横浜国立大学

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<tr><td>学 位 論 文 題 目</td><td>Real Applications of the Multistage One-shot Decision-making Approach in a Public Sector Institution in the Sultanate of Oman
〔オマーンのスルタン国の公共セクター機関における多段階ワンショット意思決定アプローチの実際の応用〕</td></tr>
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論文の要旨

This research delves into the complexities of decision-making under uncertainty, exploring the application of the Multistage One-Shot Decision-Making Approach (MOSDMA) and its foundational theories, the One-Shot Decision Theory (OSDT) and the Focus Theory of Choice. Addressing the gap between theoretical models and practical decision-making, the study demonstrates MOSDMA's efficacy in real-world scenarios, particularly in reevaluating decision problems in IT project management and other fields. The approach, which is yet to be widely applied in practice, offers a novel perspective on decision-making by integrating scenario-based thinking, which is particularly effective in one-shot, non-repetitive decision scenarios.

The research contributes to the field by extending MOSDMA to multiple criteria evaluation problems, involving both quantitative and qualitative data. The methodology developed comprises a three-step process starting from an initial case review, through the customization of a decision-making toolkit, to the final application of MOSDMA. This approach is exemplified in three case studies, each underscoring MOSDMA's practicality and alignment with intuitive, human-centric decision-making, as opposed to traditional methods like Subjective Expected Utility (SEU).

The findings highlight MOSDMA's potential in facilitating informed decisions that are mathematically

rigorous yet closely aligned with human intuition and satisfaction levels. The study concludes that MOSDMA, bolstered by the developed methodology, paves the way for a new era in decision-making. It emphasizes the need for continued research to refine the approach, suggesting a promising future for decision-making processes that balance systematic, evidence-based strategies with a deep understanding of human psychology. This research signifies a step towards a future where decision-making is not only systematic and evidence-based but also deeply human-centric, indicating a rich field of opportunities for further exploration and refinement.

In the MOSDMA, one state or scenario (focus point) is selected at each stage according to the decision-maker's attitude toward satisfaction and likelihood. The sequence of optimal decisions is established by the suggested backward induction, which is suitable for deciding on multistage one-shot decision problems. Most traditional approaches are possibilistic lottery-based, whereas the MOSDMA is scenario-based and offers an essential substitute for solving multistage decision-making under uncertainty problems. Moreover, the MOSDMA is the first approach that handles the optimal stopping problem in possibilistic dynamic systems.

This research proposes the application of the Multistage One-Shot Decision-Making Approach (MOSDMA) to re-evaluate two prior decision problems and one ongoing decision problem. The aim is to ascertain the ease and efficacy of implementing MOSDMA in practical settings. As the approach has not yet been applied in practice, this study pioneers the use of MOSDMA in addressing real-world decision-making challenges, thereby bridging the existing gap in its practical application. The adoption of such methodologies by organizations offers practical experience, which is instrumental in narrowing the divide between theoretical models and their real-world application. Consequently, this facilitates a deeper understanding of how such decision-making models can be advanced in fields such as IT project decision-making, decision governance, and activities related to decision evaluation. Furthermore, this methodological exercise provides a framework for evaluating historical decisions, encompassing lessons-learned activities, auditing, consulting, and governance, as well as for dealing with future uncertainties. In the theoretical contribution, this research successfully extended the MOSDMA for a multiple criteria evaluation problem involving quantitative and qualitative data.

Despite the promising trajectory, the existing literature reveals a gap in understanding the practical applicability and efficiency of these mathematical models, a gap this research aspired to fill through the application of MOSDMA. The MOSDMA was successfully applied to reevaluate former decision problems in actual practice in (Aishanfari & Guo, 2021; Al-Shanfari, 2022, 2023a, 2023b). The third case is the first attempt to utilize the MOSDMA to make an informed decision about a new investment problem that contributes to a completely new segment and provides valued insights on the practical applications of new decision problems for further improvements.

In the first case study, the MOSDMA was employed to revisit a past decision problem, marking its inaugural application in a real-world scenario. Despite being in its nascent stage, the approach demonstrated promising potential in reevaluating past decisions, aligning well with stakeholders' satisfaction levels and intuitive expectations. The study underscored the necessity for further research to enhance both the theoretical and practical dimensions of MOSDMA, paving the way for its application in contemporary decision problems and diverse organizational settings.

The second case study further validated the effectiveness of MOSDMA in reevaluating a high-value IT project investment decision. It showcased the approach's ability to foster confidence, satisfaction, and ownership of the decision, emphasizing the potential of MOSDMA in facilitating informed decision-making in similar business environments and IT project settings. The study also brought to light the untapped potential of decision-making tools like decision trees in the realm of IT project management.

In the final case study, MOSDMA was applied to a new business multistage decision problem under uncertainty, offering a fresh perspective on the problem at hand. The approach proved to be practical, understandable, and easy to apply, marking a significant milestone in the ongoing journey of MOSDMA's real-world applications. It underscored the approach's potential in evaluating both new and historical decisions, serving as a valuable tool in auditing, consulting, and governance spheres.

While stochastic dynamic programming and Subjective Expected Utility (SEU) methods indicate a preference for certain alternatives, MOSDMA excels in one-time, critical decision scenarios by providing not only a decision sequence but also the underlying rationale for each choice. This distinction is crucial, as MOSDMA offers a scenario-based, focused path that is particularly advantageous for singular decision events, a feature not readily replicated by traditional expected utility/value methods. The study concludes that MOSDMA's unique approach to decision-making substantiates its value in practical applications, bridging the gap between theoretical models and the realities of decision-making in complex environments.

Additionally, this study is enriched by the development of a comprehensive three-step methodology, which has been instrumental in operationalizing the Multistage One-Shot Decision-Making Approach (MOSDMA) across diverse case studies. This methodology commenced with an initial case review to garner foundational understanding (Step 1), progressed to the customization of a decision-making toolkit for robust data harvesting (Step 2), and culminated in the application of MOSDMA, coupled with a rigorous synthesis of results and discussions (Step 3). The deliberative inclusion of three participants ensured a balanced and meaningful dialogue, avoiding the pitfalls of oversimplification or excessive complexity in the decision-making simulation. The utilization of an Excel spreadsheet as part of the toolkit in Step 3 allowed for the precise calculation of outcomes, thereby facilitating an efficient and replicable decision-making process. This methodological framework stands as a cornerstone of the research, encapsulating the synergy between

academic rigor and pragmatic application, and serves as a substantive contribution to the field of decision-making under uncertainty.

In conclusion, this dissertation stands as a testament to the burgeoning potential of MOSDMA, a beacon guiding us toward a future of decision-making that is not only systematic and evidence-based but also deeply human-centric, offering a rich tapestry of opportunities for further exploration and refinement in the dynamic landscape of decision-making under uncertainty.

審査結果の要旨

　　本論文は、多段階ワンショット意思決定アプローチを用いて、オマーンセントラルバンクにおける内部監査 IT プロジェクトと部門横断的な IT プロジェクトおよびセントラルバンクの博物館再建問題に適用し、多段階ワンショット意思決定アプローチの有効性を検証し、如何に効率よく応用するかについての研究である。本研究の貢献は主に以下の三点である。

1.　　従来の不確実性下の意思決定モデルは主に効用関数をベースにしたものであり、意思決定者の思考過程からかけ離れており、沢山の意思決定モデルを提案したが、現実問題を解決するためには、依然として意思決定者の直感と経験に依存することがほとんどである。郭らは（2014）マルチステージ意思決定問題に対して初めて意思決定者の思考過程を考慮した多段階ワンショット意思決定アプローチを提案したが、このアプローチの有効性はまだ検証されてない。本論文はオマーンセントラルバンクにおける三つの大規模かつ複雑なプロジェクトへ適用し、多段階ワンショット意思決定アプローチの有効性を実証した。これは先駆的な研究であり、不確実性下における経営、経済および社会の意思決定問題を分析するための斬新な道筋を示すことができた。

2.　　スコアカードを用いて、多段階ワンショット意思決定アプローチを理論的に拡張し、従来の単一基準と定量なデータのみから定性的なデータ、多基準意思決定問題にも適応することができた。

3.　　多段階ワンショット意思決定アプローチの大規模かつ複雑な意思決定問題に適応するためのメソドロジーを提案した。この方法は、基礎的な理解を得るための初期レビュー（ステップ 1）から始まり、確実なデータ収集のための意思決定ツールキットのカスタマイズ、専門家の知識の抽出のためのディスカッション（ステップ 2）を経て、多段階ワンショット意思決定アプローチの適用とモデルの検証（ステップ 3）に進むものである。ステップ 3 では、ツールキットの一部としてエクセルのスプレッドシートを用いることで、研究結果の正確な計算が可能になる。これによって一連の作業が系統的かつ効率よく実行することができる。

　　本研究で多段階ワンショット意思決定アプローチが提案されてから初めての大規模かつ複雑な

現実問題への応用を行っただけでなく、理論的な拡張とメソドロジーも経営科学において重要な貢献であると言える。AL SHANFARI 氏は今までに国際会議論文（査読付き）を３編と国際学術ジャーナル論文（査読付き）を２編（そのうち SCI indexed 1 編）発表した。以上より審査委員一同は本学府の博士号審査基準①に照らして、AL SHANFARI 氏の学位請求論文「Real Applications of the Multistage One-shot Decision-making Approach in a Public Sector Institution in the Sultanate of Oman」が、博士（経営学）の学位を授与するのに相応しいものと判断する。