Contingency Scenario Planning using Generative AI

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ABSTRACT

This article describes the transformative potential of Generative AI (GenAI) in enhancing Contingency Scenario Planning (CSP), a crucial tool for businesses and governments navigating the uncertainties of a rapidly changing world. Traditional scenario planning, often constrained by its time-intensive processes, faces new pressures from immediate, unpredictable events, a reality starkly highlighted during the COVID-19 pandemic. The exploration includes a detailed examination of how GenAI can significantly expedite and refine the CSP process, offering detailed, adaptable strategies that are particularly vital for resource-constrained entities or those in dynamic industries, like automotive manufacturing. Using an illustrative hypothetical case study, the article showcases the profound impact GenAI can have on bolstering efficiency, resilience, and prominence capabilities in confronting future disruptions.

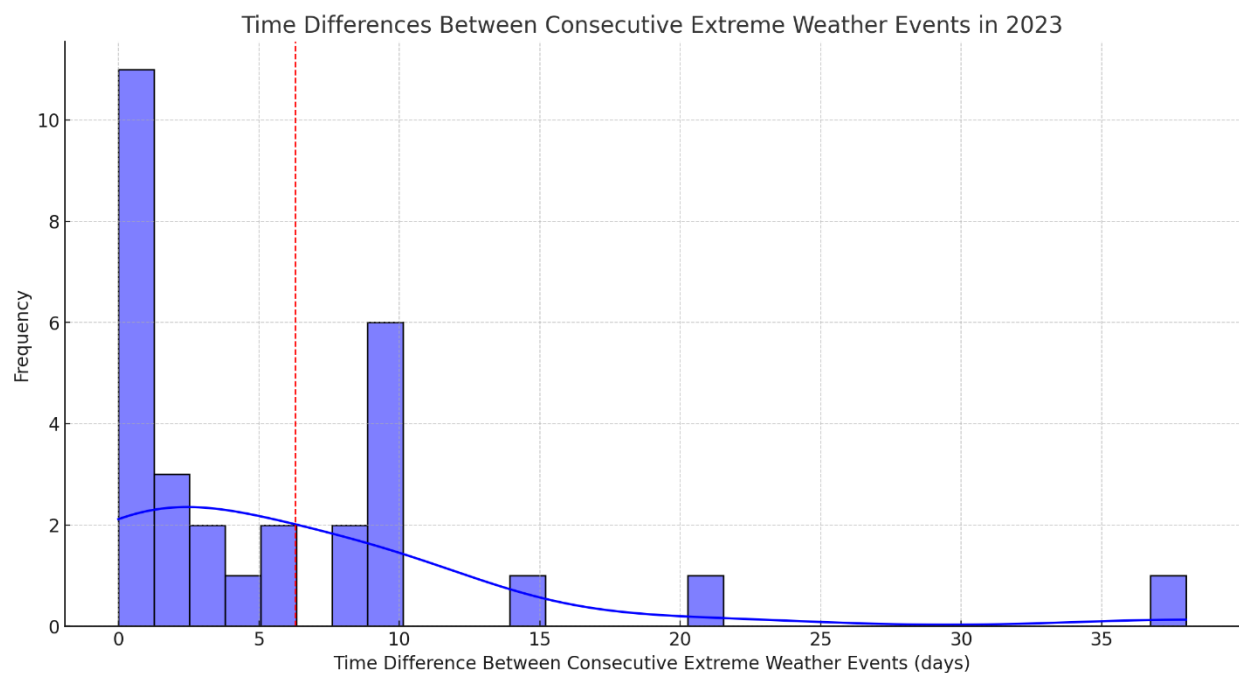Keywords: Generative AI, Scenario Planning, Contingency Planning

Businesses and governments alike employ foresight methodologies such as scenario planning to better anticipate future challenges, enabling them to make informed decisions in a rapidly changing world. While traditional scenario planning works on a horizon of two to five years or more, COVID-19 saw the global requirement for contingency scenario planning (CSP) – compression of the scenario planning timeframe into weeks or even days initiated by contingent or emergency events. Firms face challenges anticipating all possible disruptions in the future, selecting which to best plan for in a resource constrained environment, and responding to these future disruptions when they come to pass in ever-compounding volumes.

A well-known exemplary use of CSP is the exigent application of scenario planning for the 2020 Olympic Games[1] in response to rapidly changing health conditions relating to COVID-19.[2] Traditional scenario planning has been criticized for being too time-consuming or ineffective for helping managers take decisive action – these limitations are exacerbated in the case of CSP. Fortunately, with the rise of generative AI (GenAI), we have tools to improve the effectiveness of CSP. In this article, we describe how GenAI tools can help in revisioning strategic foresight through scenario planning and formulating business continuity plans (BCP).

CSP is employed when the situations on the ground are changing quickly -possibly even minute by minute. These types of events are becoming more and more prevalent in the global market. Recent data from Resilinc's Event Watch platform shows that the time between consecutive extreme weather events disrupting supply chains was heavily skewed below the 6-day response window (shown by the red bar):

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[1] https://olympics.com/en/news/ioc-executive-board-steps-up-scenario-planning-for-tokyo-2020
[2] https://olympics.com/ioc/news/health-and-safety-paramount-as-ioc-executive-board-agrees-to-continue-scenario-planning-for-the-olympic-games-tokyo-2020

Time Differences Between Consecutive Extreme Weather Events in 2023

Firms must learn how to anticipate anomalies by engaging with their environments early and often. And they have to be able to react quickly to shifts in environments[3]. Employing foresight-based tools and analysis, Shell has created a history of trying to understand potential risks and adapt its strategies accordingly, which some have credited with putting Shell ahead of its competitors during the energy crisis of the 1970s.[4] While some contend that Shell has never really tied its anticipatory plans to being better aligned to the future than others, they have conceded that Shell's ability to consistently practice scenario planning and the mindset it requires has allowed them to catch on to emerging changes in markets and culture. Further, sustained scenario planning practices helps organizations become more comfortable with ambiguity in taking a futures perspective by countering hubris, exposing implicit assumptions, contribute to shared and systemic sense-making, and foster quick crisis adaptation capabilities[5]. This repeated practice increases their innate abilities to respond and exposes them to more possible futures, making them more prepared to adapt quickly. These attributes allow firms to better develop continuity plans of action that offer a range of

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[3] https://hbr.org/2021/07/the-power-of-anomaly
[4] Liam Fahey, Robert M. Randall, *Learning from the Future: Competitive Foresight Scenarios (Wiley, 1997) 285-295.*
[5] https://hbr.org/2013/05/living-in-the-futures

responses to maintain operations during disruption – or rapidly recover to pre-disruption operation levels by focusing on plausible futures versus predicted outcomes.

Business Continuity Plans (BCPs) enable firms to react effectively in the face of potential disruptions. Many firms develop BCPs after experiencing a certain type of disruption for the first time, but the most successful businesses develop BCPs proactively for new types of disruptions uncovered through scenario planning. In these turbulent times, larger firms may have the resources to run dozens of 'what-if' scenarios with teams of experts. But small to medium-sized firms lack the resources necessary to build robust scenario planning events and materials and often lack risk management professionals to create strategic risk management plans. And even larger firms may suffer from an inability to decide on how to act when a CSP event occurs.

A promising alternative is emerging that can overcome these challenges. It entails enlisting the assistance of cutting-edge generative AI systems powered by large neural network models. From experiments we have conducted; we believe generative AI can significantly enhance an organization's capability to conduct robust contingency scenario planning faster and at a much lower cost than conventional processes. Some Fortune 500 firms are beginning to incorporate generative AI in continency planning, but we believe this approach would also be beneficial for resource-constrained organizations like small and medium-sized enterprises (SMEs) that are operating in highly challenging environments, such as those prone to extreme weather events.

Limitations in Traditional Scenario Planning

Traditional limitations for scenario planning can be clustered around the three relevant stages of scenario planning: (1) generating scenarios, (2) selecting scenarios, and (3) preparing for scenarios. Each of these limitations are exacerbated in the case of contingency scenario planning.

Generating Scenarios. One limitation of the traditional scenario planning outlined above is that it provides little formal guidance on where the trends and uncertainties can be found. Without a structured process for identifying and analyzing potential trends and uncertainties, organizations may fall prey to tunnel vision and overconfidence, which are two of the biases that scenario planning is tasked with helping managers avoid.

Selecting Scenarios. The next set of challenges in scenario planning relates to how the best set of scenarios may be selected. There are clear trade-offs to consider in this process. Business continuity plans need to robust to contingency scenarios – which means picking the right scenarios to prepare for in detail becomes daunting.

Preparing for Scenarios. The third set of challenges in scenario planning relates to preparing for the decision scenarios. A key limitation of traditional scenario planning is that it doesn't offer guidance on how organizations can prepare for multiple potential realities simultaneously with different strategies that may be at odds with each other. Organizations have several options to prepare for multiple, potentially contradictory scenarios.

- One approach is to focus on actions consistent with the most likely scenario based on available data and insights. However, this approach may not always be sufficient as the future is inherently uncertain.

- Another option is to take actions for an intermediate scenario, which involves finding a balance between the different scenarios. This approach can be useful in situations where the company is unsure which scenario is more likely or when the cost of preparing for one scenario is too high.

- Finally, the company can develop competencies to adapt actions based on emerging information about scenarios. This involves building a culture of agility and flexibility where the company can quickly pivot and adjust its strategies based on new information and changing circumstances.

Embracing Generative AI Tools to Address Key Limitations of Scenario Planning

To improve the effectiveness of contingency scenario planning, organizations can leverage generative AI tools, including large language models (LLMs).
These powerful tools offer valuable support in several ways:

- Identifying Baseline Scenarios: Generative AI tools can assist in identifying baseline scenarios by analyzing historical data and recognizing patterns, providing a solid foundation for the scenario planning process.

- Formulating Scenarios based on Trends: By utilizing the vast knowledge and predictive capabilities of LLMs, organizations can formulate scenarios that align with emerging trends, allowing for more accurate and forward-looking planning.

- Generating Innovative Ideas: LLMs can spark creativity by generating innovative ideas and potential courses of action that might not have been considered otherwise, enriching the organization's strategic decision-making.

- Combining Scenarios: With AI-powered assistance, organizations can efficiently combine scenarios and assess their potential implications, enabling more comprehensive scenario planning and risk analysis.
- Evaluating Ideas: Lastly, generative AI tools can aid in evaluating various ideas and actions generated for different scenarios, providing valuable insights into the most promising strategies for enhancing survivability.

GenAI Augmented Contingency Scenario Planning in Action

Next, let us consider a hypothetical CSP exercise at an automotive manufacturer with supply chain issues in 2023 that explains the use of a generative AI framework. To begin generating scenarios we developed a custom GPT within ChatGPT 4.0 to follow our process[6]. First, the AI lists these strategic concerns in three categories - resources, forces, and observers. The AI categorizes these concerns into levels of significance to the automotive manufacturing business. The following prompt was used to create a list of relevant resources, forces, and observers:

Let's consider a hypothetical scenario planning exercise for an automotive manufacturing firm. In the first step, we need to identify and evaluate all the relevant resources, external forces, and observers of significance. Can you please list some of the critical resources, external forces, and observers in order of their significance? Can you place this into a table listed by order of significance and add what you are using as the basis for significance level?

We received the following output:

Category	Most Significant	Significant	Moderately Significant	Least Significant	Basis for Significance Level
Resources (Ro)	Human Resources	Financial Resources	Technological Resources	Supply Chain Infrastructure	**Efficiency:** Direct impact on production, innovation, and financial health.
External Forces (Fo)	Market Competition	Technological Advancements	Economic Factors	Regulatory Changes	**Resilience:** Influence on adaptability to market and environmental changes.
Observers (Ob)	Customers	Investors/Shareholders	Competitors	Brand Reputation	**Prominence:** Impact on public perception, investment attraction, and market competition.

The next step involves creating hypothetical trends. We prompted ChatGPT to generate hypothetical trends that could affect this automotive manufacturing firm, specifically relating to human resources, market competition and customers.

We received the following output with detailed definitions of each that are removed for brevity:

1) **Human Resources Trends**
   a. Increased Automation and AI Integration: A significant shift towards more automated manufacturing processes and integration of AI in design and testing.
   b. Focus on Sustainable Practices: Growing emphasis on sustainability within the industry.
   c. Remote Work Adaptations: Expansion of remote work capabilities in areas like design, administration, and sales.

2) **Market Competition Trends**
   a. Shift to Electric Vehicles (EVs): An accelerated transition towards electric vehicles.
   b. Entry of Tech Companies: Involvement of technology giants in the automotive sector.
   c. Global Supply Chain Realignment: Post-pandemic supply chain restructuring, leading to more regional manufacturing hubs.

3) **Customer Trends**
   a. Increased Demand for Customization: Growing customer expectations for personalized vehicles.
   b. Sustainability as a Purchase Factor: A significant rise in consumer preference for environmentally friendly vehicles.
   c. Adoption of Connected Vehicle Technologies: Customers seeking advanced connected features in vehicles.

Next, we wanted to assess three different types of scenarios from this consideration set of trends assigned to varied probabilities and impacts (labeled T1-T3).

Scenario Type	Trend	Description	Probability	Impact
High Probability, High Impact (T1)	Shift to Electric Vehicles (Market Competition)	The automotive industry sees a rapid and large-scale shift to electric vehicles (EVs), driven by environmental regulations and consumer demand.	High	High
Low Probability, High Impact (T2)	Tech Giants Entering Automotive Sector (Market Competition)	Major technology companies, with their advanced AI and software capabilities, enter the automotive sector, disrupting traditional manufacturing and marketing models.	Low	High
High Probability, Moderate Impact (T3)	Increased Remote Work Adaptations (Human Resources)	The automotive sector adapts more roles to remote work environments, particularly in design, administration, and sales, reshaping workforce dynamics and operational models.	High	Mod

The next step is to use the trends T1 to T3 to create a set of learning scenarios LS11 to LS33 by assessing the relationships between the trends and the resources, observers, and forces of the firm.

Trends	Resources (1)	Forces (2)	Observers (3)
T1: Shift to Electronic Vehicles	LS11	LS12	LS13
T2: Tech Giants Entering Automotive Sector	LS21	LS22	LS23

T3: Increased Remote Work Adaptations	LS31	LS32	LS33

The table provides a scenario planning matrix that allows managers to select from various scenarios.

Now we simply point GPT to this table and ask:

Please provide a detailed examination of the considerations in LS11 from the table related to Trend 1 (T1) and the relevant resources as it relates to this automotive manufacturing firm.

We immediately get the below analysis that is a great starting point for scenario development.

Trend T1: Shift to Electric Vehicles (EVs)

Relevant Resources (LS1)

1. **Human Resources:**

   - **Skills Development:** The need for skills in electric vehicle technology, including battery technology and electronic systems, is paramount. This involves training existing employees and recruiting new talent with these specialized skills.

   - **Workforce Transition:** As the focus shifts from combustion engines to electric powertrains, some roles may become redundant, while new roles will emerge, necessitating workforce adaptation and potential restructuring.

2. **Financial Resources:**

   - **R&D Investment:** Significant investment is required in the development of electric vehicle technologies, especially in battery technology and electric drive systems.

   - **Capital Allocation:** Shifting financial resources from traditional combustion engine technologies to electric vehicle development, which might involve reallocating budgets and securing new funding sources.

3. **Technological Resources:**

   - **Infrastructure Overhaul:** Upgrading or establishing new production lines for EVs, which includes acquiring new manufacturing technologies and adapting existing facilities.

   - **Research and Development:** Investing in research and development facilities equipped to innovate in the field of electric vehicles.

4. **Supply Chain Infrastructure:**

- **Supplier Network:** Developing new supplier relationships for EV-specific components, such as batteries and electric drivetrains.
- **Supply Chain Adaptation:** Adjusting the supply chain for changes in sourcing, manufacturing, and distribution that come with electric vehicles.

Finally, we can utilize the LLM to provide a scenario that would benefit businesses of any size. Now we can prompt the LLM with something like the following: *Create a rich narrative scenario for an automotive manufacturing firm that considers the impact of [trend T1] and its relationship to the list of resources. Leave the scenario as an open ended scenario for planners to teach the workforce with. Include key questions for planners to ask their workforce to elicit anticipatory thinking and strategic foresight.*

Scenario: "Revolution on Wheels: Embracing the Electric Shift in Auto Dynamics"

In 2025, Velocity Motors, a prominent automotive manufacturer with a rich legacy, faces a defining moment in the industry's shift towards sustainability and electric vehicles (EVs). This transition is not merely about producing electric cars but reimagining the company's core identity in the context of innovative and sustainable automotive technology.

The firm's sprawling manufacturing facilities, traditionally focused on combustion engines, are undergoing a significant transformation. The workforce, a mix of experienced engineers and new talent, is gearing up to adapt their skills to the evolving demands of EV production. This pivot raises critical questions about skill development and workforce readiness for the future of automotive manufacturing.

Financially, Velocity Motors is redirecting its investments. Funds previously allocated to traditional automotive technologies are now flowing into research and development for electric drivetrains and battery efficiencies. This financial shift represents the company's commitment to leading the EV market, balancing immediate operational needs with long-term strategic goals.

Technological innovation is at the forefront of this transformation. The company's research labs, once dominated by the sounds of internal combustion engines, are now filled with the hum of electric motors and advanced computing systems. Velocity Motors is not just creating vehicles but integrating software and hardware to deliver intelligent, user-centric automotive experiences.

This shift to EV production necessitates a reconfiguration of manufacturing lines and a revamping of the supply chain. The procurement team is actively seeking suppliers for high-quality battery cells and sustainable materials, redefining long-standing partnerships and forging new alliances.

As Velocity Motors embarks on this journey, the company faces several critical questions. How will it ensure its workforce is equipped for this technological shift? What strategies will maintain financial health during the transition? How will technological evolution impact internal processes? What changes will this shift bring to the supply chain dynamics?

Generating Ideas for Scenario Solutions

We can also directly prompt the AI to solve for us. We prompted ChatGPT 4.0 to generate three ideas to assist scenario planners and managers with the above scenario, provide pro/con analysis based on factors of efficiency, resilience and prominence (ERP) and then suggest if one or more of the ideas would best be suited to assist in the scenario. Efficiency is about optimizing utilization of valuable resources, resilience focuses on an organization's capacity to withstand and navigate through force-induced stresses, and prominence deals with the organization's ability to create positive attention while avoiding negative attention from observers. ChatGPT generated the following output, selecting AI-driven predictive maintenance as the top strategy :

Strategy	Pros	ERP Impact (Pros)	Cons	ERP Impact (Cons)
Specialized EV Certification Programs	1. Improves specific skills relevant to EV manufacturing. 2. Builds confidence in new technologies.	**Efficiency:** Direct skill enhancement in key areas. **Resilience:** Quick adaptation to industry changes.	1. Resource-intensive to implement. 2. Might not cover all necessary skills immediately.	**Efficiency:** Short-term resource allocation away from production. **Resilience:** Limited initial skill coverage.
Collaborative Partnerships with Battery Suppliers	1. Secures a consistent quality battery supply. 2. Facilitates joint R&D for battery improvement.	**Resilience:** Reduces risk of supply chain disruptions. **Efficiency:** Streamlines procurement process.	1. Dependency on a single supplier can be risky. 2. Requires tight coordination and trust.	**Resilience:** Potential over-reliance on partner. **Efficiency:** Risk of misaligned objectives impacting output.
AI-Driven Predictive Maintenance Systems	1. Reduces downtime through early fault detection. 2. Optimizes maintenance schedules.	**Efficiency:** Minimizes production disruptions. **Resilience:** Enhances equipment longevity.	1. High setup and integration cost. 2. Requires employee training for system utilization.	**Efficiency:** Initial productivity dip during implementation. **Resilience:** Learning curve for maintenance staff.

In effectively preparing for multiple scenarios, striking a balance among ERP-related tradeoffs is paramount. This includes considering diverse ideas within a specific scenario, as well as evaluating these tradeoffs across various scenarios. To achieve this, the following steps are recommended:

1) Unearthing Inconsistencies: Thoroughly scrutinize the required levels and directions of strategic factors across different ideas within a single scenario, as well as across distinct scenarios.

2) Evaluating Adaptability: Determine the degree of adaptability needed to address these identified inconsistencies effectively. Adapting strategic factors is crucial, as preparing for one potential scenario may inadvertently make the organization less equipped to tackle other plausible scenarios.

3) Adjusting Actions: Based on the insights gained from scenario analysis, fine-tune the set of actions for each scenario. This iterative process ensures that each scenario's strategies align cohesively with the organization's overall strategic objectives.

Conclusion

The integration of GenAI in the CSP process can be vital, assisting in identifying baseline scenarios, formulating trends, generating innovative ideas, combining and evaluating scenarios, and providing valuable insights into the most promising strategies for success. Optimally, GenAI tools can help organizations of any size conduct scenario planning ensuring that business continuity planning accounts for new and evolving disruptive events to minimize impacts to operations. Small firms and large firms can benefit from detailed tactical planning necessary to make optimal decisions rapidly.