**Strategic foresight analysis**

**Introduction**

Strategic Foresight Analysis (SFA) has evolved as a proactive approach essential for businesses to navigate uncertainties and strategically prepare for the future (Schwartz, 1991). Originating in the mid-20th century, scholars such as Herman Kahn and Pierre Wack played pivotal roles in laying the foundations of this concept. As modern businesses grapple with increasingly complex and dynamic environments, the adoption of SFA has emerged as a crucial tool aiding organizations in anticipating and managing critical uncertainties (Godet, 2006).

Herman Kahn, a prominent futurist and strategist is often credited with pioneering scenario planning which is a key component of SFA (Kahn, 1962). Kahn's work, particularly in the fields of military strategy and global stability during the Cold War era demonstrated the practical applications of anticipating and planning for various future scenarios. Additionally, Pierre Wack who was known to be a visionary strategist at Royal Dutch/Shell Group significantly contributed to the development of scenario planning in the corporate realm (Wack, 1985) with his innovative use of scenarios at Shell which became a hallmark example of how businesses could proactively manage uncertainties. These early contributions laid the groundwork for the systematic application of strategic foresight in diverse sectors.

**Global Automotive Industry Overview**

The exponential growth of the automotive sector has historically been intertwined with advancements in technology. The introduction of assembly line production by Henry Ford revolutionized manufacturing processes, making automobiles more affordable and accessible to the general population (Klier & Rubenstein, 2008). The contemporary automotive industry therefore faces a different set of challenges and opportunities. Technological innovation, particularly in electric and autonomous vehicles is reshaping the competitive landscape, forcing traditional manufacturers to reassess their strategies and adapt to the evolving market (Smith, 2020).

Environmental imperatives are another critical dimension influencing the global automotive industry. The sector faces increasing pressure to address climate change concerns, prompting a shift towards sustainable and eco-friendly practices. Stricter emission standards and a growing emphasis on corporate social responsibility have prompted manufacturers to invest heavily in research and development of electric and hybrid vehicles (Müller et al., 2021). This shift is not only driven by regulatory demands but also by a changing consumer mindset that values environmentally conscious choices (Sierzchula et al., 2014).

Consumer demands, marked by evolving preferences and expectations constitute the third pillar of the automotive industry's intersection. Modern consumers seek not only reliable and efficient transportation but also connectivity, comfort and sustainability in their vehicles. This has given rise to a demand for smart vehicles equipped with advanced technologies such as infotainment systems and connectivity features (Schoettle, 2014). Moreover, the concept of mobility-as-a-service and the sharing economy are altering traditional ownership models, presenting both challenges and opportunities for the automotive sector (Bieńkowska et al., 2019).

In essence, the global automotive industry positioned at the crossroads of technology, environmental responsibility and consumer evolution represents a dynamic ecosystem where uncertainties are inherent. This analysis endeavors to navigate these uncertainties, offering a nuanced understanding of the challenges and opportunities that lie ahead for automotive manufacturers and stakeholders (Müller et al., 2021)

**Critical Uncertainties**

**Organizational Level:** Navigating the organizational uncertainties within the automotive sector is an intricate process characterized by the rapid evolution of technologies particularly the advent of electric and autonomous vehicles. As emphasized by Jones (Jones et al., 2019) that automotive companies find themselves at the forefront of technological disruptions that challenge traditional business models. The shift towards electric and autonomous vehicles is not merely a technological transition but a strategic paradigm shift that demands a holistic re-evaluation of product development, manufacturing processes and customer engagement strategies (Technological Forecasting, 2023). Companies that successfully adapt to and integrate these advancements into their operations will define their competitive resilience in a landscape marked by constant technological flux.

The strategic choices made by automotive firms at the organizational level extend beyond the immediate integration of new technologies. They encompass decisions about research and development investments, partnerships and the restructuring of internal processes to align with the demands of a rapidly changing market (Baghai et al., 2000). For instance, investing in electric vehicle technology might require a substantial shift in manufacturing capabilities and the development of new skill sets among the workforce

**Sectoral Level:** At the sectoral level, the regulatory environment in particular is undergoing significant transformations globally, with an increasing focus on environmental sustainability and emissions reduction targets. The automotive sector must grapple with the implications of stringent emission standards and the push towards green technologies (Sierzchula et al., 2014).

Geopolitical tensions further compound sectoral uncertainties by introducing risks related to supply chain disruptions, trade tariffs and political instability. The evolving geopolitical landscape can redefine market dynamics and alter the competitive balance among automotive players (Hill, 2018). The emergence of new competitors, particularly from regions with evolving automotive industries adds another layer of complexity (Risk analysis, 2022).

**Societal Level:**

Macro-economic trends such as economic downturns or upswings, demographic shifts and changing consumer behaviors further contribute to societal uncertainties (porter, 1985). For instance, the rise of urbanization and the gig economy have implications for mobility patterns and vehicle ownership models, prompting the industry to reassess traditional approaches (Bieńkowska et al., 2019). Navigating societal uncertainties requires a deep understanding of global trends, consumer preferences and societal values positioning automotive companies to anticipate and respond to shifts in the market landscape (Wei et al., 2021). In doing so, the industry can proactively contribute to societal well-being while securing its own sustainable future in a rapidly evolving world.

**STEEP Analysis in Shaping the Future of the Automotive Industry**

As the automotive industry steers through an era of unprecedented change, the strategic foresight necessitates a lens that captures the complexities of the environment it operates within. The STEEP analysis, encapsulating Social, Technological, Economic, Environmental and Political factors emerges as an important methodology to unravel key uncertainties influencing the automotive landscape.

**Social Factors:**

The automotive industry is intrinsically linked to societal trends and behaviors (Ayuk et al., 2017). The preferences of consumers, their values and the evolving concept of mobility are critical in shaping the industry. The STEEP analysis emphasizes the social dimension therby providing insights into how societal shifts influence the industry's trajectory.

**Technological Factors:**

Technological advancements are at the heart of the automotive evolution (Ayuk et al., 2017). Innovations such as electric vehicles, autonomous driving and manufacturing technologies are redefining the industry. STEEP recognizes the significance of technological factors offering a framework to analyze their impact on organizational strategies and sectoral developments.

**Economic Factors:**

Economic forces play a pivotal role in the automotive landscape (Larson et al., 2014). Fluctuations in economic conditions, market demand and financial considerations influence the resilience of organizations within the sector. The economic dimension in STEEP provides a structured approach to assess these uncertainties.

**Environmental Factors:**

The automotive industry is under increasing pressure to address environmental concerns (Rubenstein et al., 2002). Sustainability, emissions regulations and eco-friendly practices are integral considerations. STEEP's Environmental factor aligns with the industry's focus on minimizing environmental impact and navigating societal expectations.

**Political Factors:**

Political dynamics and regulatory landscapes shape the automotive sector (Larson et al., 2014). Government policies, regulatory frameworks and geopolitical shifts influence industry practices. The Political factor in STEEP offers a lens through which to analyze the impact of political uncertainties on the automotive industry.

**Scenario Planning Methodology:**

The two-axis scenario method, focusing on Technological Evolution and Regulatory Landscape provides a robust foundation for crafting scenarios that encapsulate the diverse range of uncertainties faced by the automotive industry (Shirvani et al., 2019). By exploring these dimensions, this analysis aims to offer an in-depth examination of potential trajectories.

**Scenario Development**

**Focal Question:** How will the global automotive industry adapt and thrive in the face of unprecedented technological disruptions and regulatory transformations, ensuring sustainability, innovation, and societal well-being from 2023 to 2035?

**Scenario 1**: Electrification Era (Best Case Scenario)

**Time Horizon:** 2023-2035

**Plausible Events:** Pervasive adoption of electric vehicles, expanded charging infrastructure.

**Organizational, Sectoral, and Societal Impact**: Alterations in production processes, regulatory challenges, and substantial environmental benefits.

**Organizational Impacts**: The Electrification Era sees automotive companies at the forefront of a transformative shift, necessitating significant alterations in production processes. Manufacturers redirect resources towards electric vehicle (EV) production, retooling assembly lines and investing in new technologies. Companies that proactively embrace this shift benefit from early-mover advantages, establishing themselves as leaders in the electric vehicle market.

**Sectoral Impacts**: The sector experiences a radical transformation with the widespread adoption of EVs. Established companies face competition from new entrants thereby reshaping market dynamics. Regulatory challenges emerge as governments grapple with crafting policies that foster innovation while addressing concerns related to charging infrastructure, grid capacity and environmental impact.

**Societal Impacts:** The Electrification Era brings about substantial environmental benefits with a significant reduction in carbon emissions. Consumers witness improved air quality and the availability of sustainable transportation options becomes more widespread. However, challenges related to charging infrastructure development and affordability persist therefore requiring concerted efforts from both the public and private sectors

**Scenario 2:** Regulatory Hurdles (Challenging Scenario)

**Time Horizon:** 2023-2035

**Plausible Events:** Regulatory challenges impeding industry growth, uneven technological progress.

**Organizational, Sectoral and Societal Impact:** Hindered innovation, fragmented market and unequal access to advanced automotive technologies.

**Organizational Impacts:** The Regulatory Hurdles scenario presents significant organizational impacts as companies grapple with aligning strategies in the face of regulatory uncertainties. Innovation is stifled and market leaders struggle to adapt to the evolving landscape, resulting in a challenging environment for the entire sector.

**Sectoral Impacts:** Fragmented regulations create barriers to entry thereby limiting cross-border collaborations and causing sluggish growth in the automotive sector. Market instability becomes prevalent as regulatory inconsistencies hinder a unified approach to technological progress.

**Societal Impacts:** The Regulatory Hurdles scenario manifests in uneven access to advanced automotive technologies, hindering widespread adoption. Environmental gains are constrained as regulatory roadblocks impede the sector's ability to embrace sustainable practices.

**Scenario 3:** Technological Lag (Worst Case Scenario)

**Time Horizon:** 2023-2035

**Plausible Events:** Stagnation in technological advancements, limited global regulatory coordination.

**Organizational, Sectoral, and Societal Impact:** Decline in market relevance, contracting industry and limited access to sustainable transportation options.

**Organizational Impacts:** In the Technological Lag scenario, organizational impacts are severe. The industry witnesses slow adoption of new technologies leading to a decline in market relevance for industry leaders. Innovation becomes secondary to cost-cutting measures resulting in stagnation and a diminished role in the broader transportation landscape.

**Sectoral Impacts:** Lack of innovation leads to a contracting automotive market, diminishing global competitiveness. The sector faces challenges in adapting to emerging technologies, putting its future growth at risk.

**Societal Impacts:** The worst-case scenario of Technological Lag results in limited access to sustainable transportation options for society. Environmental challenges persist as the industry's slow response fails to address critical issues related to emissions and environmental sustainability.

**Scenario 4:** Green Revolution Backlash (Complicated Scenario)

**Time Horizon:** 2023-2035

**Plausible Events:** Advancements in electric vehicles, resistance to sustainability regulations.

**Organizational, Sectoral and Societal Impact**: Focused sustainability efforts, fragmented market, mixed societal and environmental outcomes.

**Organizational Impacts:** The Green Revolution Backlash scenario introduces a complex narrative where industry leaders focus on sustainability efforts, but resistance to stringent regulations creates organizational challenges. Companies adept at balancing sustainability with consumer demands fare better in this scenario, ensuring a more resilient position in the market.

**Sectoral Impacts**: The market becomes fragmented as companies grapple with diverse regulatory landscapes. Some thrive by aligning with sustainability efforts while others struggle against resistance to change. The sector witnesses a spectrum of outcomes with varying degrees of success for different industry players.

**Societal Impacts:** Societal impacts in the Green Revolution Backlash scenario are characterized by uneven acceptance of sustainable transportation. Market confusion and mixed environmental outcomes highlight the complexities of navigating societal expectations amid a rapidly evolving automotive landscape.

Regulatory Hurdles Landscape Electrification Era Spectrum

Technological Lag Continuum Green Revolution Balancing Act

Two axis scenario method for automobile landscape

**Conclusion**

In the ever-evolving landscape of the global automotive industry, strategic foresight emerges as an indispensable compass guiding stakeholders through the complexities of technological disruptions, regulatory transformations and societal expectations. This comprehensive analysis, employing a two-axis scenario method has endeavored to illuminate potential futures for the automotive sector ranging from an electrification utopia to the challenging terrains of regulatory hurdles and technological lag.

The scenarios crafted provide a vivid tapestry of possibilities with each carrying its own set of organizational, sectoral and societal impacts. The Electrification Era envisions a future where the automotive industry pioneer's sustainability, reshaping production processes and redefining market dynamics. Regulatory Hurdles paint a challenging landscape where uneven regulations impede growth, leading to fragmented markets and disparities in technological adoption. The nightmare of Technological Lag portends a scenario where industry leaders stagnate, and societal and environmental benefits remain elusive. Lastly, the Green Revolution Backlash introduces a nuanced narrative, balancing sustainability with consumer demands amid a fragmented market and mixed societal outcomes.

Therefore, in navigating the complex terrain ahead, industry stakeholders are advised to adopt a holistic approach. Embrace innovation particularly in electric and autonomous technologies while prioritizing sustainable practices to meet evolving consumer expectations. Collaborate within the sector and with policymakers for cohesive regulatory frameworks and tailor strategies to consumer preferences and invest in talent development. These interconnected recommendations form a resilient foundation for adaptive strategies ensuring prosperity amid dynamic uncertainties.

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