experimentation, and innovation play in addressing uncertainty? Firms can revisit and redesign established OSCM approaches to create organizational and supply chain resiliency, reduce risks, and seize opportunities (e.g., Öhman et al., 2021). The OSCM literature has also examined financial hedging and other financial models to manage risk (Brusset & Bertrand, 2018; Serrano et al., 2018). What are the relative merits of these different risk control and mitigation strategies (e.g., Markou & Corsten, 2021)? Does their efficacy vary based on where the uncertainty manifests in the firm's value chain or the types of operational practices underpinning its OSCM processes?

3. Timeline

The deadline for initial manuscript submission is September 30, 2022, with early submission encouraged. Manuscripts will be evaluated as soon as they are received, with first-round decisions no later than December 2022. Revisions will be due on or before March 31, 2023, and final decisions will be made by June 2023.

4. Guest Editors

Stephen Disney is a Professor of Operations at the University of Exeter Business School, UK. Steve's research examines the dynamic, stochastic, and economic performance of supply chains with a focus on the bullwhip effect, forecasting, and inventory management.

Jan Holmström is a Professor of Operations Management at the Department of Industrial Engineering and Management at Aalto University, Finland, and is an Associate Editor for *JOM*. Jan's main research interest is on the impact of technology on OM concepts and practices.

Benn Lawson is an Associate Professor of Operations Management at Judge Business School at the University of Cambridge, UK. Benn's research focuses on supply chain strategy and managing the product design-supply chain management interface.

Frits Pil is a Professor of Business Administration and Research Scientist at the University of Pittsburgh, USA. Frits' research focuses on value creation and knowledge management within and across firms.

Christopher Tang is a UCLA Distinguished Professor and Edward W. Carter Chair in Business Administration. Chris's research focuses on managing supply chains in uncertain times with visibility, integrity, and agility.

5. References

- Ambulkar, S., Blackhurst, J., Grawe, S., 2015. Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management* 33: 111-122.
- Boute, R., Disney, S.M., Gijsbrechts, J., Van Mieghem, J.A., 2021. Dual sourcing and smoothing under non-stationary demand time series: Re-shoring with SpeedFactories. Forthcoming in *Management Science*.
- Browning, T.R. 2014. A quantitative framework for managing project value, risk, and opportunity, *IEEE Transactions on Engineering Management* 61(4): 583-598.
- Browning, T.R. 2019. Planning, tracking, and reducing a complex project's value at risk, *Project Management Journal* 50(1): 71-85.
- Browning, T.R., Ramasesh R.V., 2015. Reducing unwelcome surprises in project management, *MIT Sloan Management Review* 56(3): 53-62.
- Brusset, X., Bertrand, J.L., 2018. Hedging weather risk and coordinating supply chains. *Journal of Operations Management* 64: 41-52.
- Chandrasekaran, A., Treville, S., Browning, T., 2020. Editorial: Intervention-based research —What, where, and how to use it in operations management. *Journal of Operations Management* 66: 370–378.
- Charpin, R., Powell, E.E., Roth, A.V., 2021. The influence of perceived host country political risk on foreign subunits' supplier development strategies. *Journal of Operations Management* 67(3): 329-359.
- Chod, J., Markakis, M. G., Trichakis, N., 2021. On the learning benefits of resource flexibility. Forthcoming in *Management Science*.
- de Treville, S., Petty, J.S., Wager, S., 2014. Economies of extremes: Lessons from venture-capital decision making. *Journal of Operations Management* 32(6): 387-398.
- Elmachtoub, A.N., Grigas, P. 2021. Smart "predict, then optimize". Forthcoming in *Management Science*
- Feduzi, A., Faulkner, P., Runde, J., Cabantous, L., Loch, C., 2021. Heuristic methods for updating small world representations. Forthcoming in *Academy of Management Review*.
- Gao, F., Chen, J., 2015. The role of discount vouchers in market with customer valuation uncertainty. *Production and Operations Management* 24(4): 665-679.
- Goldschmidt, K., Kremer, M., Thomas, D.J., Craighead, C.W., 2021. Strategic sourcing under severe disruption risk: learning failures and under-diversification bias. *Manufacturing and Service Operations Management* 23(4): 761-780.
- Graves, S.C. 2021. Reflections on the evolution of operations management. Forthcoming in *Management Science*.
- Hubbard, D. 2009. *The Failure of Risk Management: Why It's Broken and How to Fix It*, Chapter 5. Wiley & Sons, Hoboken, NJ.
- Lampert, C.M., Kim, M., Polidoro, F., 2020. Branching and anchoring: Complementary asset configurations in conditions of Knightian Uncertainty. *Academy of Management Review* 45(4): 847–868.
- Leung, W.S., Sun, J., 2021. Policy uncertainty and customer concentration. *Production and Operations Management* 30: 1517–1542.
- Lu, M., Shen, Z.J.M., 2020. A review of robust operations management under model uncertainty. *Production and Operations Management* 30: 1927-1943.

Special Issue in the *Journal of Operations Management*: Call for Papers

- Markou, P., Corsten, D., 2021. Financial and Operational Risk Management: Inventory Effects in the Gold Mining Industry. Forthcoming in *Production and Operations Management*.
- Öhman, M., Hiltunen, M., Virtanen, K., Holmström, J. 2021. Frontlog scheduling in aircraft line maintenance: From explorative solution design to theoretical insight into buffer management. *Journal of Operations Management* 67: 120-151.
- Osadchiy, N., Schmidt, W., Wu, J. 2021. The bullwhip effect in supply networks. Forthcoming in *Management Science*.
- Packard, M.D., Clark, B.B., Klein, P.G. 2017. Uncertainty types and transitions in the entrepreneurial process. *Organization Science* 28(5): 840-856.
- Ramasesh, R.V., Browning, T.R., 2014. A conceptual framework for tackling knowable unknown unknowns in project management. *Journal of Operations Management* 32: 190–204.
- Saunders, L.W., Merrick, J.R., Holcomb, M.C., 2021. Microdosing flexibility in an efficient supply chain. *Journal of Operations Management* 67(3): 407-416.
- Serrano, A., Oliva, R., Kraiselburd, S., 2018. Risk propagation through payment distortion in supply chains. *Journal of Operations Management* 58: 1-14.
- Sommer, S.C., Loch, C.H., 2009. Incentive contracts in projects with unforeseeable uncertainty. *Production and Operations Management* 18: 185-196.
- Taleb, N.N. 2010. *The Black Swan. The Impact of the Highly Improbable*. Penguin Books, London.