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Quantum-Inspired Mathematical Models for Complex Decision Systems

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Abstract

The increasing complexity of modern decision-making environments has challenged the effectiveness of classical mathematical models. Traditional probabilistic frameworks often struggle to represent uncertainty, ambiguity, contextual dependence, and nonlinear interactions among decision variables. Quantum-inspired mathematical models have emerged as a promising interdisciplinary approach that leverages mathematical principles derived from quantum theory without requiring quantum computing hardware. These models utilize concepts such as superposition, interference, entanglement, and contextuality to represent complex decision processes more accurately. This paper explores the theoretical foundations, mathematical structures, and applications of quantum-inspired decision models in complex systems. The study examines how quantum probability theory provides a more flexible representation of human cognition, organizational decision-making, financial forecasting, and artificial intelligence systems. Furthermore, the paper discusses mathematical formulations, implementation strategies, advantages, challenges, and future research directions. The findings suggest that quantum-inspired models offer significant potential for addressing uncertainty and dynamic interactions in

complex decision environments, thereby contributing to the advancement of intelligent decision support systems.

Keywords: *Quantum-inspired computing, Decision systems, Quantum probability, Mathematical modeling, Complex systems, Artificial intelligence*

1. Introduction

Decision-making is a fundamental process across numerous domains, including business management, healthcare, engineering, economics, and artificial intelligence. As modern systems become increasingly interconnected and data-rich, decision environments exhibit characteristics such as uncertainty, ambiguity, incomplete information, and nonlinear relationships. Classical mathematical models based on deterministic or probabilistic assumptions often fail to capture these complexities adequately (Bellman, 1957).

Traditional decision theories rely heavily on Bayesian probability and expected utility frameworks. While these methods have demonstrated effectiveness in structured environments, they frequently encounter limitations when human behavior deviates from rational assumptions or when contextual factors significantly influence outcomes (Kahneman & Tversky, 1979). Researchers have therefore sought alternative mathematical paradigms capable of modeling complex decision phenomena more realistically.

Quantum-inspired mathematical modeling represents one such paradigm. Unlike quantum computing, which requires physical quantum systems, quantum-inspired approaches utilize mathematical concepts derived from quantum mechanics to develop new computational and analytical models (Busemeyer & Bruza, 2012). These models exploit quantum probability structures to represent uncertainty, contextual dependencies, and dynamic interactions more effectively than classical approaches.

The emergence of quantum-inspired decision theory has opened new opportunities for understanding cognitive processes, optimizing organizational strategies, improving machine learning algorithms, and enhancing decision support systems. This paper investigates the theoretical foundations and practical applications of quantum-inspired mathematical models for complex decision systems.

2. Background and Literature Review

The origins of quantum-inspired decision models can be traced to efforts aimed at explaining anomalies in human decision-making that classical probability theory could not adequately address. Studies in cognitive psychology revealed systematic violations of classical probabilistic principles, including the conjunction fallacy, order effects, and context-dependent preferences (Tversky & Kahneman, 1983). Researchers observed that these phenomena could often be explained using quantum probability theory. Unlike classical probability, quantum probability allows events to exist in superposition states and enables interference effects among possible outcomes (Aerts, 2009). Consequently, decision outcomes become influenced by context and observation order.

Busemeyer and Wang (2015) demonstrated that quantum probability models successfully explain several cognitive paradoxes that challenge classical decision theories. Similarly, Pothos and Busemeyer (2013) highlighted the applicability of quantum cognition frameworks to judgment, memory, and preference formation.

In artificial intelligence, quantum-inspired algorithms have been developed for optimization and pattern recognition. Narayanan and Moore (1996) proposed early quantum-inspired neural networks, while more recent studies have explored quantum-inspired evolutionary algorithms for complex optimization tasks (Han & Kim, 2002).

Financial decision-making has also benefited from quantum-inspired approaches. Researchers have applied quantum probabilistic frameworks to market uncertainty, portfolio selection, and risk assessment, demonstrating improved predictive capabilities in volatile environments (Haven & Khrennikov, 2013).

The growing body of literature indicates that quantum-inspired models offer a promising alternative framework for representing and solving complex decision problems.

3. Theoretical Foundations of Quantum-Inspired Decision Models

3.1 Classical Probability versus Quantum Probability

Classical probability theory assumes that events possess definite states before observation. Probabilities are assigned based on fixed sample spaces and mutually exclusive outcomes.

Quantum probability, in contrast, represents states using vectors in a Hilbert space. A system can exist in multiple potential states simultaneously until observation occurs (Dirac, 1958).

The probability of observing a specific outcome is determined through the squared magnitude of the state vector projection onto the corresponding basis vector.

Mathematically, if ψ represents a state vector, the probability of observing outcome i is:

$$P(i) = |\langle i|\psi\rangle|^2$$

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This formulation allows for richer representations of uncertainty and contextual influence.

3.2 Superposition

Superposition enables a decision-maker to simultaneously consider multiple alternatives before reaching a final choice.

A quantum-inspired decision state can be expressed as:

$$|\psi\rangle = \alpha|A\rangle + \beta|B\rangle$$

where:

- |A⟩ and |B⟩ represent alternative decisions,
- α and β are probability amplitudes.

The normalization condition is:

$$|\alpha|^2 + |\beta|^2 = 1$$

Superposition captures indecision, ambiguity, and evolving preferences more naturally than binary representations.

3.3 Interference Effects

Interference occurs when decision pathways interact with one another.

The probability of an outcome becomes:

$$P = P_1 + P_2 + 2\sqrt{P_1 P_2}\cos(\theta)$$

where θ represents the phase relationship between alternatives.

Positive interference increases probabilities, while negative interference decreases them.

This mechanism explains many behavioral anomalies observed in human decision-making.

3.4 Contextuality

Contextuality implies that decisions depend on surrounding conditions and information structures.

Unlike classical systems, where probabilities remain fixed, quantum-inspired systems allow probability distributions to change according to contextual influences. This property makes quantum-inspired models particularly suitable for dynamic environments characterized by rapidly changing information.

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3.5 Entanglement

Entanglement describes interdependencies among variables that cannot be represented independently. In organizational decision-making, multiple departments may exhibit entangled behavior where decisions in one unit immediately influence outcomes in another. Entanglement provides a mathematical framework for modeling highly interconnected systems.

4. Mathematical Framework for Complex Decision Systems

Complex decision systems often involve numerous interacting variables.
A quantum-inspired decision model represents system states within an n-dimensional Hilbert space:

$$H = \mathbb{C}^n$$

Each possible decision corresponds to a basis vector.
The system state is represented as:

$$|\psi\rangle = \sum_{i=1}^{n} c_i |i\rangle$$

where:

$$\sum_{i=1}^{n} |c_i|^2 = 1$$

The evolution of decision states may be described using a unitary transformation:

$$|\psi(t)\rangle = U(t)|\psi(0)\rangle$$

where U(t) represents a decision evolution operator.
Decision outcomes are obtained through measurement operators:

$$M_i = |i\rangle\langle i|$$

and probabilities become:

$$P(i) = \langle\psi|M_i|\psi\rangle$$

This framework enables dynamic modeling of evolving preferences and uncertain environments.

5. Applications in Complex Decision Systems

5.1 Business and Strategic Management

Organizations operate within highly uncertain environments involving market fluctuations, technological disruptions, and competitive pressures.

Quantum-inspired decision models assist managers in evaluating multiple strategic alternatives simultaneously.

Applications include:

- Strategic planning
- Resource allocation
- Risk management
- Innovation assessment
- Supply chain optimization

By representing strategic options in superposition states, organizations can explore diverse scenarios before committing to specific actions.

5.2 Artificial Intelligence

Artificial intelligence systems increasingly require decision-making capabilities under uncertainty.

Quantum-inspired models contribute to:

- Intelligent agents
- Recommendation systems
- Autonomous systems
- Reinforcement learning
- Knowledge representation

Contextual decision mechanisms improve adaptability and responsiveness in changing environments.

Researchers have demonstrated that quantum-inspired optimization algorithms often converge more efficiently than conventional methods in complex search spaces (Han & Kim, 2002).

5.3 Healthcare Decision Support

Medical decision-making involves incomplete information, uncertain diagnoses, and evolving patient conditions.

Quantum-inspired approaches assist clinicians by modeling:

- Diagnostic uncertainty

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- Treatment selection
- Risk evaluation
- Personalized medicine

These models enable healthcare professionals to incorporate multiple competing hypotheses simultaneously, improving diagnostic accuracy.

5.4 Financial Systems

Financial markets exhibit nonlinear dynamics and behavioral complexities.

Quantum-inspired models have been applied to:

- Portfolio optimization
- Market prediction
- Risk assessment
- Asset valuation
- Trading strategies

Quantum probability structures capture investor behavior more effectively than classical rational-agent assumptions. Studies suggest that quantum-inspired financial models improve understanding of market volatility and irrational market reactions (Haven & Khrennikov, 2013).

5.5 Engineering Systems

Engineering systems are among the most complex decision environments because they involve numerous interconnected variables, uncertain operating conditions, resource constraints, and multiple optimization objectives. Traditional optimization approaches often struggle to address the dynamic interactions among system components, particularly when decisions made in one subsystem significantly affect the performance of others. Quantum-inspired mathematical models provide a powerful framework for addressing such multidimensional optimization challenges by incorporating principles such as superposition, interference, and entanglement into engineering decision-making processes. These models enable engineers to simultaneously evaluate multiple design alternatives and operational scenarios, thereby enhancing decision quality and system performance (Busemeyer & Bruza, 2012).

In infrastructure planning, quantum-inspired approaches facilitate the optimization of large-scale projects involving transportation networks, utility systems, and urban development. Infrastructure decisions often require balancing economic costs, environmental sustainability, and social benefits under uncertain future conditions. A quantum-inspired decision state can be represented as:

$$|\psi\rangle = \sum_{i=1}^{n} c_i |I_i\rangle$$

where |Ii⟩| represents a potential infrastructure configuration and c_i denotes the corresponding probability amplitude. The probability of selecting a particular infrastructure alternative is calculated using the Born rule:

$$P(I_i) = |c_i|^2$$

This formulation allows planners to model multiple future scenarios simultaneously and evaluate their potential impacts before implementation (Haven & Khrennikov, 2013).

Energy management systems also benefit significantly from quantum-inspired optimization. Modern energy grids must integrate renewable energy sources, fluctuating demand patterns, and storage technologies while maintaining reliability and efficiency. Classical optimization methods may fail to capture the nonlinear dependencies among these factors. Quantum-inspired models employ state-space representations that evolve dynamically according to unitary transformations:

$$|\psi(t)\rangle = U(t)|\psi(0)\rangle$$

where U(t) represents the evolution operator governing changes in energy demand, generation capacity, and resource allocation over time. Such formulations support adaptive energy management strategies capable of responding to real-time environmental and operational conditions (Aerts, 2009).

Transportation systems present another domain characterized by high levels of uncertainty and interdependence. Traffic flows, route selection, congestion patterns, and public transportation scheduling involve numerous interacting variables. Quantum-inspired models allow transportation planners to represent alternative routing decisions in superposition states and evaluate network-wide consequences before selecting a final strategy. Interference effects can be modeled using:

$$P = P_1 + P_2 + 2\sqrt{P_1 P_2}\cos(\theta)$$

where P_1 and P_2 represent alternative transportation pathways and θ captures contextual interactions between them. This interference term enables the model to account for emergent traffic patterns and collective behavioral effects that are difficult to represent using conventional methods (Pothos & Busemeyer, 2013).

Manufacturing optimization similarly benefits from quantum-inspired decision frameworks. Modern manufacturing systems involve production scheduling, inventory management, quality control, and supply chain coordination. The entanglement concept is particularly useful in representing dependencies among production stages. If two manufacturing variables are entangled, their combined state can be represented as:

$$|\Psi\rangle=\alpha|00\rangle+\beta|11\rangle$$

where the state of one production component cannot be considered independently of the other. This representation enables more effective optimization of interconnected manufacturing processes and improves overall operational efficiency (Han & Kim, 2002).

Network design and communication systems also involve highly interconnected structures where decisions regarding node placement, routing protocols, and bandwidth allocation influence overall performance. Quantum-inspired models facilitate holistic optimization by capturing the interdependencies among network elements. The ability to represent multiple potential configurations simultaneously enables more robust and resilient network architectures capable of adapting to changing operational conditions. Consequently, quantum-inspired mathematical frameworks provide valuable tools for engineering applications where complexity, uncertainty, and interdependence play critical roles in decision-making outcomes (Narayanan & Moore, 1996).

6. Advantages of Quantum-Inspired Models

Quantum-inspired mathematical models offer several significant advantages over traditional decision-making frameworks, particularly when addressing complex systems characterized by uncertainty, contextual dependence, and nonlinear interactions. One of the primary benefits is their enhanced representation of uncertainty. Classical probability theory assumes that decision states are fully defined before observation, whereas quantum-inspired probability allows decision states to exist in superposition, reflecting uncertainty more naturally. A general decision state can be represented as:

$$|\psi\rangle = \alpha|A\rangle + \beta|B\rangle$$

subject to the normalization condition:

$$|\alpha|^2 + |\beta|^2 = 1$$

This formulation captures situations in which multiple alternatives coexist simultaneously before a final decision is made, thereby providing a more realistic representation of uncertain environments (Busemeyer & Wang, 2015).

Another important advantage is context sensitivity. In many real-world situations, decision outcomes depend heavily on contextual factors, such as the order in which information is presented or the

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surrounding environment. Classical probabilistic models generally assume stable probability distributions, whereas quantum-inspired frameworks allow probabilities to evolve dynamically based on contextual influences. This contextual adaptability can be mathematically expressed through projection operators acting on state vectors:

$$P(i)=\langle\psi|Mi|\psi\rangle$$

Where M_i represents the measurement operator associated with a specific context. As contexts change, the resulting probabilities also change, allowing the model to reflect real-world decision dynamics more accurately (Aerts, 2009).

Quantum-inspired models also improve the representation of human cognition and behavior. Numerous studies have demonstrated that classical rational-choice theories often fail to explain cognitive biases, preference reversals, and paradoxical decision patterns observed in human behavior. Quantum probability theory successfully accounts for many of these phenomena by incorporating interference effects. The probability of an outcome may therefore be expressed as:

$$P = P_1 + P_2 + 2\sqrt{P_1 P_2}\cos(\theta)$$

Where the interference term captures cognitive interactions among competing alternatives. This capability enables quantum-inspired models to explain behavioral phenomena such as the conjunction fallacy and order effects that remain challenging for conventional theories (Tversky & Kahneman, 1983; Pothos & Busemeyer, 2013).

Efficient exploration of alternatives constitutes another major advantage. Superposition allows decision-makers to evaluate multiple possibilities simultaneously rather than sequentially. This characteristic is particularly valuable in optimization problems involving large search spaces. Instead of examining alternatives one at a time, the decision system considers numerous possibilities within a unified mathematical framework, thereby improving computational efficiency and solution quality (Han & Kim, 2002).

Furthermore, quantum-inspired models provide superior handling of interdependencies among decision variables through the concept of entanglement. In many organizational, engineering, and financial systems, variables interact in ways that cannot be adequately represented using independent probability distributions. Entangled states capture these relationships mathematically:

$$|\Psi\rangle=\alpha|00\rangle+\beta|11\rangle$$

Such representations facilitate more accurate modeling of interconnected systems and improve overall decision outcomes (Haven & Khrennikov, 2013).

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Finally, scalability represents an important practical advantage. Unlike quantum computing, which requires specialized hardware, quantum-inspired algorithms can be implemented on conventional computing platforms while leveraging mathematical principles derived from quantum theory. This accessibility enables organizations to benefit from advanced decision-making capabilities without substantial infrastructure investments. Consequently, quantum-inspired models provide a powerful and flexible framework for addressing complex decision problems across diverse application domains (Busemeyer & Bruza, 2012).

7. Challenges and Limitations

Despite their considerable potential, quantum-inspired mathematical models face several challenges and limitations that must be addressed before widespread adoption can occur. One of the most significant challenges is mathematical complexity. Quantum-inspired frameworks rely heavily on advanced concepts from linear algebra, vector spaces, matrix theory, and probability amplitudes. The state of a decision system is typically represented in a Hilbert space:

$$H = \mathbb{C}^n$$

Where decision alternatives correspond to basis vectors within a complex vector space. While mathematically elegant, such formulations often require specialized expertise that may not be readily available among practitioners and organizational decision-makers (Dirac, 1958).

Interpretability also presents a major concern. Traditional decision models generally produce outputs that are relatively straightforward to understand and explain. In contrast, quantum-inspired models employ abstract mathematical constructs such as superposition and entanglement, which may appear counterintuitive to users. As a result, stakeholders may find it difficult to understand how specific decisions are generated, potentially reducing trust and acceptance of the model's recommendations (Busemeyer & Wang, 2015).

Computational costs represent another limitation. Although quantum-inspired algorithms operate on classical hardware, large-scale implementations often involve high-dimensional state spaces and complex matrix operations. The computational burden increases substantially as the number of decision variables grows. For a system with nnn alternatives, the state vector dimension increases proportionally:

$$|\psi\rangle = \sum_{i=1}^{n} c_i |i\rangle$$

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and computational requirements may increase exponentially in certain applications, limiting scalability for extremely large decision systems (Han & Kim, 2002).

Data requirements also pose challenges. Accurate estimation of probability amplitudes, phase parameters, and contextual interactions requires substantial amounts of high-quality data. Insufficient or noisy data may reduce model reliability and predictive accuracy. In many real-world settings, collecting comprehensive datasets remains difficult due to privacy concerns, operational constraints, or resource limitations (Haven & Khrennikov, 2013).

Another limitation involves the lack of standardization within the field. Quantum-inspired decision science is still relatively young, and researchers have proposed numerous alternative frameworks, methodologies, and mathematical formulations. The absence of universally accepted standards can hinder model comparison, validation, and practical implementation. Consequently, organizations may face difficulties selecting appropriate modeling approaches for specific applications (Pothos & Busemeyer, 2013).

Finally, validation challenges remain a critical concern. Although quantum-inspired models have demonstrated success in explaining cognitive phenomena and solving optimization problems, empirical validation across diverse industries and application domains remains ongoing. Establishing robust performance benchmarks and conducting large-scale comparative studies will be essential for demonstrating the practical advantages of quantum-inspired approaches over conventional methods. Addressing these challenges through interdisciplinary research and methodological refinement will be crucial for realizing the full potential of quantum-inspired decision systems (Aerts, 2009).

8. Future Research Directions

The future of quantum-inspired mathematical modeling lies in the development of increasingly sophisticated frameworks capable of addressing the growing complexity of modern decision systems. One promising direction involves the integration of classical optimization methods with quantum-inspired probability structures. Hybrid classical-quantum models seek to combine the computational efficiency of traditional algorithms with the contextual and probabilistic advantages of quantum-inspired approaches. Such hybrid systems may be represented through composite objective functions:

$$F(x) = \lambda F_C(x) + (1 - \lambda)F_Q(x)$$

where FC(x) represents the classical optimization component, FQ(x) denotes the quantum-inspired component, and λ controls their relative influence. This integration has the potential to improve optimization performance across diverse application domains (Busemeyer & Bruza, 2012).

Another important research area involves the development of explainable quantum-inspired artificial intelligence. As AI systems become increasingly influential in decision-making processes, transparency and interpretability have become essential requirements. Future research will likely focus on designing quantum-inspired frameworks that provide clear explanations for decision outcomes while maintaining high predictive accuracy. Such developments could significantly increase user trust and facilitate adoption in critical domains such as healthcare, finance, and public policy (Busemeyer & Wang, 2015).

Real-time decision systems represent another promising avenue for investigation. Modern environments generate continuously evolving streams of information, requiring adaptive decision mechanisms capable of responding rapidly to changing conditions. Quantum-inspired state evolution models,

$$|\psi(t)\rangle = U(t)|\psi(0)\rangle$$

offer a mathematical foundation for real-time adaptation and dynamic learning. These capabilities could prove particularly valuable in autonomous systems, smart manufacturing, and cybersecurity applications (Aerts, 2009).

Future research is also expected to explore multi-agent systems in which multiple decision-makers interact within shared environments. Entanglement-inspired representations may facilitate more effective coordination and cooperation among autonomous agents by modeling collective decision states that cannot be decomposed into independent components. Such approaches could significantly enhance the performance of distributed intelligent systems (Haven & Khrennikov, 2013).

The emergence of smart cities presents additional opportunities for quantum-inspired decision modeling. Urban environments involve complex interactions among transportation systems, energy networks, communication infrastructures, and public services. Quantum-inspired frameworks capable of representing contextual and interconnected relationships may provide powerful tools for optimizing urban planning and resource management strategies.

Finally, the integration of quantum-inspired concepts with deep learning architectures constitutes one of the most exciting research frontiers. Quantum-inspired neural networks may exploit superposition, interference, and contextuality to enhance learning efficiency and predictive performance. Combining quantum-inspired mathematical structures with advanced machine learning techniques could lead to the development of next-generation intelligent systems capable of solving increasingly complex decision problems. Continued collaboration among mathematicians, engineers, computer scientists, cognitive researchers, and decision theorists will be essential for advancing these emerging research directions and unlocking the full potential of quantum-inspired decision science (Pothos & Busemeyer, 2013).

9. Conclusion

Quantum-inspired mathematical models represent an innovative and powerful approach for addressing the challenges of complex decision systems. By incorporating concepts such as superposition, interference, contextuality, and entanglement, these models provide richer representations of uncertainty and dynamic interactions than traditional frameworks. Applications across business management, artificial intelligence, healthcare, finance, and engineering demonstrate their versatility and effectiveness. Although challenges related to complexity, interpretability, and validation remain, ongoing research continues to refine theoretical foundations and practical implementations. As computational capabilities advance and interdisciplinary collaboration expands, quantum-inspired decision models are likely to become increasingly important tools for solving real-world decision problems. Their ability to capture the nuanced and interconnected nature of modern systems positions them as a promising frontier in mathematical modeling and intelligent decision support.

References

[1] Aerts, D. (2009). Quantum structure in cognition. *Journal of Mathematical Psychology*, 53(5), 314–348.

[2] Aerts, D., & Sozzo, S. (2014). Quantum entanglement in concept combinations. *International Journal of Theoretical Physics*, 53(10), 3587–3603.

[3] Bellman, R. E. (1957). *Dynamic Programming*. Princeton University Press.

[4] Busemeyer, J. R., & Bruza, P. D. (2012). *Quantum Models of Cognition and Decision*. Cambridge University Press.

[5] Busemeyer, J. R., & Wang, Z. (2015). What is quantum cognition, and how is it applied to psychology? *Current Directions in Psychological Science*, 24(3), 163–169.

[6] Busemeyer, J. R., Wang, Z., & Townsend, J. T. (2006). Quantum dynamics of human decision-making. *Journal of Mathematical Psychology*, 50(3), 220–241.

[7] Dirac, P. A. M. (1958). *The Principles of Quantum Mechanics* (4th ed.). Oxford University Press.

[8] Diederik, A., Gabora, L., & Sozzo, S. (2013). Concepts and their dynamics: A quantum-theoretic modeling perspective. *Topics in Cognitive Science*, 5(4), 737–772.

[9] Feynman, R. P. (1982). Simulating physics with computers. *International Journal of Theoretical Physics*, 21(6–7), 467–488.

[10] Grover, L. K. (1996). A fast quantum mechanical algorithm for database search. *Proceedings of the Twenty-Eighth Annual ACM Symposium on Theory of Computing*, 212–219.

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(ISSN:* 3139-3373*)
Volume 2 Issue 2 June 2026 - Available at https://slijms.com

[11] Han, K. H., & Kim, J. H. (2002). Quantum-inspired evolutionary algorithm for a class of combinatorial optimization. *IEEE Transactions on Evolutionary Computation*, 6(6), 580–593.

[12] Haven, E., & Khrennikov, A. (2013). *Quantum Social Science*. Cambridge University Press.

[13] Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263–291.

[14] Khrennikov, A. (2010). *Ubiquitous Quantum Structure: From Psychology to Finance*. Springer.

[15] Narayanan, A., & Moore, M. (1996). Quantum-inspired genetic algorithms. *Proceedings of the IEEE International Conference on Evolutionary Computation*, 61–66.

[16] Nielsen, M. A., & Chuang, I. L. (2010). *Quantum Computation and Quantum Information* (10th Anniversary Edition). Cambridge University Press.

[17] Pothos, E. M., & Busemeyer, J. R. (2013). Can quantum probability provide a new direction for cognitive modeling? *Behavioral and Brain Sciences*, 36(3), 255–327.

[18] Shor, P. W. (1994). Algorithms for quantum computation: Discrete logarithms and factoring. *Proceedings of the 35th Annual Symposium on Foundations of Computer Science*, 124–134.

[19] Tversky, A., & Kahneman, D. (1983). Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review*, 90(4), 293–315.

[20] Wang, Z., Solloway, T., Shiffrin, R. M., & Busemeyer, J. R. (2014). Context effects produced by question orders reveal quantum nature of human judgments. *Proceedings of the National Academy of Sciences*, 111(26), 9431–9436.

