Sentiment and Opinion Analysis in Experts on Artificial Intelligence Applied to Strategic Planning of Energetic Sector around Nearshoring

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Abstract: During the pandemic, the use of Artificial Intelligence saw a significant increase, driven by social distancing and confinement policies. In response to this need, strategic planners developed an AI-based system. While previous research has focused on the motivations and reasons for utilizing AI, this study aimed to capture the sentiments and perspectives surrounding strategic alliances in AI and planning. A documentary, cross-sectional, and exploratory study was conducted involving 20 experts selected based on their H-index reported in Google Scholar. The findings indicate the existence of four dimensions connected to eleven categories regarding AI and its relationship with planning and evaluation in the context of the pandemic.

Keywords: COVID-19, Artificial Intelligence, Strategic Planning, Neural Network

Introduction

Strategic planning in response to COVID-19 has been a crucial focus for several organizations and agencies (Pizzo & Esteban, 2021). The National Institutes of Health (NIH) quickly developed a plan to address the pandemic, prioritizing research to study SARS-CoV-2. The National Institute of Allergy and Infectious Diseases (NIAID) outlined its strategic plan for COVID-19 research, emphasizing priorities to control and end the spread of the virus. NIAID's strategic plan includes improving fundamental knowledge of SARS-CoV-2 as one of its key priorities. The Department of Health and Human Services (HHS) faced unprecedented challenges due to the emergence of COVID-19, prompting the development of strategic plans to address the situation. The NIH published a comprehensive strategic plan for COVID-19 research to accelerate the development of solutions to combat the pandemic. Furthermore, the COVID-19 Strategic Preparedness and Response Plan (SPRP) for 2021 highlights the importance of safe, equitable, and effective delivery of diagnostics and vaccines.

The international community has also outlined a strategic preparedness and response plan to provide public health measures to support the fight against the virus (Muhyeeddin et al., 2024). Comments and suggestions have been requested on the NIH-wide COVID-19 Research Strategic Plan, which focuses on conducting fundamental research, advancing diagnostics, treatments, and prevention strategies, and addressing poor outcomes related to COVID-19. The operational aspects of the COVID-19 Strategic Preparedness and Response Plan emphasize the importance of delivering diagnostics and vaccines effectively and equitably.

The outbreak of the COVID-19 pandemic has led to a significant increase in infection cases and deaths globally, with no indication of a well-controlled situation (Causo et al., 2021). Several studies have been conducted to use artificial intelligence (AI) and big data to combat the spread of COVID-19. Mathematical models and AI have been employed for the early detection and management of COVID-19 to provide a comprehensive overview of

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the methods used in these studies. AI applications in clinical settings have been highlighted to help clinicians and researchers address the challenges posed by COVID-19 big data.

The contribution of AI to the fight against COVID-19 has been discussed in several areas, including early warnings, monitoring, diagnosis, treatments, and social control (Chacín et al., 2020). AI-based models have been proposed to improve critical care of COVID-19 patients, highlighting the need for innovative solutions in healthcare systems worldwide. AI methods have been studied to determine their applications in fighting the COVID-19 outbreak and to provide researchers with an overview of the current state of AI applications in this unprecedented battle. Innovations in data science and AI have been recognized as essential to support global efforts to combat COVID-19, with a focus on responsible research and innovation to address concerns about social inequity. The role of AI in building supply chain resilience during extreme disruptions such as COVID-19 has been explored, highlighting the importance of leveraging AI technologies for organizational resilience. Additionally, the use of blockchain and AI to identify COVID-19-related symptoms, treatments, and drug manufacturing has been studied to provide innovative solutions to combat epidemics.

Integrating artificial intelligence (AI) into strategic planning has become increasingly prevalent across various industries (Wided, 2023). Business leaders, especially in smaller companies, recognize the potential benefits of applying AI to strategic planning processes. AI-powered insight services such as ChatGPT, Bard, and ChatSonic are revolutionizing how businesses imagine different scenarios and develop strategic plans. The National Artificial Intelligence Research and Development Strategic Plan emphasizes incorporating AI into organizational frameworks to improve decision-making processes. Furthermore, AI has been shown to improve strategic planning by analyzing vast data sets, uncovering insights, forecasting trends, and providing predictive analytics.

Despite AI's opportunities for strategic planning, some obstacles need to be addressed, and human input remains crucial to implementing practical strategies (Yáñez-Valdés & Guerrero, 2024). By embracing the AI revolution and integrating it into strategic planning processes, organizations can gain deeper insights, predict market trends, and stay ahead of competitors. AI is a valuable tool that can provide insights and support strategic planning efforts. However, organizations must develop a strategy cycle to deliver a more significant impact.

Strategic planning has significantly transformed due to the COVID-19 pandemic (Ribas et al., 2021). Artificial intelligence (AI) has played a crucial role in this transition, enabling organizations to adapt to a volatile and uncertain environment. This study explores expert perceptions of AI's impact on strategic planning, identifying key dimensions of impact, innovation, adaptability, resources, and foresight (Table 1).

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Table 1. Comparative analysis categories

Category	Dimensions Before the Pandemic	Dimensions During and After the Pandemic
Resilience and Adaptation	Static strategic plans	Agility and adaptability
Data Analysis	Using historical data	Real-time analysis
Digital Transformation	Incipient digitalization	Acceleration of digital processes
Prediction and Uncertainty	Traditional contingency plans	Scenario modeling with AI
Innovation	Focus on long-term trends	Quick responses to new needs

However, the relationship between AI and PE has not been observed as interaction and learning between their categories and indicators. Therefore, this paper aims to compare the learning network structure reported in the literature to the observations made in the present study.

Are there differences between the theoretical structure of the relationship between AI and PE concerning the observations made in the present study?

This paper is based on the premise that AI was implemented due to confinement and social distancing. In this sense, PE was oriented towards teleworking, directing the use of AI in strategic planning. Therefore, significant differences are expected between both theoretical and empirical structures.

Method

Design. The study was conducted using Delphi methodology, involving a panel of 20 experts with over 10 years of experience in strategic planning and artificial intelligence. Two rounds of consultation were conducted, first using an open questionnaire and then with a structured questionnaire based on the initial responses. The final analysis included qualitative and quantitative methods to identify significant consensus and divergences.

Instrument. The Strategic Planning Scale was used (Annex A). It includes: 1) Impact, 2) Benefits, 3) Challenges, 4) Resilience, 5) Perspective and 6) Management. The instrument's reliability reached alpha values of 0.768 and omega of 0.793 for the general scale and 0.723 and 0.773 for the subscales. Sphericity and adequacy were significant. Validity ranged between 0.324 and 0.672.

Procedure. To ensure the validity of the Delphi study, a panel of 20 experts was selected that met the following criteria:

- Professional Experience: More than 10 years of experience in strategic planning and artificial intelligence.
- Diversity: Representation from different sectors (public, private, academic) and geographic regions.
- Recognition: Relevant publications, conference participation, and/or leadership positions in your field.

First phase

Objective: To gather initial feedback and general perceptions on how AI has or could influence strategic planning in response to the pandemic.

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Procedure: Through an open questionnaire, the experts expressed their opinions and experiences.

- How do you think AI has affected strategic planning in your organization during the pandemic?
- What opportunities and challenges do you identify in using AI for strategic planning in the future?
- In what areas do you think AI has had the most significant impact?

Second phase
Objective: To analyze the responses from the first round and develop a structured questionnaire reflecting the key points identified.
Procedure: The research team qualitatively analyses the responses, categorizing the main ideas. Based on this, a questionnaire with closed questions (Likert scale) will be designed to validate and deepen the experts' perceptions.

Third phase
Objective: To validate the opinions collected in the first round and seek consensus.
Procedure: Based on the answers from the first round, experts will respond to a structured questionnaire and be asked to justify any disagreement with the majority opinion.

Fourth phase
Objective: To identify significant consensus and divergences and to prepare a final report.
Procedure: The responses were analyzed quantitatively to identify trends, and the justifications given in case of disagreement were analyzed qualitatively. The final report includes recommendations and areas for future research.

Results
Neural network analysis suggests relationships between categories and dimensions to reveal a learning process (Fig. 1). The results indicate that the learning process around the use of AI in PE starts with capabilities and culminates in the redefinition of PE based on AI.

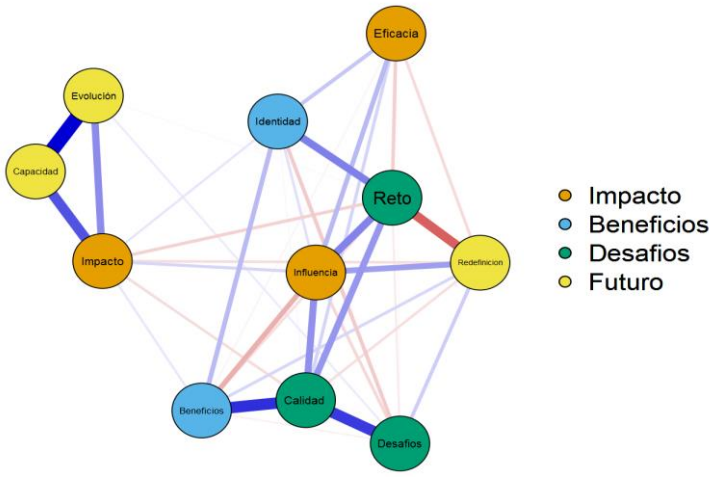

Figure 1. Neural network learning AI experts on PE in the face of COVID-19.

The centrality, clustering, and structuring coefficients suggest that the hypothesis regarding significant differences between the theoretical structure reported in the reviewed literature and the observations made in the present work with a sample of AI and PE experts is not rejected.

Discussion

The contribution of this work lies in establishing a matrix of opinions and feelings related to the impact of AI on PE in the face of the pandemic. The matrix includes five categories related to 1) impact, 2) innovation, 3) adaptability, 4) resources, and 5) foresight. About the state of the art where a) resilience and adaptation to change, b) real-time analysis, c) digital migration, d) prediction and management of uncertainty, e) consumer volatility, f) innovation, g) remote talent management and reconstruction of the organization are proposed, this work suggests focusing the impact of AI on PE on the innovation of remote work with resilience. Opportunity lies in distancing and confinement, but socio-digital networks are suggested to conduct the interviews.

Companies used to develop strategic plans with longer time horizons and a relatively static approach (Pedroza-Gutiérrez et al., 2021). Changes were implemented gradually and with relatively predictable foresight. The COVID-19 crisis demonstrated the urgent need for organizations to become more resilient and agile. AI became a key tool to quickly adapt strategies to changing conditions, such as supply chain disruptions, sudden shifts in demand, and the need to operate remotely.

Data was collected and analyzed more sporadically, and strategic decisions were made based on historical data (Diaz, 2020). The need for fast, data-driven decisions became critical. AI allowed organizations to analyze real-time data on the spread of the virus, local regulations, and economic trends, helping to adjust strategies on the fly. For example, companies could quickly adapt their business models by moving to a digital approach or modifying supply chains based on AI analytics.

Many organizations were still in the early stages of digitizing and using AI in their strategic processes (Garrido et al., 2022). The need to operate remotely and digitize business processes accelerated the adoption of AI technologies. Companies that had not adopted AI before were forced to integrate it to survive. This included automating processes, implementing AI systems for customer service, and optimizing resources in a context of uncertainty.

Business strategies were based on predictable scenarios, and uncertainty was mainly managed through traditional contingency plans (Priede et al., 2021). The unpredictable nature of the pandemic highlighted the importance of AI for planning in times of high uncertainty. AI algorithms enabled organizations to model multiple future scenarios, quickly adapt to new developments, and make informed strategic decisions even under high volatility conditions.

Consumer behavior was more stable and predictable, and businesses used traditional approaches to understand and anticipate their needs (Elisa & Companioni, 2021). There was a dramatic shift in consumer behavior, such as the rise of e-commerce, preference for essential products, and demand for contactless options. AI helped businesses quickly

understand and adapt to these changes, adjusting their marketing and operations strategies to meet new demands.

Strategic innovation focuses on improving existing products and services or developing new ones based on long-term trends (Temprana-Salvador et al., 2022). New needs and challenges emerged, such as the demand for healthcare solutions, remote work tools, delivery services, and the impact on scientific and technological information systems (García-Lirios et al., 2023). AI facilitated the rapid development of innovations in response to these emerging needs. Companies that use AI could quickly identify opportunities in the market and adjust their strategies to take advantage of them.

Talent management and strategic workforce planning were previously done physically with little reliance on advanced technology (Neylan et al., 2022). AI helped manage the shift to remote work, from hiring to performance appraisal and virtual collaboration. Moreover, HR planning strategies were quickly adapted with the help of AI, ensuring that businesses maintained their productivity and strategic alignment in a wholly digital environment.

Companies were planning for growth and expansion with a long-term focus on global economic stability. Organizations use AI to plan their post-pandemic recovery and growth (Cala et al., 2022). AI enables companies to foresee possible economic recovery scenarios, identify strategic investment areas, and redesign their operations for a new normal.

Unlike the state of the art where AI and PE are associated by dimensions related to 1) resilience and adaptation to crises, 2) real-time analysis, 3) accelerated digital transformation, 4) prediction and management of uncertainty, 5) changes in consumer behavior, 6) Innovation in responses to new needs, 7) talent management and remote work, 8) planning for post-pandemic recovery, this work demonstrated a neural sequence that starts with capabilities and ends with redefinitions of AI-based PE.
Therefore, this work's areas of opportunity will be to observe the accumulation of dimensions to describe the feelings and opinions around the implementation of AI in the context of a health crisis such as COVID-19. Expanding the neural learning network model will allow anticipating scenarios of rejection or acceptance of AI in the face of the PE of risk, uncertainty, and vulnerability scenarios.

Conclusion

This study aimed to investigate and assess expert perspectives on the influence of artificial intelligence (AI) on strategic planning in the context of the pandemic. The findings indicate a consensus among experts regarding the importance of innovation for adaptability to change and effective talent management for remote collaboration. While there are opportunities for distancing and confinement, the study identifies a competitive advantage in leveraging social-digital networks.

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ANNEX A

Structure of the instrument

1. Dimension 1: Overall Impact of AI on Strategic Planning
    - Items:
        - AI has enabled my organization to adapt its strategies to changing conditions during the pandemic quickly.
        - AI has positively influenced strategic decision-making during the pandemic.
        - The areas most impacted by AI include data analysis, scenario prediction, innovation, and strategic management. *(Multiple choice question)*
2. Dimension 2: Benefits of AI
    - Items:
        - AI has improved the accuracy of strategic analysis.
        - It has significantly reduced planning and response times.
        - It has facilitated the identification of new business opportunities during the pandemic.
3. Dimension 3: Challenges and Barriers
    - Items:
        - Lack of technical knowledge is a significant barrier to implementing AI in my organization.
        - There is organizational resistance to the integration of AI technologies.
        - The quality of available data has been a limitation of the effective use of AI.
4. Dimension 4: Adaptability and Resilience
    - Items:
        - AI has helped my organization adapt to sudden supply chain disruptions.
        - AI has facilitated the transition to digital business models.
        - AI has enabled multiple scenarios to be modeled to manage uncertainty during the pandemic.
5. Dimension 5: Prospective and Future

- Items:
  - I believe AI will play a central role in strategic planning in the next five years.
  - AI-based tools will redefine strategic processes in my industry.
  - The future of AI in strategic planning requires greater integration with predictive and collaborative tools.

6. Dimension 6: Talent Management and Remote Work
   - Items:
     - AI has improved virtual collaboration in my organization during the pandemic.
     - It has facilitated strategic planning of human resources in a remote environment.
     - AI has enabled talent assessment and management under remote working conditions.

Instrument format

- 5-point Likert scale:
  1 = Strongly disagree2 = Disagree3 = Neutral4 = Agree5 = Strongly agree

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APPENDIX B

```
# Step 1: Install required libraries (if not installed)
!pip install tensorflow matplotlib seaborn

# Step 2: Import the necessary libraries
import numpy as np
import pandas as pd
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
import matplotlib.pyplot as plt
import seaborn as sns

# Step 3: Generate or load the data (you can replace it with real data)
# Category data simulation (AI and PE with five dimensions)
np.random.seed(42)
data = {
'Impact': np.random.uniform(0, 5, 100), # Overall impact of AI
'Benefits': np.random.uniform(0, 5, 100), # Benefits identified
'Challenges': np.random.uniform(0, 5, 100), # Barriers and challenges
'Adaptability': np.random.uniform(0, 5, 100), # Adaptation and resilience
'Future': np.random.uniform(0, 5, 100), # AI Foresight
'Result': np.random.uniform(0, 5, 100) # Overall result in PE
}
# Convert data to DataFrame
df = pd.DataFrame(data)

# Show a preview of the data
print("Dummy data:")
print(df.head())
```


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```
# Step 4: Separate the data into input (X) and output (y) variables
X = df[['Impact', 'Benefits', 'Challenges', 'Adaptability', 'Future']].values
y = df['Result'].values

# Step 5: Create the neural network model
model = Sequential([
Dense(16, input_dim=5, activation='relu'), # Hidden layer with 16 neurons
Dense(8, activation='relu'), # Hidden layer with 8 neurons
Dense(1, activation='linear') # Output layer (PE result)
])

# Compile the model
model.compile(optimizer='adam', loss='mean_squared_error', metrics=['mae'])

# Step 6: Train the model
history = model.fit(X, y, epochs=100, batch_size=10, verbose=1)

# Step 7: Visualize training results
plt.figure(figsize=(12, 5))

# Loss during training
plt.subplot(1, 2, 1)
plt.plot(history.history['loss'], label='Loss')
plt.title('Loss during training')
plt.xlabel('Epoches')
plt.ylabel('Loss')
plt.legend()

# MAE during training
plt.subplot(1, 2, 2)
plt.plot(history.history['mae'], label='Mean Absolute Error (MAE)', color='orange')
plt.title('MAE during training')
plt.xlabel('Epoches')
plt.ylabel('MAE')
plt.legend()
plt.tight_layout()
plt.show()

# Step 8: Evaluate the model
loss, mae = model.evaluate(X, y, verbose=0)
print(f"Final loss: {loss:.4f}")
print(f"final MAE: {mae:.4f}")

# Step 9: Making predictions with new data
new_data = np.array([[4.5, 3.2, 2.8, 4.1, 3.9]]) # Example input
prediction = model.predict(new_data)
print(f"Prediction for the new data: {prediction[0][0]:.4f}")
```


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