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Antifragility Analysis: A Tool for Business Management in Turbulent Environments

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Abstract

This study, based on the MARA methodology and the concept of systems fragility, introduced the fragility analysis approach to the problem of strategy selection. In turbulent and unpredictable environments, decision-making (especially regarding key and influential decisions such as strategy selection) is challenging. In changing and variable conditions, classical approaches to strategy selection as well as multi-attribute decision-making approaches lose their effectiveness. Classical scenario planning approaches are also unable to cope with turbulent environments due to their inherent limitations and simplification. In response to the shortcomings of the aforementioned approaches, the Matrix Approach to Robustness Analysis (MARA) was introduced, which is able to solve the problem of strategy selection without computational constraints. However, this approach is suitable when a conservative decision-maker wants to choose a strategy with the lowest risk. Therefore, this approach does not provide a desirable outcome when the decision maker seeks to exploit opportunities. In this approach, after listing the decision options and defining scenarios based on the most important environmental indicators, the performance of the strategies in each of the different states of the indicators was determined and the total performance of each strategy in each scenario was compared with the performance of that strategy in the base scenario (status quo). The proposed approach was described in the form of a case study. In practice, this analysis shows which strategy (decision) can bring more benefits to the organization (decision maker) in the event of a change in each of the environmental impact indicators (scenario change). This concept is in contrast to robust analysis, which considers the option that has less risk in the event of a change to be superior. Using this tool in turbulent environments can help managers in the business management process.

Keywords:
Decision-making model,
strategic decision-making,
strategy selection,
chaotic environment,
antifragility analysis.

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Extended Abstract

Introduction

The complexity we face in today's modern and rapidly changing world requires a better understanding of how to make decisions that effectively deal with this complexity; otherwise, we may develop strategies that have unintended and irreversible consequences. Accordingly, decision-makers must first equip themselves with appropriate decision-making tools. Choosing a method or approach to decision-making is, in turn, a decision-making problem (Sorourkhah, 2024). In the decision-making literature, there are various methods, models, and approaches to decision-making, each of which is suitable for a specific situation. Based on a) the type of problem, b) the quality of the data, c) the number of indicators and d) the goal of solving the problem, decision makers can choose the most appropriate option (Bartolini, 2021). Given that the problem of choosing a strategy is a) a key decision with long-term consequences, b) the data is uncertain and unpredictable, and c) the indicators are numerous and often contradictory; we know that classical approaches such as QSPM and multi-criteria decision-making techniques are not suitable. In these circumstances, the use of scenario-based approaches seems more logical (Joorbonyan et al., 2024).

Although the modern world is increasing in knowledge, paradoxically, this makes it more difficult to predict things. Due to the emphasis of the inductive learning process on narrative and causality, the impression is formed that the only way to deal with uncertainty is to identify the causal chains that have been constructed early; for example, by identifying early "trigger events", "weak signals", or "early warnings", and then implementing precautionary measures to mitigate the consequences of an undesirable future or to take early advantage of a desirable future. This view is prominent in the recent scenario planning literature. In contrast, the existential view of uncertainty sees outcomes as the result of random processes that are not causally related. The increasing complexity of the challenges faced by modern organizations far exceeds the ability to discover causality, and causal speculation is therefore temporary, unstable, and error-prone. Therefore, the ability of methods to prepare for the future (the ability to cope with uncertainty arising from complexity) is becoming increasingly important, without relying solely on identifying causes (Bahrami et al., 2025).

In such a situation, the Matrix Approach to Robustness Analysis (MARA) can simultaneously deal with complexity and uncertainty (Amiri et al., 2024). However, the MARA method is conservative and tries to choose the option that brings the least loss. Therefore, if the goal of decision-making is to maximize the exploitation of an opportunity, a new approach is needed. This concept has been known as antifragility in recent years. So far, the concept of antifragility has been actively applied in several fields, including molecular biology, physics, computer science, transportation planning, risk analysis, and engineering; however, a practical criterion for antifragility has not been developed yet (Pineda et al., 2019).

According to the resilience literature, organizations can be fragile or antifragile to shocks; researchers believe that decisions (strategies) can also be fragile or antifragile to shocks (Kokkinos et al., 2023). When an unexpected event occurs, many previously selected strategies lose their effectiveness and, in some cases, may even lead to negative results. Accordingly, in this study, the researcher seeks to answer the question: what is antifragile analysis: a tool for managing business in a turbulent environment?

Theoretical foundations

Antifragility

The phenomenon of antifragility has been proposed as a new theoretical framework in management and organizational sciences in recent years. This concept was first introduced by Nasim Nicholas Taleb and showed its fundamental difference from concepts such as fragility

and antifragility. In Taleb's definition, antifragile systems not only resist shocks and disturbances, but also benefit from these instabilities and rise to a higher level of performance. In this view, unlike fragile systems that are damaged in the face of disturbances and antifragile systems that only return to their original state, antifragile systems adapt to and benefit from disturbances (kianirad et al., 2022) .

Faryadras et al., (2026) studied "The relationship between antifragility and financial performance and business continuity in banks listed on the Tehran Stock Exchange". 10 eligible banks were selected for the sample and the data were analyzed using panel data regression. The results showed that antifragility has a positive and significant effect on business continuity and also on the financial performance of banks listed on the Stock Exchange. In addition, financial performance has a positive effect on business continuity.

Gaadim ghobadi et al., (2024) studied "Providing a model of antifragility in Iranian financial organizations through thematic analysis". The results of the study led to the identification of 79 codes and 19 themes in the form of four main categories such as 1- the random and environmental category, which includes the components of flexibility, financial crisis, antifragile performance, agility and adaptability, and 2- the financial performance category, which includes the components of cost control, financial performance of institutions, central bank independence, inflation volatility, cash flow management, 3- the management category, which includes the components of risk management, improving economic growth, capital management, financial policies, relationship with the government, and 4- the organizational category, which includes the components of innovation and creativity, adaptability, resistance and coping, integration and service empowerment.

Research Method

This study was designed to present and test the approach to analyzing the antifragility of strategies in turbulent environments and is considered an applicable and analytical-modeling study. The data in this study were collected secondary and computationally, and the analyses were based on matrix modeling of scenarios and strategy performance. In this study, first, the environmental impact indicators for strategic decision-making were identified and structured based on the MARA method. Then, possible future scenarios were eliminated according to the different states of each production indicator and impossible or contradictory scenarios. The performance of each strategy in each scenario was evaluated by experts and specialists in the relevant field and recorded in the form of a strategy performance matrix. In the next step, the total performance of each strategy in the scenarios was compared with the baseline to calculate the antifragility score of each option.

Research Findings

The results showed that different strategies experience different degrees of antifragility to environmental changes. The examination of future scenarios revealed that some strategies are not only unvulnerable to shocks, but also perform better than the baseline in many alternative scenarios. The aggressive strategy scored the highest antifragility score and has a high ability to transform environmental changes into opportunities. These findings emphasize the importance of choosing opportunistic rather than conservative options in turbulent environments. Furthermore, using the antifragility framework allows managers to make structured and flexible decisions.

Conclusion

In the agitated, turbulent, and unpredictable environments that characterize many industries today, strategy selection becomes doubly important. The findings of this paper indicate that a

antifragility -based approach, especially in situations where nonlinear changes and environmental shocks occur, can provide a more efficient tool for strategic decision-making than conservative approaches. Relying on environmental scenarios and comparing the performance of strategies against the baseline allows for the identification of options that perform better across a wide range of possible futures. This finding is consistent with previous studies. For example, Kokkinos et al. (2023) has shown that organizations that are able to exploit shocks and fluctuations are not only more antifragile to change but can also use these conditions to improve performance and innovation. Also, recent research in the field of innovation management and organizational performance shows that measuring antifragility components, such as diversity of responses, capacity for emergent behaviors, and nonlinear response to shocks, can increase the productivity and adaptability of organizations (Branicki, Sullivan, & Worrall, 2018). Studies that have examined antifragility in the context of supply chains and dynamic systems also emphasize that systems that are not only antifragile but also benefit from environmental shocks perform better in the long run (Santos & Eisenhardt, 2020.)

Numerical implementation of the proposed approach showed that different strategies experience different degrees of antifragility, and some of them are not only not vulnerable to changes but also outperform the baseline in a significant part of alternative scenarios. In the present case study, the aggressive strategy obtained the highest antifragility score and was able to turn environmental changes into opportunities. This finding suggests that in conditions of fluctuating, unstable, and complex environments, choosing strategies that have the capacity to exploit change (rather than simply resist it) can promote decision-making from a conservative to an opportunity-oriented mode.

Overall, the results of this study indicate that the antifragility approach can provide a structured and numerical framework for strategy selection in turbulent environments. This approach, in line with previous literature that emphasizes the exploitation of volatility and the capacity for innovation, guides managers' decision-making path from a focus solely on risk reduction towards opportunity-based decision-making and enhancing competitive advantage (Sorourkhah, 2024). Therefore, antifragility can be recognized as an important practical and theoretical concept in strategic management in the era of uncertainty and provides new research horizons for the development of more data-driven and generalized models.