



Uso de IA Generativa na Pesquisa Científica

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DEP/UFSCar

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NEWS | 08 September 2023

Scientific sleuths spot dishonest ChatGPT use in papers

Manuscripts that don't disclose AI assistance are slipping past peer reviewers.

By [Gemma Conroy](#)



<https://www.nature.com/articles/d41586-023-02477-w>

[nature](#) > [articles](#) > [article](#)

Article | [Open access](#) | Published: 19 June 2024

Detecting hallucinations in large language models using semantic entropy

[Sebastian Farquhar](#) , [Jannik Kossen](#), [Lorenz Kuhn](#) & [Yarin Gal](#)

Nature **630**, 625–630 (2024) | [Cite this article](#)

109k Accesses | **2** Citations | **1521** Altmetric | [Metrics](#)

Abstract

Large language model (LLM) systems, such as ChatGPT¹ or Gemini², can show impressive reasoning and question-answering capabilities but often ‘hallucinate’ false outputs and unsubstantiated answers^{3,4}. Answering unreliably or without the necessary information prevents adoption in diverse fields, with problems including fabrication of legal precedents⁵ or untrue facts in news articles⁶ and even posing a risk to human life in medical domains such as radiology⁷. Encouraging truthfulness through supervision or reinforcement has been only partially successful⁸. **Researchers need a general method for detecting hallucinations in LLMs** that works even with new and unseen questions to which humans might not know the answer.





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E INOVAÇÃO



Reunião do Pleno do
Conselho Nacional de Ciência e Tecnologia

29 de Julho de 2024

IA para o Bem de Todos

Proposta de Plano Brasileiro de
Inteligência Artificial 2024-2028

Agenda

- Considerações sobre inteligência artificial
- Como interagir com LLMs
- AI Generativa como um/a assistente
- AI Generativa no processo de pesquisa
- Reflexões e Desafios

Agenda

- *Considerações sobre inteligência artificial*
- Como interagir com LLMs
- AI Generativa como um/a assistente
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Considerações sobre AI

- Primeiros esforços com Alan Turing
- Vários tipos de AI e aprendizado de máquinas
- Vivemos um momento disruptivo com os GPTs ou virá mesmo com inteligência artificial geral (em inglês, AGI)?



Considerações sobre AI



- Natural Language Processing (NLP)
- **Generative Pre-trained Transformer (GPT)**
 - família de Large Language Model (LLM)
 - uso de deep learning (aprendizado profundo)
- Comunicação por predição (modelo estatístico)
 - apresenta "alucinações"



Estou começando uma pesquisa sobre cultura organizacional direcionada por dados (data-driven culture) para facilitar o uso de big data analytics em empresas. Você poderia me sugerir alguns artigos científicos para leitura?

Google

"The Role of Data-Driven Culture in Business Performance"

Todas Imagens Notícias Vídeos Shopping Livros Web E Mais Ferramentas

Nenhum resultado encontrado para "The Role of Data-Driven Culture in Business Performance"

Resultados para **The Role of Data-Driven Culture in Business Performance** (sem aspas)

Artigos acadêmicos sobre **The Role of Data-Driven Culture in Business Performance**

... **data-driven culture** impact innovation and performance ... - Chatterjee - Citado por 212
... **performance**: the mediating role of **data-driven culture** - Karaboga - Citado por 32
... the mediating **role** of organizational **data-driven culture** - Chaudhuri - Citado por 107



Claro! Aqui estão algumas sugestões de artigos científicos que podem ser úteis para a sua pesquisa sobre cultura organizacional orientada por dados:

1. **"The Role of Data-Driven Culture in Business Performance"** - Este artigo explora como uma cultura orientada por dados pode impactar o desempenho das empresas.
2. **"Building a Data-Driven Culture: Best Practices and Case Studies"** - Este trabalho discute as melhores práticas para implementar uma cultura de dados, incluindo estudos de caso reais.
3. **"Data-Driven Decision Making in Organizations: A Systematic Review"** - Uma revisão sistemática que analisa como as organizações utilizam a tomada de decisões baseadas em dados e os desafios envolvidos.
4. **"Creating a Data-Driven Organization"** - Este artigo foca em estratégias para transformar a cultura organizacional para ser mais orientada por dados, com foco em liderança e engajamento dos colaboradores.
5. **"The Impact of Organizational Culture on Data Analytics Capability"** - Analisa como diferentes

Não compartilhe informações confidenciais. Os chats podem ser revisados e usados para treinar nossos modelos. Saiba mais

Mensagem ChatGPT



Versão
Grátis

Alucinações em AI Generativa

- Modelos estatísticos de inferência
 - Uso de amostras
 - Sujeito a erros de amostragem
- Transformar tudo em 0 e 1 (digitalização)

- Como eu **provavelmente** iniciaria este seminário às 16:00?
 - "Bom dia"
 - "Boa tarde"
 - "Boa noite"

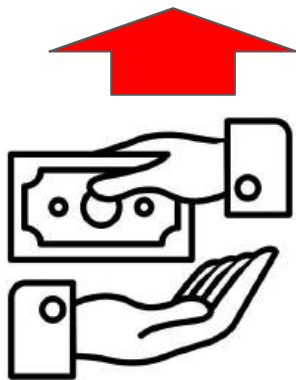


Alucinações em AI Generativa

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< 3/3 >



Pensou por 21 segundos

Claro! Aqui estão alguns artigos científicos que abordam a cultura organizacional orientada por dados e o uso de big data analytics em empresas:

1. **Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management*, 53(8), 1049-1064.**
 - Este artigo discute como as empresas podem desenvolver capacidades de análise de big data e destaca a importância da cultura organizacional nesse processo.
2. **Davenport, T. H., & Bean, R. (2018). Big companies are embracing analytics, but most still don't have a data-driven culture. *Harvard Business Review*.**
 - Os autores exploram os desafios que grandes empresas enfrentam ao tentar criar uma cultura orientada por dados e oferecem insights para superar esses obstáculos.

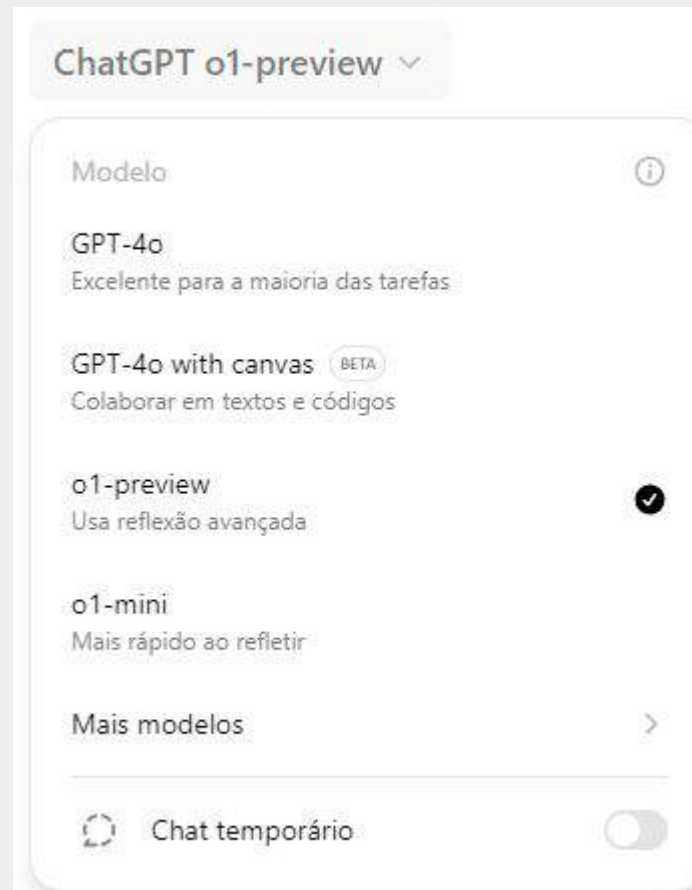
Mensagem ChatGPT

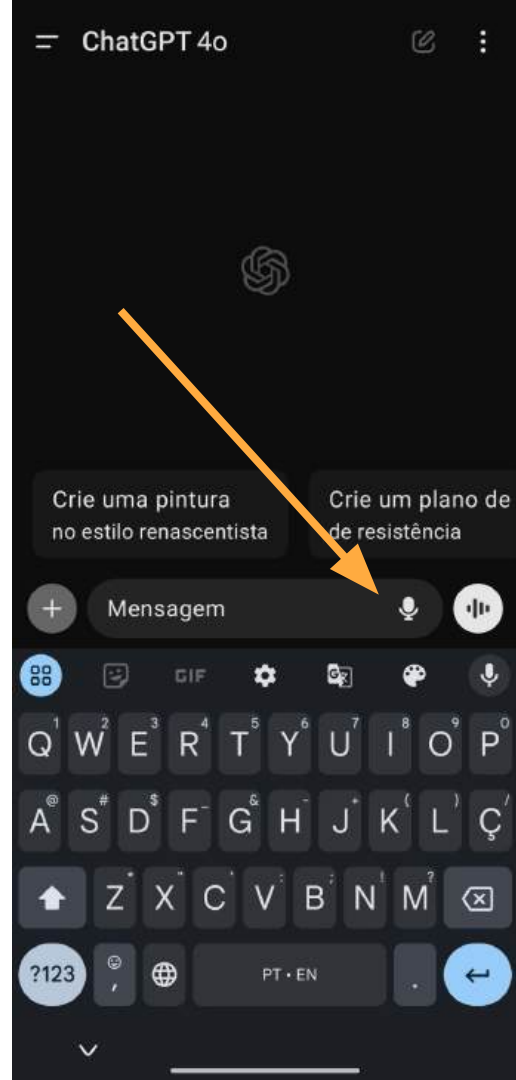





ChatGPT

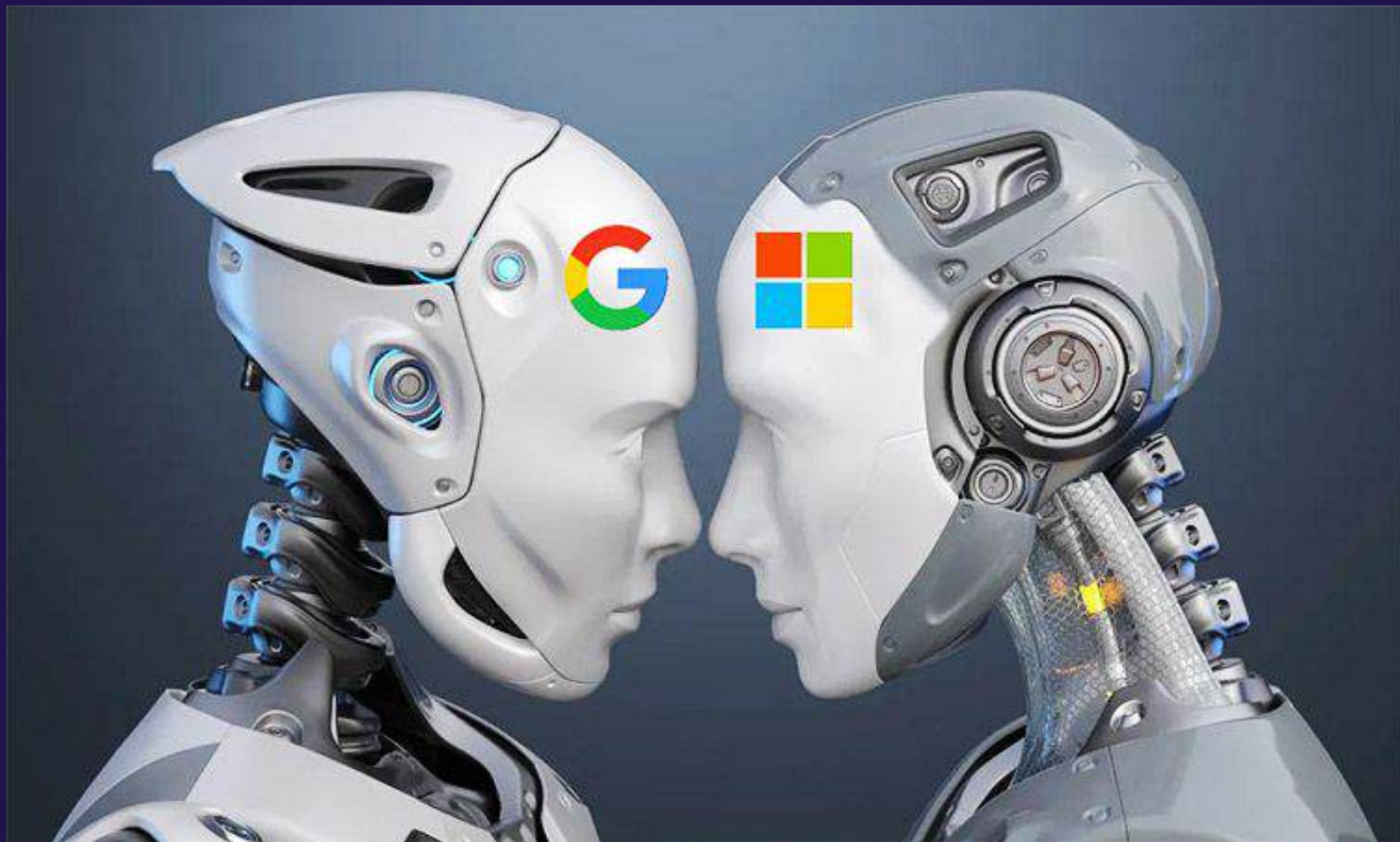
- Produto da OpenAI
- Várias versões
- Treinamento intensivo em bases de dados não reveladas
- Grande capacidade de comunicação escrita, processamento de imagens, ouvir e falar





Alternatives

<u>Name</u>	Logo	<u>Freemium</u>	<u>Paid version</u>
<u>Gemini by Alphabet</u>		✓	✓
<u>Bing or Copilot by Microsoft</u>		✓	✓
<u>Claude by Anthropic</u>		✓	✓
<u>Perplexity</u>		✓	✓
<u>Llama by Meta</u>		✓	



Agenda

- Considerações sobre inteligência artificial
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- Reflexões e Desafios

ChatGPT e outros LLMs

- Não é um oráculo!
- Rede neural aprende conforme ela é usada
- Qualidade da resposta depende do **prompt**
- A resposta necessita de **curadoria**
 - de especialista
 - a crítica é uma oportunidade de aprendizado (método didático)
- ChatGPT e Claude têm GPTs especializados criados pelos usuários





Quero ajuda para estudar
vocabulário para uma prova

Conte uma curiosidade divertida
do Império Romano

Escreva um agradecimento
para meu entrevistador

Ajude-me a escolher
uma roupa que fique boa em fotos

Prompt

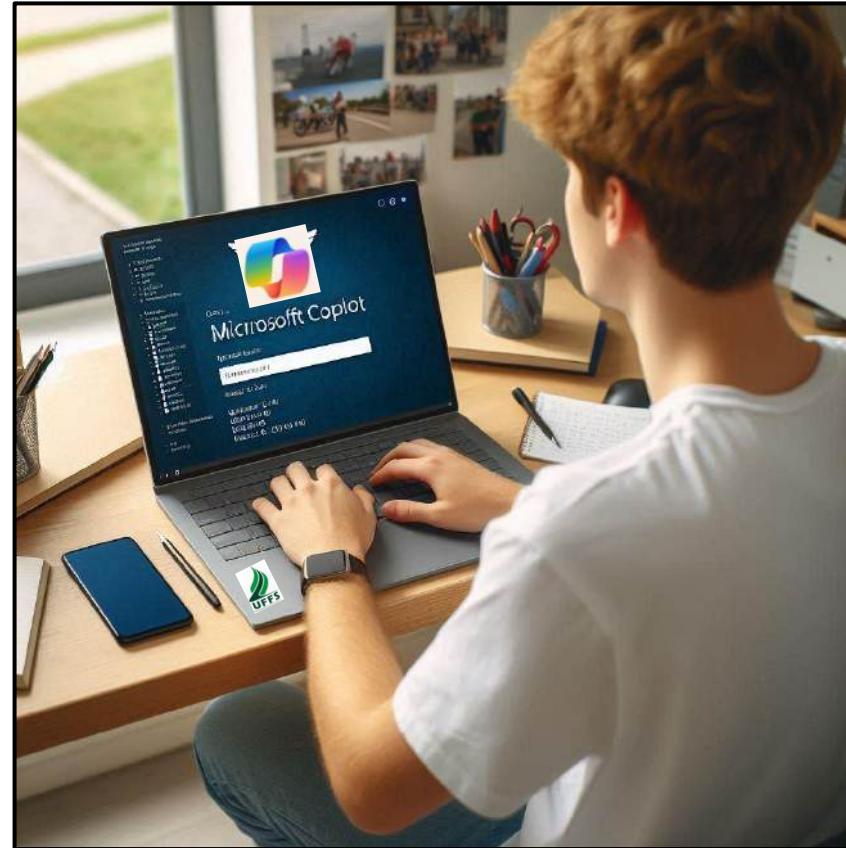


Mensagem ChatGPT



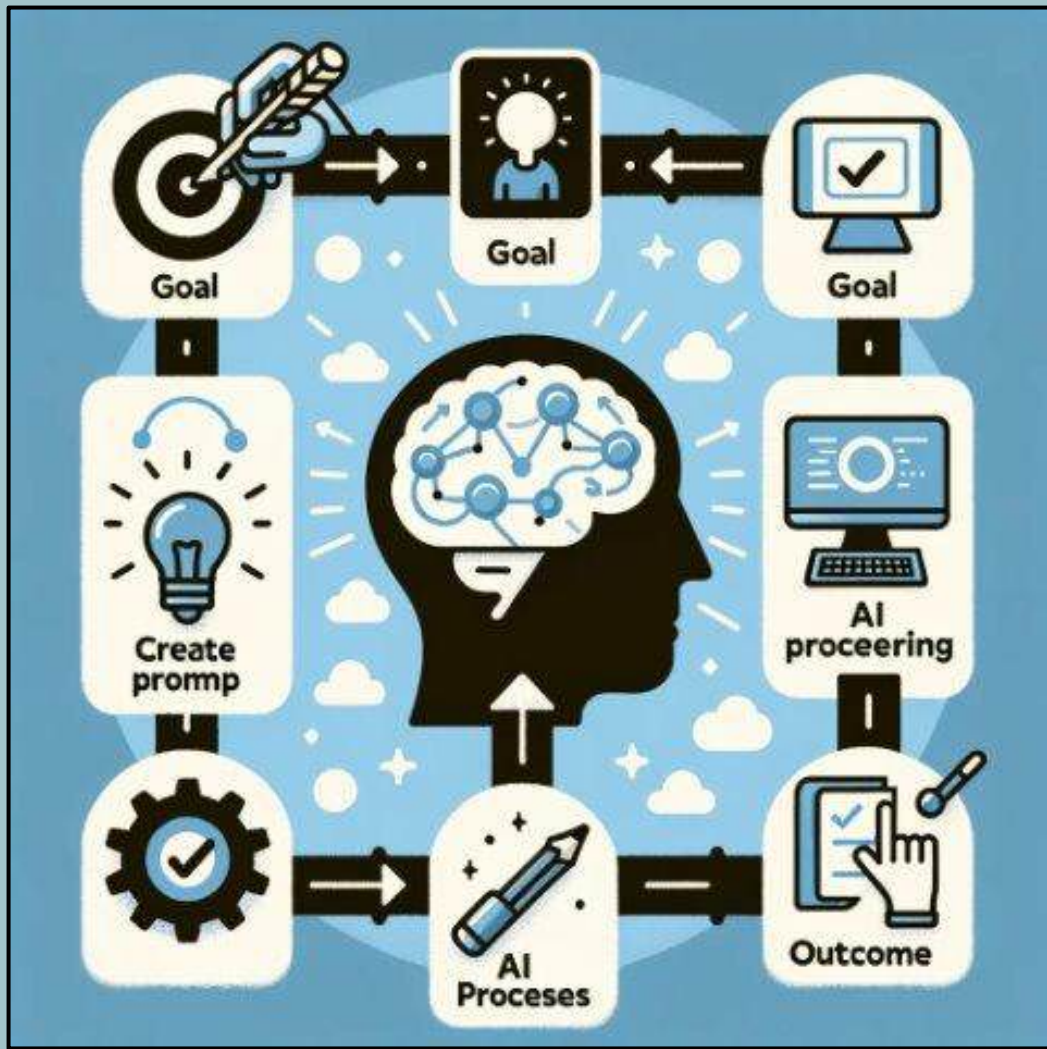
Prompt Engineering

- A **entrada de dados** para o LLM
- Garante respostas específicas e mais acuradas
- Prompts precisos provém contexto, melhorando a relevância
- **Direciona** as respostas do LLMs



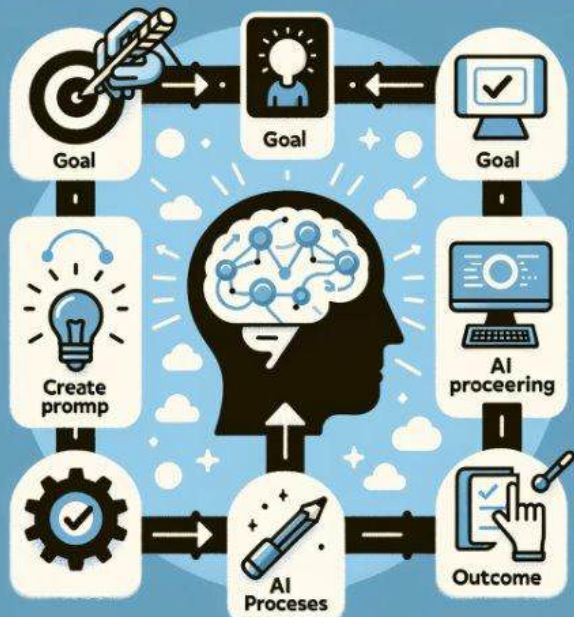
Prompt Para Criar Imagem com uso DALL-E

Create a flowchart illustration that visually explains the importance of engineering prompts in AI systems. Start with an icon representing a user's goal, like a target or a lightbulb, at the top left. Connect this to a thought bubble or a pen and paper icon, symbolizing the creation of a prompt. Next, show a computer screen or a stylized brain icon, representing AI processing the prompt. Conclude with a check mark or a smiley face icon to symbolize a successful outcome. Use arrows to connect these icons in a left-to-right sequence. Add brief labels under each icon such as 'Goal,' 'Create Prompt,' 'AI Processes,' 'Outcome,' and a caption at the bottom explaining the process. Use a clean, simple style with a professional appearance suitable for a business presentation



duas tentativas

Exemplo Simple bernardbuilds. io

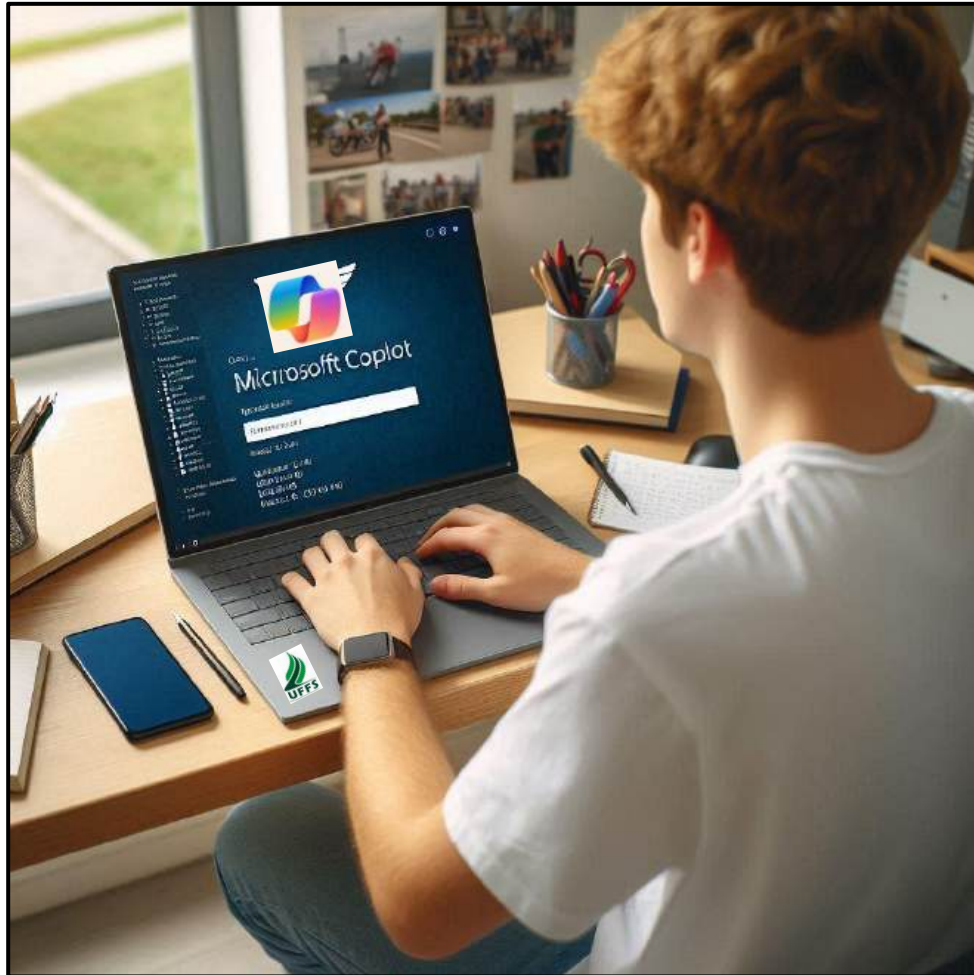


- **Papel**
Atuar como um redator experiente

- **Tarefa**
Escrever um anúncio para o LinkedIn.
Quero divulgar resultados de uma pesquisa sobre Logística de produtos agroindustriais
....


- **Formato**
Use tom persuasivo e uma linguagem clara, simples e direta

- **Restrições**
Máximo de 200 palavras e não uses clichés



Escrevendo um Prompt Vencedor

- Persona
- Objetivo
- Instruções
- Contexto
- Restrições
- Saída Esperada



Sempre faça
Curadoria das
respostas dos
modelos de LLM



Alucinações

Não é Oráculo

Enganos e Desinformação

Tipos de Alucinação

- *Factual*



Who was the first person to land on Moon?



Answer: Yuri Gagarin was the first person to land on the Moon. **X**



Correct Answer: Neil Armstrong was the first person to land on the Moon. **✓**

- *Fidelidade*



Translate the following English question into Spanish: "What is the capital of Italy?"



Answer: Capital of Italy is Rome **X**



Explanation: User instruction asked for translating the provided question, but LLM instead of doing translation, chose to answer it.

Inconsistência da instrução

Tipos de Alucinação

- *Fidelidade*



Solve the equation $2x + 3 = 11$ step by step.



Answer: Step 1: Subtract 3 from both sides to get: $2x = 8$. Step 2: Divide both sides by 2 to get: $x = 3$. So, the result of the equation is $x = 3$.



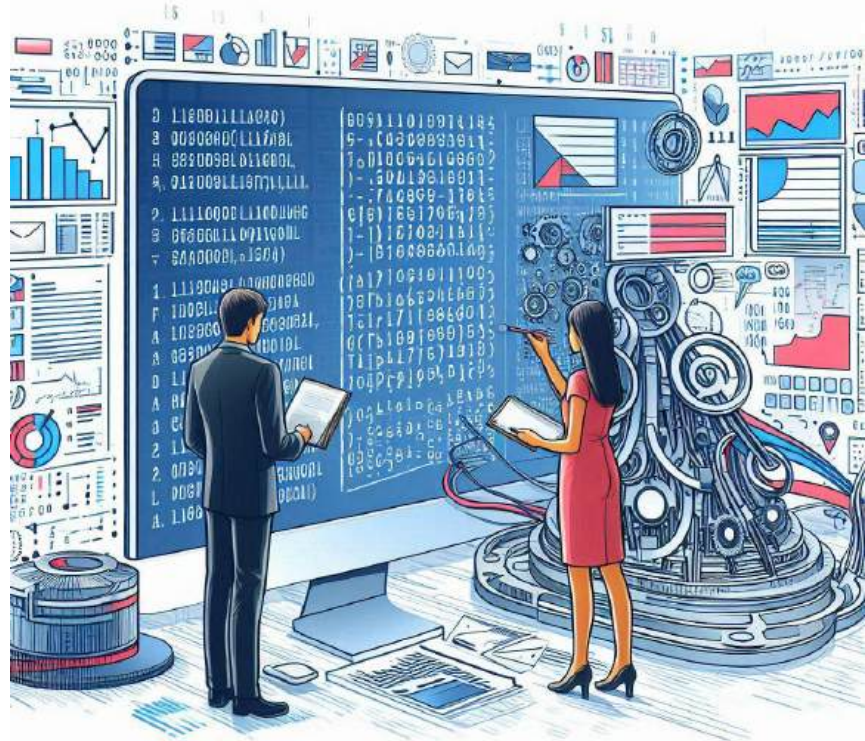
Explanation: The first step correctly isolates the term with x to get $2x = 8$. However, the next step in accurately divides 8 by 2 to yield a result of $x = 3$, which is inconsistent with the earlier reasoning.

Inconsistência lógica



Curadoria em IA Generativa

- Usar verificadores humanos
 - especialista no assunto
 - orientador/a
- Usar múltiplas fontes para validar
- Examinar a plausibilidade
- Verificar as fontes





Estou iniciando uma pesquisa sobre cultura organizacional voltada para dados. Você como um especialista sobre os assunto me responda: quais são os elementos de uma cultura organizacional voltada para dados? Apresente suas fontes.

< 3/3 >



Pensou por 15 segundos ▾

Os elementos de uma cultura organizacional voltada para dados incluem:

1. **Liderança Orientada a Dados:** A alta gestão promove o uso de dados na tomada de decisões e serve como exemplo para o restante da organização.
2. **Alfabetização em Dados:** Investimento no desenvolvimento das habilidades dos colaboradores para compreender e analisar dados eficazmente.
3. **Acesso a Dados de Qualidade:** Disponibilização de dados precisos e atualizados para todos que deles necessitam.
4. **Governança de Dados:** Implementação de políticas e procedimentos para garantir a qualidade, segurança e privacidade dos dados.
5. **Tomada de Decisão Baseada em Dados:** As decisões são fundamentadas em evidências obtidas

5. **Tomada de Decisão Baseada em Dados:** As decisões são fundamentadas em evidências obtidas através da análise de dados, em vez de intuições ou experiências passadas.
6. **Tecnologia e Infraestrutura Adequadas:** Utilização de ferramentas e sistemas que facilitam a coleta, armazenamento, análise e compartilhamento de dados.
7. **Cultura de Experimentação e Inovação:** Incentivo à experimentação, aprendizado contínuo e aceitação de falhas como parte do processo de melhoria.
8. **Colaboração Interdepartamental:** Promoção de uma comunicação aberta e compartilhamento de dados entre diferentes áreas da organização.
9. **Métricas e KPIs Definidos:** Estabelecimento de indicadores-chave de desempenho para monitorar e avaliar o progresso em relação aos objetivos estratégicos.
10. **Foco no Cliente:** Utilização de dados para compreender as necessidades dos clientes e melhorar a experiência oferecida.

**Fontes:**

- Davenport, T. H., & Harris, J. G. (2007). *Competing on Analytics: The New Science of Winning*. Harvard Business School Press.
- McAfee, A., & Brynjolfsson, E. (2012). *Big Data: The Management Revolution*. Harvard Business Review, 90(10), 60-68.
- Schmarzo, B. (2013). *Big Data: Understanding How Data Powers Big Business*. Wiley.

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Quais são os elementos de uma cultura organizacional voltada para dados?

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Pro Search

- Pesquisar os elementos de uma cultura organizacional voltada para dados
- Seleccionar e resumir as informações encontradas sobre a cultura organizacional voltada para dados

Sources

Inovações de Mercado a partir da LGPD: A cultura de proteção de dados...

semantic scholar · 1

Desafios na implantação da cultura de segurança do paciente no Brasil...

semantic scholar · 2

PERSPECTIVA SOBRE WIKI NA ORGANIZAÇÃO DA INFORMAÇÃO EM...

semantic scholar · 3



View 2 more

Answer

Uma cultura organizacional voltada para dados é essencial para que as empresas possam

Attach text or PDF files. 3 left today



Ask follow-up



Pro



AutoGPT's

- Desenvolvidos para automatizar uma gama de atividades usando vários GPTs **simultaneamente**
- Modelos escaláveis e adaptativos
- Indicado para tarefas complexas
- Após o prompt, GPT entrega um plano de ação, você concorda e as **tarefas acontecem em paralelo**

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ChatGPT

PONTOS FORTES

- Gerar conteúdos bem
 - códigos (Python, Java, R etc.)
 - imagens
 - estórias, letras de música, poesia
 - e-mails, cartas
- Correção de textos
- Diferentes tons de comunicação escrita
- Manipular uma grande quantidade de dados
- Code-interpreter

PONTOS FRACOS

- Alucinações
- Falta de originalidade na criação (generativo)
- Resposta incompleta ou simplista ou aproximadas
- Muito detalhista
- Falta de sensibilidade, inteligência emocional

Usar IA Generativa

Um/a **assistente** ou
um/a **co-piloto/a** de
pesquisa



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Identificação do Problema de Pesquisa

- **Dificuldade** para criar conteúdos originais
 - problemas de pesquisa já existentes
- **Auxilia**
 - mapear a literatura
 - testar questões de pesquisa
- ChatGPT
- Copilot
- Gemini
- Claude
- Perplexity





ChatGPT 4o ▾

Considere-se um candidato ao processo seletivo ao curso de mestrado do Programa de Pós-Graduação em Engenharia de Produção da EESC/USP. O assunto de seu interesse é Multi-critéria decision-making (MCDM). Elabore algumas questões de pesquisa para propor um projeto de pesquisa no processo seletivo do programa.

< 2/2 >

Foram sugeridas 8 questões



Claro, Roberto. Aqui estão algumas possíveis questões de pesquisa que você pode propor para um projeto de pesquisa em Multi-critéria Decision-Making (MCDM) no processo seletivo do Programa de Pós-Graduação em Engenharia de Produção da EESC/USP:

1. **Como as diferentes técnicas de MCDM podem ser aplicadas para melhorar a tomada de decisão em cadeias de suprimentos sustentáveis?**
 - Esta questão busca explorar como metodologias como AHP, TOPSIS e PROMETHEE podem ser utilizadas para balancear critérios econômicos, ambientais e sociais em cadeias de suprimentos.
2. **Quais são os principais desafios e benefícios da integração de MCDM com tecnologias da Indústria 4.0 em ambientes de manufatura avançada?**
 - Esta questão examina como a MCDM pode ajudar na tomada de decisão em tempo real e



Mensagem ChatGPT



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Answer

Aqui estão algumas questões de pesquisa relevantes para propor um projeto de pesquisa sobre Multi-Criteria Decision-Making (MCDM) no processo seletivo do Programa de Pós-Graduação em Engenharia de Produção da EESC/USP:

Questões de Pesquisa

- Quais são as tendências mais recentes e aplicações emergentes de métodos MCDM em problemas práticos de engenharia de produção?**
 - Revisar a literatura sobre avanços recentes em MCDM e identificar áreas promissoras de aplicação na engenharia de produção ¹ ³.
 - Analisar estudos de caso que demonstrem a eficácia de métodos MCDM em resolver desafios complexos na engenharia de produção ¹ ⁴.
- Como a integração de MCDM com técnicas de inteligência artificial e análise de dados pode melhorar o suporte à tomada de decisão em sistemas de produção?**
 - Investigar abordagens híbridas que combinem MCDM com métodos de IA e análise de dados para lidar com incerteza e complexidade em problemas de engenharia de produção ¹ ³.
 - Desenvolver modelos de decisão baseados em dados que utilizem MCDM para avaliar alternativas e apoiar a tomada de decisão em sistemas de produção ⁶.
- Quais são os desafios e limitações atuais dos métodos MCDM e como podem**

+ Ask follow-up

Pro

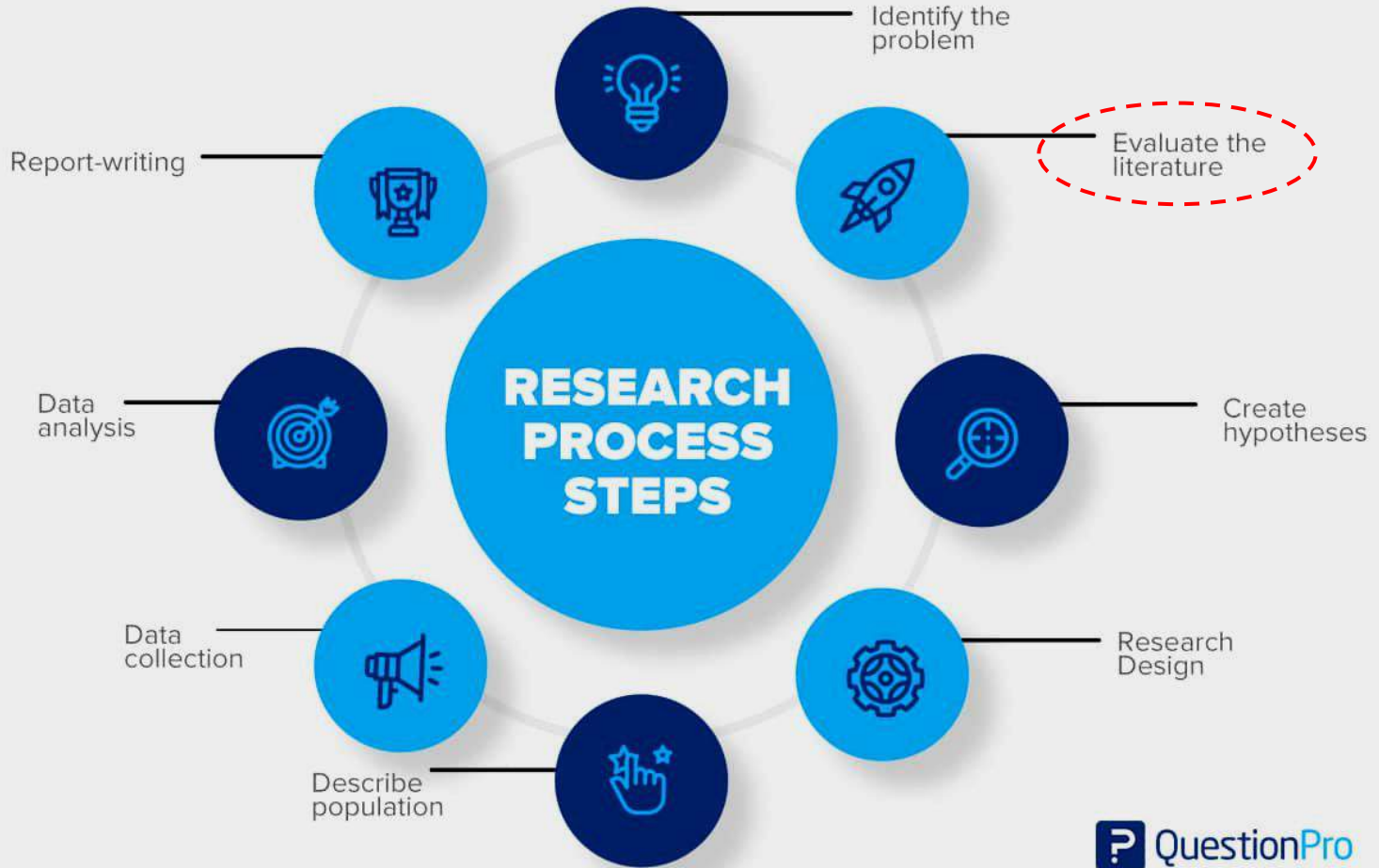
modelagem de incerteza, robustez e adaptabilidade ⁴.

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4 questões



Revisão da Literatura

- Uma das maiores contribuições
- Buscas em bases abertas ou abstracts de bases pagas
- Importar buscas feitas em SCOPUS ou WoS (BibTex, RIS)
- Auxilia
 - **buscar** literatura
 - identificar potencial de leitura
 - resumir
 - **gerenciar** referências
- ELICIT, RESEARCH RABBIT, SCISPACE, CONNECTED PAPERS, CONSENSUS, TEXTERO, RESEARCH BUDDY





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Sustainable Supply Chain Performance Measurement System

How to develop a performance measurement system for a sustainable supply chain?

Summary of top 4 papers

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Developing a performance measurement system for sustainable supply chains requires a comprehensive approach that integrates multiple dimensions of sustainability across the entire supply chain. Researchers have proposed frameworks that incorporate economic, environmental, and social aspects, as well as additional dimensions like reputation and equity (Tajbakhsh & Hassini, 2015). These systems should be context-dependent and tailored to specific supply chain requirements (Cuthbertson & Piotrowicz, 2011). Methodologies such as grey-based neighborhood rough set theory can help evaluate and select key performance measures (Bai et al., 2012). For agri-food supply chains, a standardized mapping approach has been suggested, identifying 16 performance areas and 71 subcategories that cover the triple bottom line (Ivo de Carvalho et al., 2022). To develop an effective performance measurement system, organizations should consider their operational decisions, industry type, and sustainability goals while ensuring the integration of measures across different supply chain stages and partners.

Sort: Most relevant

Filters

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Paper

Abstract summary

Performance measurement of sustainable supply chains: a review and research

Alireza Tajbakhsh +1

Add new step

proposes a comprehensive framework for developing performance measurement systems for supply chains.

Q How to develop a performance measurement system for a sustainable supply chain?



2 selected

+ Show more like these

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Paper	Abstract summary
<input checked="" type="checkbox"/> Performance measurement of sustainable supply chains: a review and research questions Alireza Tajbakhsh +1 2015 · 104 citations · DOI	The paper proposes a comprehensive framework for developing performance measurement systems for sustainable supply chains.
<input type="checkbox"/> Evaluating ecological sustainable performance measures for supply chain management Chunguang Bai +3 2012 · 223 citations · DOI	The paper introduces a methodology to evaluate, select, and monitor sustainable supply chain performance measures that can be integrated into a performance management system.
<input checked="" type="checkbox"/> Performance measurement systems in supply chains: A framework for contextual analysis Richard W. Cuthbertson +1 2011 · 137 citations · DOI	The paper proposes a framework for analyzing supply chain performance measurement systems in different contexts.
<input type="checkbox"/> A roadmap for sustainability performance assessment in the context of Agri-Food Supply Chain Mafalda Ivo de Carvalho +2 Sustainable Production and Consumption	The paper proposes a framework to guide the sustainable measurement of different supply chain stakeholders in the agri-food industry.

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Describe what kind of data you want to extract

e.g. Limitations, Survival time

ADD COLUMNS

- + Summary
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- + Intervention
- + Outcome measured
- + Limitations

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Q How to develop a performance measurement system for a sustainable supply chain?

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2015 · 104 citations DOI
- Evaluating ecological sustainable performance measures for supply chain management
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Richard W. Cuthbertson +1
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- Meta-Analysis
- Systematic Review
- RCT
- Longitudinal

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work for developing performance y chains.

valuate, select, and monitor sustainable n be integrated into a performance

ng supply chain performance

he sustainable measurement of pri-food industry.

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- + Methodology
- + Intervention
- + Outcome measured
- + Limitations

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Performance measurement of sustainable supply chains : A literature review and a research agenda

🔍 P. Taticchi, F. Tonelli, Roberto Pasqualino


2013 197 citations [Semantic Scholar ↗](#) [DOI ↗](#)

Abstract summary

The paper provides a critical literature review on sustainable supply chain performance measurement and suggests future research directions.

Purpose -- The purpose of this paper is to develop the body of knowledge in the area of sustainable supply chains by providing a critical literature review in the field of sustainable supply chain performance measurement (SSCPM) and suggesting paths for future research. **Design/methodology/approach** -- At a macro level, the evolution of the research field is analysed with the use of citation and co-citation analysis techniques. Further, the evolution of research on performance measurement (PM), supply chain PM, sustainability measurement and SSCPM is presented so as to highlight the criticalities of the research field. **Findings** -- The paper highlights a research field that is immature, but is growing very fast. Moreover, key issues are highlighted in order to help scholars in planning future research. **Research limitations/implications** -- The research presented in this paper is mainly limited to work that is referred directly with PM, operations management and supply chain management. Related research, such as literature on strategy or accounting has only been partially considered, even if future researches could include it. **Originality/value** -- Research in this area is receiving large attention from both academic and practitioners due to the significant relevance of the sustainability debate and the key role of supply chains in this discussion. The body of knowledge is yet immature, and the paper provides an updated state of the art, a critical analysis of the available literature and guidelines for future research.

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From Artificial Intelligence to Explainable Artificial Intelligence in Industry 4.0: A Survey on What, How, and Where

IEEE Transactions on Industrial Informatics

Nowadays, Industry 4.0 can be considered a reality, a paradigm integrating modern technologies and innovations. Artificial Intelligence (AI) can be considered the leading component of the industrial transformation enabling intelligent machines to execute tasks autonomously such as self-monitoring, interpretation, diagnosis, and analysis. AI-based methodologies (especially machine learning and deep learning support manufacturers and industries in predicting their maintenance needs and reducing downtime. Explainable artificial intelligence (XAI) studies and designs approaches, algorithms and tools producing human-understandable explanations of AI-based systems information and decisions. This article presents a comprehensive survey of AI and XAI-based methods adopted in the Industry 4.0 scenario. First, we briefly discuss different technologies enabling Industry 4.0. Then, we present an in-depth investigation of the main methods used in the literature: we also provide the details of what, how, why, and where these methods have been applied for Industry 4.0. Furthermore, we illustrate the opportunities and challenges that elicit future research directions toward responsible or human-centric AI and XAI systems, essential for adopting high-stakes industry applications.

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We use a proprietary data set from a national US department store chain to investigate the impact of competitor store closures on a major retailer. The transaction level data set includes nearly 80 million transactions, corresponding to \$2 billion in sales over a 25-month period. We find that store sales increase with respect to a store's proximity to closed competitor locations. More interestingly, we find that online channel sales also increase in geographic locations where competitors close stores and where our focal retailer has store locations in close proximity to the markets it serves. This latter finding highlights the important role that stores play in the online channel. Stores provide a level of shopping assurance generally not available online and support customer webrooming and showrooming to mitigate purchase uncertainty. Stores are also integral to omnichannel services like return-to-store wherein stores provide a convenient nearby location to make a free return should an online purchase not meet expectations. Consistent with these shopping behaviors, our results demonstrate that the focal retailer, in markets affected by competitor store closures, is able to capture demand that exhibits greater uncertainty in purchases as evidenced by (i) a disproportionate increase in riskier high value vs. low value

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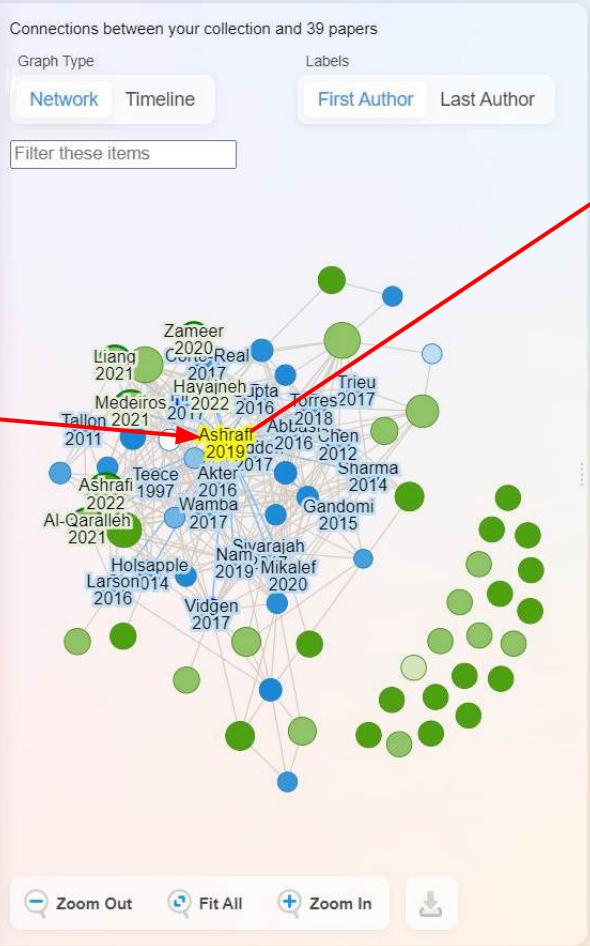
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The role of business analytics capabilities in bolstering firms' agility and performance
International Journal of Information Management 2019 L 110

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Abstract Many companies invest considerable resources in developing Business Analytics (BA) capabilities to improve their performance. BA can affect performance in many different ways. This paper analyses how BA capabilities affect firms' agility through information quality and innovative capability. Furthermore, it studies the moderating role of environmental turbulence, both technological and in the market. The proposed model was tested using statistical data from 154 firms with two respondents (CEO and CIO) from each firm. The data were analysed using Partial Least Squares (PLS)/Structured Equation Modelling (SEM). Our results indicate that BA capabilities strongly impact a firm's agility through an increase in information quality and innovative capability. We also discuss that both market and technological turbulence moderate the influence of firms' agility on firms' performance.

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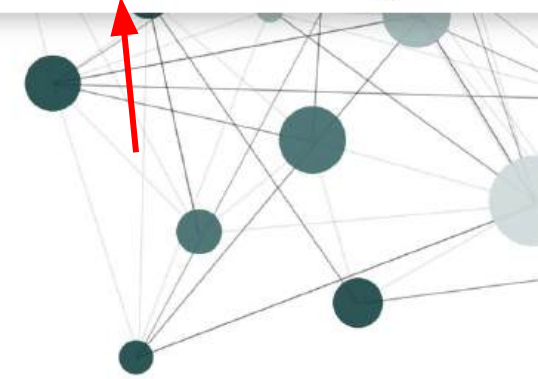
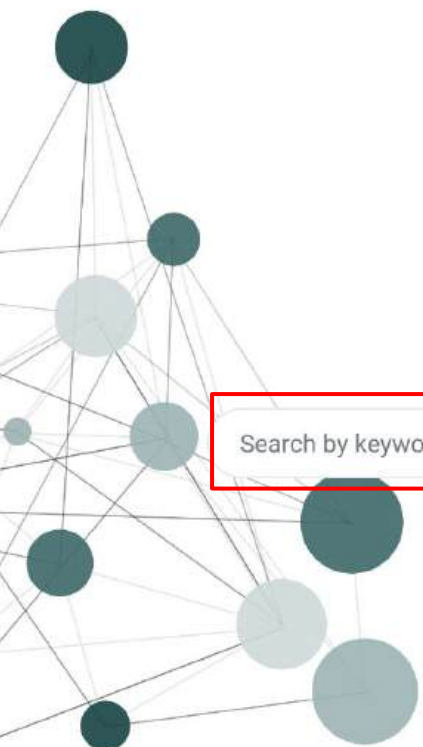
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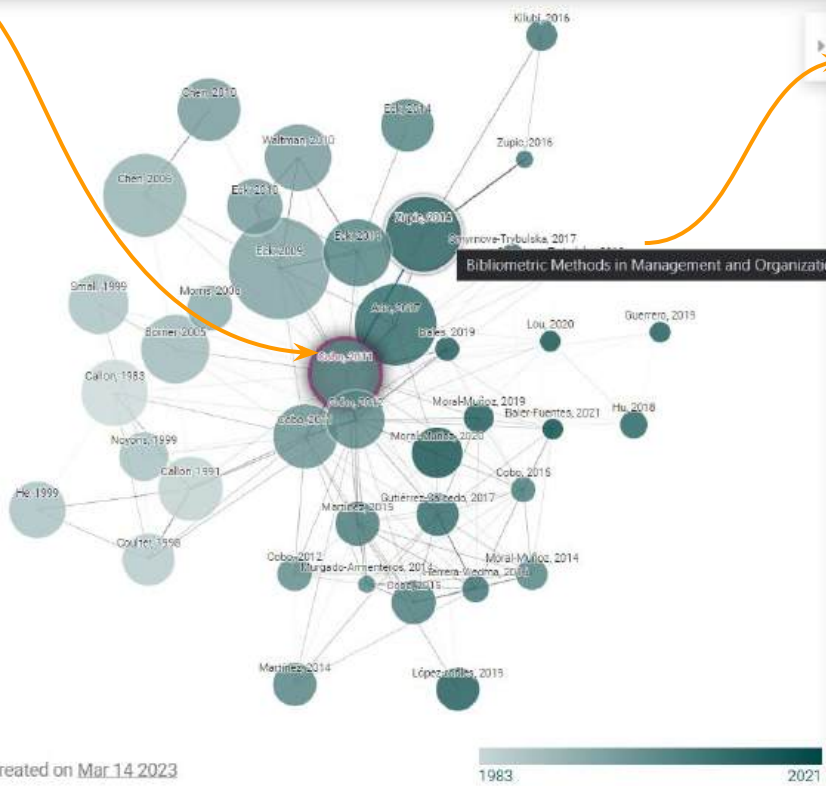
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We aim to develop a meaningful single-source reference for management and organization scholars interested in using bibliometric methods for mapping research specialties. Such methods introduce a measure of objectivity into the evaluation of scientific literature and hold the potential to increase rigor and mitigate researcher bias in reviews of scientific literature by aggregating the opinions of multiple scholars working in the field. We introduce the bibliometric methods of citation analysis, co-citation analysis, bibliographical coupling, co-author analysis, and co-word analysis and present a workflow for conducting bibliometric studies with guidelines for researchers. We



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2011, J. Assoc. Inf. Sci. Technol.

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Science mapping aims to build bibliometric maps that describe how specific disciplines, scientific domains, or research fields are conceptually, intellectually, and socially structured. Different techniques and software tools have been proposed to carry out science mapping analysis. The aim of this article is to review, analyze, and compare some of these software tools, taking into account aspects such as the bibliometric techniques available and the different kinds of analysis. © 2011 Wiley Periodicals, Inc.

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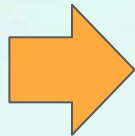
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After discovering the promising properties of graphene, the research in the field is attracting large grants and sponsors with an exponential rise in the number of papers and applications. This paper presents a global map of graphene research and its intellectual structure through the terms of more than 50,000 documents extracted from Scopus database from 1998 to 2015. The unit of analysis has been the descriptors (including Authors keywords and Indexed keywords) and its co-occurrence, using fractional counting, as unit of measure. The main research lines identified are: Fundamental



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Developing a Performance Measurement System for a Sustainable Supply Chain

Sustainable supply chain management (SSCM) is essential for businesses aiming to achieve competitive advantages while addressing environmental, social, and economic concerns. Developing a performance measurement system for a sustainable supply chain involves integrating various methodologies and frameworks to assess and manage sustainability performance effectively.



Key Insights from Research Papers

- **Multi-Criteria Decision-Making Methods:**
 - The use of multi-criteria decision-making methods, such as Life Cycle Assessment, Analytical Hierarchy Process, Fuzzy set approach, Balance Scorecard, and Data Envelopment Analysis, is prevalent in assessing sustainability performance across different sectors and supply chain echelons **1 2 6**.
- **Triple Bottom Line (TBL) Approach:**
 - There is a strong emphasis on incorporating the triple bottom line (TBL) approach, which includes environmental, social, and economic dimensions, into performance measurement frameworks. This approach ensures a comprehensive evaluation of sustainability aspects **3 5 9**.

- Various frameworks and models have been proposed to measure sustainability performance, including the Multi-Regional Input-Output framework, Fuzzy Delphi Method, and Analytical Network Process. These models help in handling the complex and global nature of supply chains and provide robust mechanisms for performance measurement [4](#) [7](#) [8](#) .
- **Challenges and Future Directions:**
 - Key challenges in developing performance measurement systems include data collection and sharing, metrics standardization, and collaboration among supply chain members and stakeholders. Addressing these challenges is crucial for the effective implementation of sustainability practices [1](#) [5](#) .
- **Empirical and Case-Based Analysis:**
 - Empirical research and case-based analysis are essential for validating the usefulness of specific industry-related TBL metrics and indexes. These methods help in building and testing theories from practical applications [3](#) [6](#) [10](#) .

Conclusion

Developing a performance measurement system for a sustainable supply chain requires the integration of multi-criteria decision-making methods and the triple bottom line approach. Various frameworks and models, such as the Multi-Regional Input-Output framework and Fuzzy Delphi Method, provide robust mechanisms for assessing sustainability performance. Addressing challenges related to data collection, metrics standardization, and collaboration is crucial for the successful implementation of these systems. Empirical research and case-based analysis play a vital role in validating and refining these performance measurement frameworks.

A performance measurement system for a sustainable supply chain should include appropriate tools for capturing and analyzing data, a conceptual framework, and collaboration among supply chain members and stakeholders.

Journal of Cleaner Production | Ardian Qorri et al. | 129 citations | 2018

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👤 Population	n/a
📊 Sample size	n/a
🔬 Methods	Systematic Review

📄 Outcomes
Sustainability performance of supply chains

2 A new fuzzy multi-criteria framework for measuring sustainability performance of a supply chain

A multi-criteria framework based on fuzzy entropy and fuzzy multi-attribute utility (FMAUT) can be used to evaluate and compare company performances in terms of sustainable supply chain.

Ecological Economics | Ismail Erol et al. | 267 citations | 2011



Does performance measurement improve sustainable supply chain management?



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These studies suggest that performance measurement improves sustainable supply chain management by assessing sustainability, integrating quality management, directing operations towards efficiency, and enhancing management effectiveness.

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Introduction

Sustainable supply chain management (SSCM) is crucial for businesses aiming to maintain competitive advantages while addressing environmental, social, and economic concerns. Performance measurement in SSCM is essential to evaluate and improve sustainability practices across supply chains. This synthesis examines whether performance measurement enhances sustainable supply chain management based on insights from multiple research papers.

Key Insights

- **Increased Use of Multi-Criteria Decision-Making Methods:** Various studies highlight the growing application of

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Overall

Overall, the literature on corporate environmental performance measurement provides valuable insights into the ways in which organizations can effectively and accurately measure their environmental impact and sustainability efforts. This research is of great importance to society as it contributes to the overall goal of achieving sustainable development and minimizing the negative environmental effects of corporate activities.

Firstly, the literature reveals various frameworks and methods that have been developed to measure corporate environmental performance. These tools enable organizations to assess their environmental impact across different dimensions, such as energy consumption, waste generation, carbon emissions, and water usage. By implementing such measurement systems, companies can gain a better understanding of their environmental performance, identify areas for improvement, and develop targeted strategies to reduce their ecological footprint.

Additionally, the research highlights the benefits of measuring and disclosing corporate environmental performance. Transparency and accountability in reporting environmental performance can enhance stakeholder trust, attract socially responsible investors, and improve corporate reputation. Furthermore, it allows for benchmarking and comparison between companies, enabling the identification of best practices and driving industry-wide improvements in environmental performance.

Moreover, the literature emphasizes the importance of integrating environmental performance measurement into broader corporate sustainability strategies. It highlights the need for organizations to align their environmental goals with their overall business objectives and to integrate sustainability considerations into decision-making processes. This integration can lead to more effective resource allocation, innovation in sustainability practices, and the development of a corporate culture that values environmental stewardship.

In terms of areas for further research, one avenue is to explore the effectiveness and limitations of different measurement frameworks and methodologies. There is a need for more comparative studies that evaluate the applicability and reliability of various approaches across different industries and organizational contexts. Additionally, research could delve into the challenges and opportunities associated with integrating environmental performance measurement into management systems and decision-making processes.

Another area for further research is the impact of corporate environmental performance on economic outcomes, more empirical evidence is needed to better understand how sustainable practices can provide valuable insights for both practitioners and policymakers.



Lastly, research could focus on the role of external stakeholders, such as government frameworks, incentives, and consumer preferences in encouraging business performance at the corporate level.

In conclusion, the literature on corporate environmental performance measurement provides valuable insights into their environmental impact. Further research can enhance our understanding of how sustainable practices can drive corporate environmental performance. These advancements are crucial for achieving sustainable development and minimizing the negative environmental effects of corporate activities.

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Audhuri², Demetris Vrontis³ • Institutions (3) ▾

Business Research (Springer US) • pp 1-26

A model has been developed to show how a firm's data-driven process innovation, which in turn improves its performance and competitive edge in the current business environment.

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Performance Measurement and Management Systems: A Perspective from Complexity Theory

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Complexity negatively impacts the process of continually improving performance management systems (PMSs). The extant PMS literature considers complexity to be a result of the external environment rather than a user response to that environment. However, this paper argues that organizations generally face internal complexity when adopting PMSs. Introducing PMSs into an organization can have varied effects in those orga-



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Suggestions (18 results)

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PMM Systems

literature review (SLR). The SLR method filtered studies to examine the latent practices used by different organizations in different operational contexts at three core process stages. The four system properties of complexity were then mapped onto the two types of controls that exist for implementing and using PMSs. The findings suggest that the performance measurement complexity (PMC) emerged in six forms; namely, role, task, procedural, methodological, analytical and technical complexities that are mapped on to the two dimensions of organizational control theory, which is a significant contribution to the theoretical foundations of PMM literature. A major inference of understanding PMC is to refocus how organizations should systematically select from the multiple best practices by examining the unique context in which a PMS is operating. The study's findings also contribute to the current discussion on how PMSs should be responsive and resilient in emerging contexts (Bititci *et al.* 2012; Melnyk *et al.* 2014; Nudurupati *et al.* 2016).

The rest of the paper is organized as follows. The next section presents the background literature and complexity theory adopted from other fields (Briscoe *et al.* 2012; Gerald *et al.* 2011). This informs the PMM literature regarding how PMSs can be viewed as complex systems. This is followed by presentation of the method employed in gathering, filtering and analysing the data. The study then presents the key findings obtained from the analysis, followed by a thorough discussion. Finally, a conclusion highlights a summary of the findings and key contributions, which is followed by the limitations of this study and future avenues of research.

Background literature

Although the PMM domain has received adequate attention from researchers and practitioners, most of the PMSs are still not dynamic and resilient to changes in the internal and external environment of the firm (Melnyk *et al.* 2014; Nudurupati *et al.* 2011). As a

PMM literature

With the dissatisfaction in traditional backward-looking financial accounting systems, a number of frameworks and models have been proposed (see Bititci *et al.* 2000; Neely *et al.* 2000). However, few scholars have explored aspects of implementing PMSs, and a three-phase model proposed by Bourne *et al.* (2000) has been widely accepted in the literature. The first phase is designing the performance measures, which are aligned with the organization's strategy. The second phase is implementing the measures by putting appropriate systems and procedures in place to collect and process data that allow measurements to be made. The third phase is ensuring that the measures are used as part of decision-making, while challenging the validity of measures on a regular basis. Since the establishment of this model, a number of researchers from different disciplines have worked in this domain to identify the best practices in these three phases under different contexts (Bititci *et al.* 2012; Folan and Browne 2005; Garengo *et al.* 2005; Jankelainen and Sillanpaa 2013; Lohman *et al.* 2004; Mason-Jones and Towill 2000; Neely 2005; Nudurupati *et al.* 2011; Suprpto *et al.* 2009).

Recently, Bititci (2015, pp. 170–187) collated the majority of this work and synthesized it into two broad perspectives: social (art) and technical (science) controls. The social controls are posited to be the cultural and behavioural controls achieved through personal traits, structures or bureaucratic elements and interactions. Some of these controls may be implicit and informal. For instance, effective leadership can empower people and promote democratic and participative culture while using performance measures. The technical controls incorporate specific methodologies that are objective and rational and are employed to reach a specific goal. These are known to be seen

to be explicit in nature and measures, information systems, data collection methods, analyses and visual communication (Bititci *et al.* 2000; Kennerley and Neely

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1. Performance management systems (PMSs) help organizations set goals and track progress, but growing complexity has made it difficult to implement effective PMSs.
2. Complexity theory suggests that PMSs can have varied effects on organizations, and understanding the life cycle of a PMS is important for success.
3. A study using a systematic literature review found that performance measurement complexity (PMC) can emerge in six forms, mapped onto the two dimensions of organizational control theory.

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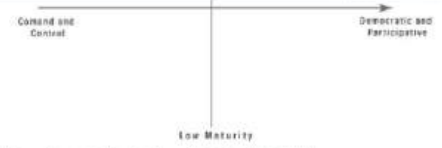


Figure 1. Framework that typifies social and technical controls (Smith and Bititci 2017)

the formalities of performance management (Buckingham and Goodall 2015). Smith and Bititci (2017) proposed a theoretical framework with the technical and social controls as two dimensions and identified a number of best practices for PMM, as depicted in Figure 1.

Perspectives of complexity theory

Complexity theory has evolved from systems theory, which emerged from natural sciences that examined randomly emergent non-linear interactions in a system (Burnes 2005; Grobman 2005). Grobman (2005) argues that complexity theory goes beyond systems thinking and can be applied to understanding the management and design of organizations. Complexity in an organization is usually triggered by change, whether small or large, and can have varied levels of consequences, even when the organizations consist of similar components (Burnes 2005). As discussed earlier, it is useful to explore further how the change triggers instability in organizations and how they can control that change. According to Bititci *et al.* (2012), contemporary organizations operate in turbulent environments in which change can be triggered from a number of sources, i.e. globalization, open innovation, autopoietic networks, technological disruption, social media, process re-engineering, continuous improvement and PM.

While the literature exploring complexity defines it in several ways, the following descriptions are most

commonly used. First, Simon (1996) conceptualizes complexity through a hierarchical model, arguing that, when faced with a dilemma of many parts in the system, the system breaks down into subsystems until a lowest abstraction is reached. Second, Anderson (1999) extends complex adaptive systems by arguing that the strategic direction of a complex system consists of establishing and modifying environments within which effective, improvised, self-organized solutions can evolve. Based on these works, most attention has been focused on trying to determine all the interactions within the system, why they interact and how they interact. These interactions remain influential when studying complexity. Third, Edmonds (1999) proposes that complexity is the model property that makes formulating its overall behaviour in a given language difficult, even when given reasonably complete information about its atomic components and their inter-relations (Vidal and Marie 2008).

Sahin *et al.* (2013) defines complexity as a behaviour that emerges from the way the components of the system are interconnected, but not how the components of the system are themselves complex, although the components, people are indeed as complex themselves because they are generally complex adaptive systems (Wilkinson 2006). Similarly, Stacey (1995) argues that organizations are made up of complex non-linear systems interacting with a number of their associated systems, which will exhibit a pattern of behaviours. Introducing the understanding of complexity in a PMS would

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Received: 15 December 2022 | Accepted: 2 January 2023
DOI: 10.1111/jipm.12656

CATALYST

JOURNAL OF PRODUCT INNOVATION MANAGEMENT

Augmenting human innovation teams with artificial intelligence: Exploring transformer-based language models

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 German Federal Ministry of Economic Affairs and Climate Action (BMWK), Grant/Award Number: 01MK20015A; Deutsche Forschungsgemeinschaft, Grant/Award Number: 390621612

Abstract
 The use of transformer-based language models in artificial intelligence (AI) has increased adoption in various industries and led to significant productivity advancements in business operations. This article explores how these models can be used to augment human innovation teams in the new product development process, allowing for larger problem and solution spaces to be explored and ultimately leading to higher innovation performance. The article proposes the use of the AI-augmented double diamond framework to structure the exploration of how these models can assist in new product development (NPD) tasks, such as text summarization, sentiment analysis, and idea generation. It also discusses the limitations of the technology and the potential impact of AI on established practices in NPD. The article establishes a research agenda for exploring the use of language models in this area and the role of humans in hybrid innovation teams. (Note: Following the idea of this article, GPT-3 alone generated this abstract. Only minor formatting edits were performed by humans.)

KEYWORDS
 artificial intelligence, GPT-3, hybrid intelligence, innovation teams, prompt engineering, transformer-based language models

1 | INTRODUCTION: AI AND INNOVATION

Over the last few decades, we could observe numerous

functions. They could also enable a more data-driven and AI-based approach to innovation (Cockburn et al., 2018; Kakatkar et al., 2020) that could bear new possibilities to dramatically increase the productivity of new product



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How do transformer-based language models fit into

- innovation teams and processes? →

What are the potential benefits and pitfalls associated with hybrid intelligence involving

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functions. They could also enable a more data-driven and AI-based approach to innovation (Cockburn et al., 2018; Kakatkar et al., 2020) that could bear new possibilities to dramatically increase the productivity of new product development (NPD)—an endeavour much more challen-

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The exploration of hybrid intelligence involving transformer-based language models (TLMs) presents both compelling benefits and notable pitfalls in the context of new product development (NPD).

Potential Benefits:

- Enhanced Productivity:** TLMs can automate various knowledge-intensive tasks, such as text summarization, sentiment analysis, and insight generation, significantly speeding up the innovation process. This automation enables teams to focus on more strategic aspects of product development.
- Expanded Problem and Solution Spaces:** By processing and generating large volumes of text, TLMs can uncover hidden insights and latent customer needs that may be overlooked by humans. This capability allows innovation teams to explore broader problem and solution spaces, leading to more innovative outcomes.

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TABLE 3 Research questions generated by GPT-3 (classification added by authors)

Research theme	Level of analysis	Research questions
Managing innovation	Organizational	What are the best ways to manage and monitor AI-based innovation processes?
	Process	How does the increasing use of AI in innovation processes change the way we think about innovation?
Effects on society and the economy	Meta	What are the best ways to measure the impact of AI on innovation processes?
		What policies or ethical considerations need to be in place to ensure that AI-based innovation processes are responsible and beneficial to society?
		What are the possible long-term effects of AI-based innovation processes on society and the economy?
		What are the potential risks and benefits of AI-based innovation?
		How can we ensure that AI-based innovation is responsible and beneficial to society?

Abbreviations: AI, artificial intelligence; GPT-3, Generative Pre-trained Transformer 3.

members (Piller et al., 2022). At the same time, including algorithms as team members may also change the way how humans interact with each other in a team. In the concluding section of our article, we will discuss some of the related

improving innovation performance. Their ability of understanding, generating, and adapting language, fostered by meta- and few-shot learning and attention mechanisms, make these AI models a powerful tool in any innovator's toolkit, enabling innovation teams to explore larger problem and solutions spaces. However, transformer-based language models are not without limitations. We discussed their most important constraints throughout this Catalyst but want to emphasize that these limitations do not render transformer-based language models useless, but rather highlight that such technology should not be trusted and used blindly. Given the speed of development in this field, we are optimistic that future generations of language models will mitigate at least some of the limitations of current state-of-the-art models.

Comparing their skills and limitations, we consider transformer-based language models not as a stand-alone technology, but rather as an actor in an innovation team that needs to be integrated into existing processes in the understanding of hybrid intelligence. At present, we are far from understanding all the potential use cases, benefits, and pitfalls associated with such hybrid innovation teams. More research is needed, not only from a technical but particularly also from a managerial perspective. We encourage scholars to take our work as inspiration to dive deeper into the possibilities and implications for innovation management associated with transformer-based language models. Hence, we conclude this Catalyst with two sets of research questions. Table 2 contains those questions we find especially relevant, considering our own practical experience of working with GPT-3 and reflecting on the results. This list is by no means exhaustive but can provide a starting point to explore the various aspects that transformer-based language models may affect, including units of analysis on the technical, individual, team, organizational, and industry (meta) level. In addition, building on the idea of this article, we also prompted the GPT-3 algorithm to continue our list of research questions presented in Table 2. Table 3 provides its output. We hope that both sets of questions inspire other scholars to investigate transformer-based language models and their implications for NPD and spark a fruitful discussion on the collaboration of humans and AI for innovation.

content they produce. This necessitates careful consideration of ethical implications and the potential for perpetuating existing biases in innovation processes.

5. Need for Managerial Insight: Effective integration of TLMs requires a deep understanding of their capabilities and limitations, along with clear governance structures to manage hybrid teams successfully. Without this knowledge, organizations may struggle to implement AI in a way that maximizes its benefits while minimizing drawbacks.

In conclusion, while the integration of transformer-based language models into innovation teams can yield significant advantages by enhancing productivity and expanding creative horizons, organizations must navigate the associated pitfalls with careful oversight and a clear strategy. Further research is needed to understand these dynamics fully and to optimize hybrid intelligence in NPD contexts.

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for example, the Parliament of Finland (Eduskunta) (2021) includes them as a member of parliamentary panels to complement humans in debates. Furthermore, numerous companies have started to deploy such models to tackle innovation challenges (see, e.g., Toews (2022) for an overview of companies providing products and services based on transformer-based language models). Examples include "Hebbia", which built a search engine to tap into vast amounts of unstructured data and extract relevant insights; "Inceptiv", which applies language models to the development of RNA therapeutics and vaccines, or "CopyAI", which uses the generative abilities of transformer-based language models to automate writing a marketing copy. These examples already indicate the opportunities to use this class of AI for automation and efficiency improvements at the stages of the innovation processes.

At the same time, transformer-based language models ask us to reconsider many established practices in NPD. For example, their creative abilities question common practices of how good ideas are created, like using creativity techniques or other divergent thinking tools. Specifically, the role of humans in NPD will change as AI takes on more tasks. So how will innovation teams deal with AI-generated and AI-co-created ideas? How do we address the fear of human experts being replaced by a machine? Will designers be reduced to "prompt engineers", that is, just designing the task given to an AI instead of the product or component? Augmenting human innovation teams with AI hence calls for investigating many aspects of jointly working with AI rather than only human colleagues.

With this catalyst, we hope to spark a discussion on how transformer-based language models will impact innovation and how this affects extant research in the field of NPD. The following section will briefly introduce the basic technology behind transformer-based language models. We then present the AI-augmented double diamond as a framework to guide our exploration of transformer-based language models for innovation. Next,

*The respective websites for these examples are <https://www.hebbia.ai>, <https://inceptiv.life>, and <https://www.copy.ai>.

performance.

- Artificial intelligence and humans will increasingly work together in a form of hybrid intelligence, which calls for a re-evaluation of how we approach and manage innovation.

we discuss several concrete examples of utilizing these models in typical tasks of an innovation project, using the GPT-3 algorithm, a powerful and easily accessible transformer-based language model. We use these examples to develop a set of research questions that arise from integrating such AI into NPD teams, also discussing the implications of such technologies. Our goal is to spark further debate and research on the opportunities, limitations, and managerial implications that emerge when artificial and human intelligence are combined to solve complex innovation tasks in a way that none of them alone could have accomplished.

2 | TECHNICAL BACKGROUND: LANGUAGE MODELS

Transformer-based language models are a special kind of AI used for natural language processing (NLP), which is a range of computational techniques for analyzing and representing naturally occurring texts to achieve human-like language processing (Liddy, 2018). In general, NLP is not new to innovation management. Previous research has explored such techniques in the area of text analysis (text mining) and how they can be applied to innovation processes (Antons et al., 2020). Whereas earlier models have typically been very task-specific, newer NLP technologies can take on multiple innovation-related tasks. Especially so-called generative or transformer-based language models have recently moved to the center of attention. Many transformer-based language models are autoregressive models (e.g., GPT-3), meaning they predict a word based on its preceding words in a text. NLP has



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The document examines the role of transformer-based language models in enhancing human innovation teams during new product development (NPD). With advancements in AI and cloud services, these models can significantly boost the productivity of NPD, which is traditionally harder to optimize compared to production tasks. Transformer-based models excel in knowledge-intensive work by automating tasks such as text summarization, sentiment analysis, and insight generation, thereby enabling innovation teams to explore larger problem spaces and generate more effective solutions.

The document discusses specific applications of these models, highlighting their ability to perform efficient text summarization and understand sentiment, which can enhance the understanding of customer needs and

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tion activities (Crossan et al., 1999). A large body of cesses requires building on substantial amounts of

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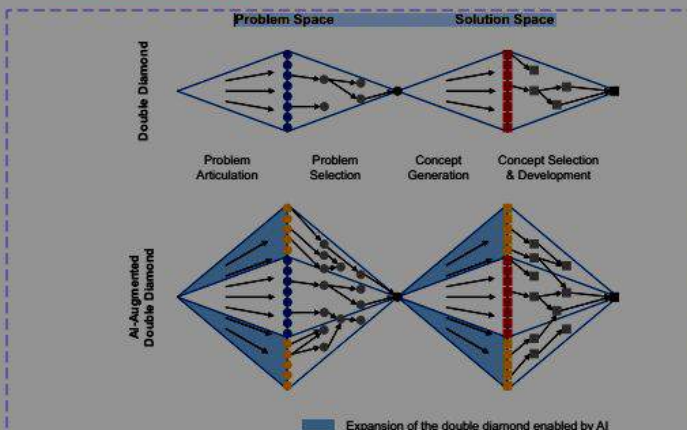


FIGURE 1 The original double diamond framework (above), as conceptualized by Marion and Faison (2019), and the artificial intelligence (AI)-augmented double diamond framework (below)

existing knowledge and ultimately generates new knowledge. Building on the conceptualization of innovation processes as a double diamond, we present the AI-augmented double diamond (Figure 1, lower picture) as a framework that highlights how AI and especially transformer-based language models can be particularly useful for fostering divergent processes and help to explore larger problem and solution spaces.

By expanding the problem and solution spaces in which NPD teams can operate, language models create

with supervised and reinforcement learning techniques to generate detailed responses on a large variety of topics, made GPT-3 known to a larger audience. For readers interested in replicating our use cases, we provide the technical parameters used to tune the model in a web appendix to this article (Appendix A1 has more information on how to access and interact with this AI model).

3.2 | Exploring problem spaces with AI

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The figure referenced in the document appears to illustrate the "AI-augmented double diamond" framework for innovation processes. This framework is an adaptation of the original double diamond model, which is utilized in design thinking to depict the phases of divergent and convergent thinking in the innovation cycle.

- 1. Original Double Diamond Framework:** In the upper part of the figure, the traditional double diamond delineates two main phases: the problem space and the solution space. The problem space involves exploring a wide range of issues and opportunities (divergent thinking), while the solution space focuses on identifying and refining specific solutions that address these problems (convergent thinking).

2. AI-Augmented Double Diamond Framework: In the

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Development of IoT based data-driven agriculture supply chain performance measurement framework

IoT based data-driven agriculture SCPM

Sanjeev Yadav and Dixit Garg
Department of Mechanical Engineering, National Institute of Technology, Kurukshetra, India, and
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Accepted 14 March 2020

Abstract

Purpose – Performance measurement (PM) of any supply chain is prerequisite for improving its competitiveness and sustainability. This paper develops a framework for supply chain performance measurement (SCPM) for agriculture supply chain (ASC) based on internet of things (IoT). Moreover, this article explains the role of IoT in data collection and communication (SC visibility) based on the supply chain operation reference (SCOR) model.

Design/methodology/approach – This research identifies various key performance indicators (KPIs) and also their role in SCPM for improving its sustainability by using SCOR. Further, Shannon entropy is utilized for weighing the basic processes of SCPM and by using weights, fuzzy TOPSIS is applied for ranking of identified KPIs at metrics level 2 (deeper level).

Findings – “Flexibility” and “Responsiveness” have been reported as two most important KPIs in IoT based SCPM framework for ASC towards achieving sustainability.

Research limitations/implications – In this research, metrics are explained only at SCOR level 2. But, this research will guide the managers and practitioners of various organizations to set their benchmark for comparing their performance at different levels of business processes. Further, this paper has managerial implications to develop an effective system for PM of IoT based data-driven ASC.

Originality/value – By using IoT based data driven system, this article fills the gap between SCPM by measuring different SC strategies in their performance measurable form of reliable, responsive and asset management etc.

Keywords Supply chain performance measurement (SCPM), Agriculture supply chain (ASC), Internet of

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Development of IoT based data-driven agriculture supply chain performance measurement framework

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IoT based
data-driven
agriculture
SCPM

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Accepted 14 March 2020

Abstract

Purpose – Performance measurement (PM) of any supply chain is prerequisite for improving its competitiveness and sustainability. This paper develops a framework for supply chain performance measurement (SCPM) for agriculture supply chain (ASC) based on internet of things (IoT). Moreover, this article explains the role of IoT in data collection and communication (SC visibility) based on the supply chain operation reference (SCOR) model.

Design/methodology/approach – This research identifies various key performance indicators (KPIs) and also their role in SCPM for improving its sustainability by using SCOR. Further, Shannon entropy is utilized for weighing the basic processes of SCPM and by using weights, fuzzy TOPSIS is applied for ranking of identified KPIs at metrics level 2 (deeper level).

Findings – “Flexibility” and “Responsiveness” have been reported as two most important KPIs in IoT based SCPM framework for ASC towards achieving sustainability.

Research limitations/implications – In this research, metrics are explained only at SCOR level 2. But, this research will guide the managers and practitioners of various organizations to set their benchmark for comparing their performance at different levels of business processes. Further, this paper has managerial implications to develop an effective system for PM of IoT based data-driven ASC.

Originality/value – By using IoT based data driven system, this article fills the gap between SCPM by measuring different SC strategies in their performance measurable form of reliable, responsive and asset management etc.

Keywords Supply chain performance measurement (SCPM). Agriculture supply chain (ASC). Internet of

Received 26 November 2019
Revised 18 January 2020
21 February 2020
Accepted 14 March 2020



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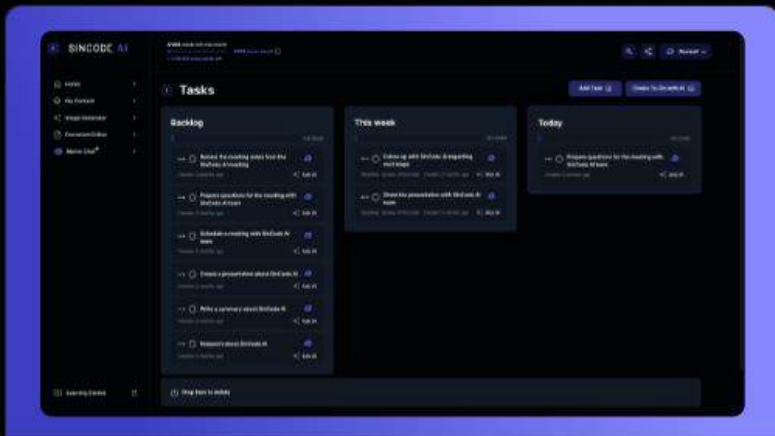


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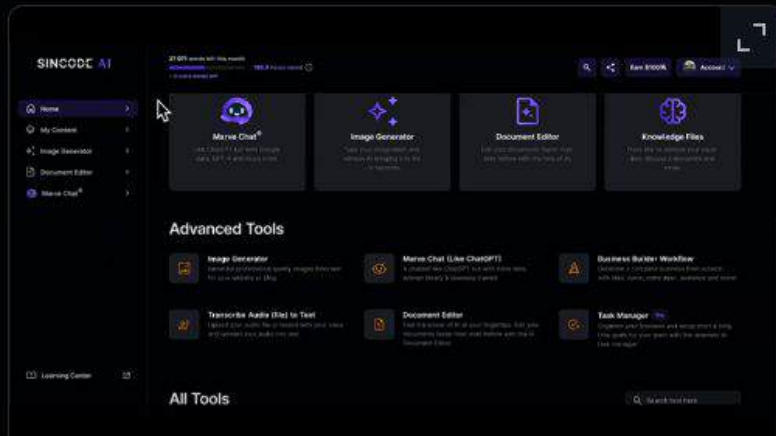




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CustosProducaoLeite 2022

	Energia eletrica rural (Oleo Diesel (L)	Adubo 20:05:20 (50 kg	Farelo de Algodão
1	0,32	2,52	12,45	31,37
2	0,31	2,49	11,49	36,50
3	0,28	2,50	11,84	39,89
4	0,27	2,55	12,17	42,35
5	0,20	2,57	12,83	42,42
6	0,17	2,13	8,17	40,14

Leia o arquivo



O arquivo contém dados sobre os custos de produção de leite para o ano de 2022. Os custos estão divididos em várias categorias, incluindo energia elétrica rural, óleo diesel, adubos, farelos e concentrados minerais. A seguir, apresento as primeiras linhas do arquivo para referência:

Energia

Quais são os maiores outliers?

Quais custos variam menos?



Mensagem ChatGPT

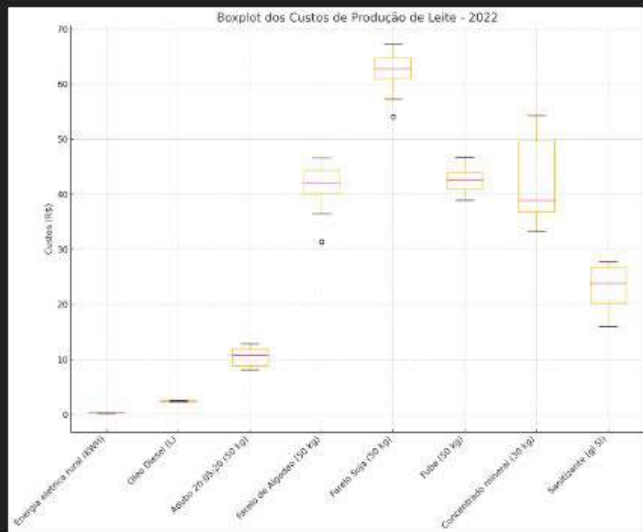




Plote o boxplot de cada variável e faça análise



Boxplot Dos Custos De Produção De Leite - 2022



O boxplot acima mostra a distribuição dos custos de produção de leite para várias categorias em 2022. Aqui está uma análise detalhada para cada variável:

1. Energia elétrica

Quais são os maiores outliers?

Quais custos variam menos?



Mensagem ChatGPT



O boxplot acima mostra a distribuição dos custos de produção de leite para várias categorias em 2022. Aqui está uma análise detalhada para cada variável:

1. **Energia elétrica rural (KWH):**

- A mediana está em torno de 0,25 a 0,30 R\$ por KWH.
- Há uma variação considerável nos valores, com alguns outliers acima de 0,35 R\$.

2. **Óleo Diesel (L):**

- A mediana está próxima de 2,50 R\$ por litro.
- A distribuição é bastante uniforme, com poucos outliers.

3. **Adubo 20:05:20 (50 kg):**

- A mediana está em torno de 12,00 R\$ por saco de 50 kg.
- A distribuição é relativamente estreita, com poucos outliers.

4. **Farelo de Algodão (50 kg):**

- A mediana está em torno de 40,00 R\$ por saco de 50 kg.
- Há uma variação significativa, com vários outliers acima de 45,00 R\$.

5. **Farelo de Soja (50 kg):**

- A mediana está em torno de 15,00 R\$ por saco de 50 kg.
- Quais são os maiores outliers? 32
- Quais custos variam menos?



Mensagem ChatGPT





Teste a correlação entre óleo diesel e energia elétrica rural com significância de 0,05

< 2/2 >



A correlação entre os custos de óleo diesel e energia elétrica rural é de aproximadamente 0.698. Este valor indica uma correlação positiva moderada entre essas duas variáveis.

Para testar a significância desta correlação com um nível de significância de 0.05, usamos o p-valor obtido. O p-valor calculado é aproximadamente 0.0116, que é menor que 0.05.

Conclusão:

- **Correlação:** 0.698 (positiva moderada)
- **P-valor:** 0.0116

Como o p-valor é menor que 0.05, podemos rejeitar a hipótese nula de que não há correlação significativa entre os custos de óleo diesel e energia elétrica rural. Portanto, concluímos que existe uma correlação significativa entre essas duas variáveis com um nível de significância de 0.05.

Se precisar de mais alguma análise ou interpretação, por favor, me avise. [:-]



Analise a correlação com outros custos

Gere estatísticas descritivas das variáveis



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CustosProducaoLeite...
spreadsheet

Provide with exploratory multivariate data analysis



J

To perform an exploratory multivariate data analysis on the provided dataset "CustosProducaoLeite-2022.csv", we will follow these steps:

1. **Load the Data:** Read the CSV file into a dataframe.
2. **Inspect the Data:** Check the structure, summary statistics, and any missing values.
3. **Visualize the Data:** Use various plots to understand the relationships between variables.

Let's start with loading and inspecting the data.

```
</> Loaded and summarized milk production cost data ^
```



R

Rerun Edit ↗

This code snippet reads a CSV file containing milk production costs, displays the first few rows, provides a summary of the data...

```
1 df <- read.csv('CustosProducaoLeite-2022.csv', header = TRUE, sep = ',')
2 print(head(df))
3 print(summary(df))
4 print(str(df))
```

Here's an initial look at the data:

Optional: Click on columns or rows to focus on specific data

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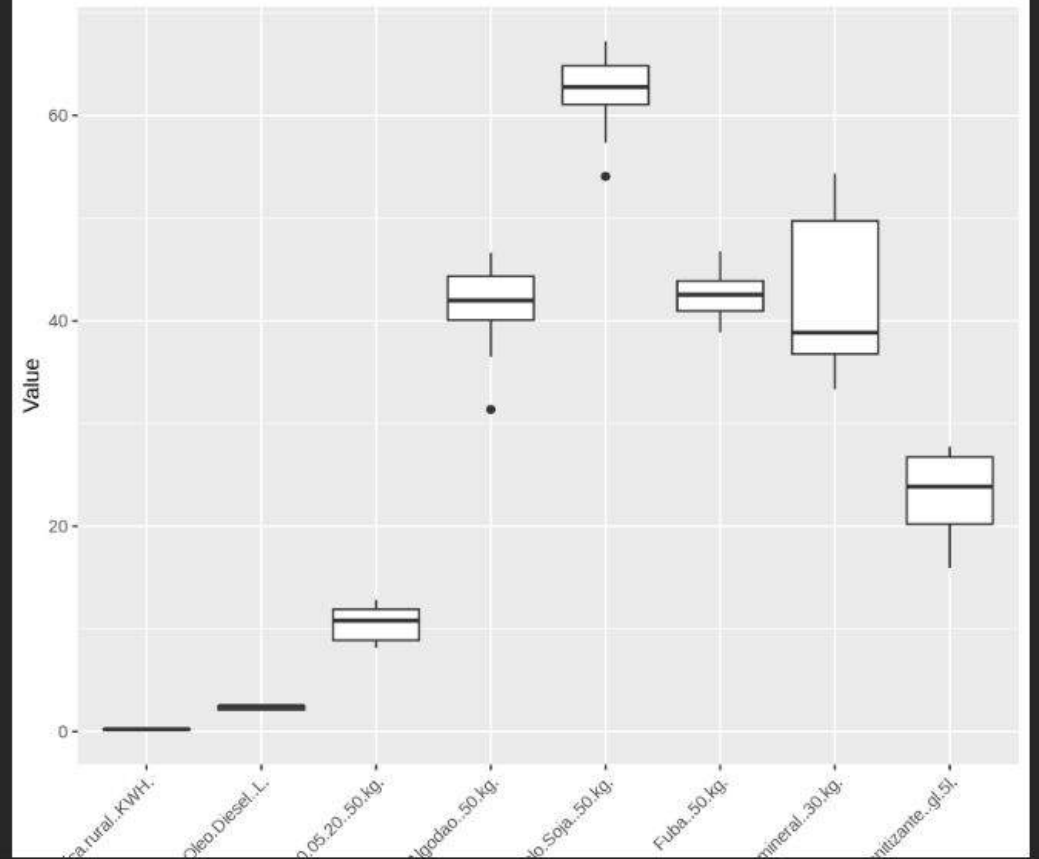
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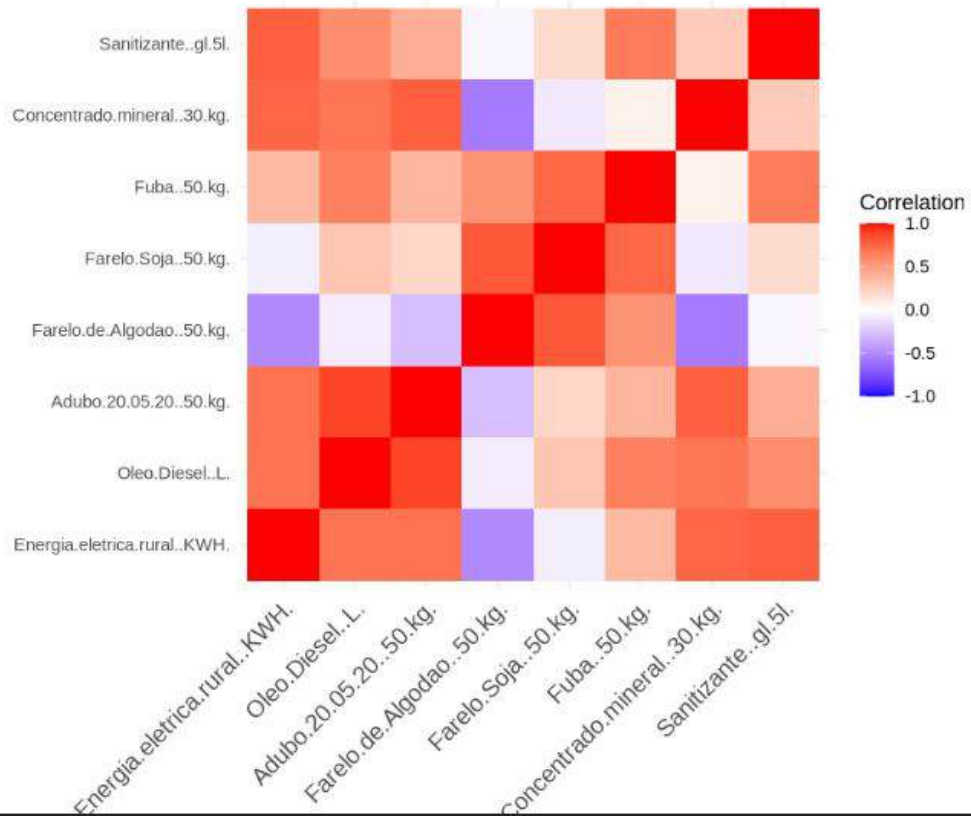
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Boxplot of All Variables



Correlation Matrix Heatmap





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Proofreading the following text in formal, academic, plain UK English. It's an abstract for an scientific article. Keep it in 100 words.

This paper aims to present the results of a performance measurement system design for a Brazilian electricity distribution company in a regulated private monopoly market. The literature review revealed mismatches between traditional PMS frameworks like the Balanced Scorecard and the unique regulatory and operational challenges of this sector. The results point out the need for a PMS that accommodates regulatory requirements and promotes alignment with strategic objectives while addressing stakeholder demands. Findings highlight the development and initial implementation of a new PMS framework that integrates regulatory perspectives into performance management practices, offering a promising direction for regulated utilities.

< 3 / 3 >

**ChatGPT**

This paper presents the outcomes of designing a performance measurement system for a Brazilian electricity distribution firm operating within a regulated private monopoly market. The literature review uncovered disparities between conventional PMS frameworks such as the Balanced Scorecard and the distinctive regulatory and operational hurdles in this sector. The findings underscore the necessity for a PMS capable of conforming to regulatory mandates and fostering alignment with strategic goals while meeting stakeholder expectations. Highlighting the inception and preliminary deployment of a vel PMS framework, the study integrates regulatory viewpoints into performance management methodologies, promising a forward-looking approach

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Organizations worldwide have seen improved competitiveness through implementing continuous improvement initiatives like PDCA, Kaizen, Six Sigma, or LeanSigma. Nonetheless, there are numerous examples of unsuccessful attempts to put this initiative into practice. Several authors have documented the reasons behind the challenges faced in implementing or maintaining continuous improvement efforts in diverse sectors. Conversely, agile methodologies have demonstrated their worth in enhancing software development processes. Uncertain improvement goals, changing requirements, multidisciplinary teams, and complex tasks are common characteristics shared by continuous improvement efforts and software development. Generally, continuous improvement activities do not deliver performance improvements during the projects. Traditional software development follows the same pattern. The most crucial delivery is the functional software for the users. However, agile methodologies have transformed software development with, for instance, sprints that deliver small testable pieces of software to the customer to check if the development is correct. The use of agile methodologies has resulted in improved software development, among other practices. Can the implementation of agile principles and methodologies benefit continuous improvement initiatives? This paper aims to address the question by presenting the findings of a systematic literature review.

Organizations worldwide have attempted to improve their competitiveness by implementing continuous improvement initiatives such as PDCA, Kaizen, Six Sigma, or LeanSigma. However, there are numerous examples of challenges faced in implementing or maintaining these initiatives. Several authors have documented the

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However, there are numerous examples of challenges encountered in implementing or sustaining these initiatives.

However, there are numerous examples of challenges in the implementation or maintenance of these initiatives.

However, there are numerous examples of the challenges that organizations face in implementing or sustaining these initiatives.

software development by breaking it down into sprints that deliver small, testable pieces of software to the customer for verification. The use of agile methodologies has transformed software development by breaking it down into sprints that deliver small, testable pieces of software to the customer for verification. As a result, agile methodologies have contributed to improved software development, among other benefits. It is worth considering whether the implementation of agile principles and methodologies could also benefit continuous improvement initiatives. This paper presents the findings of a systematic literature review in order to address the question.

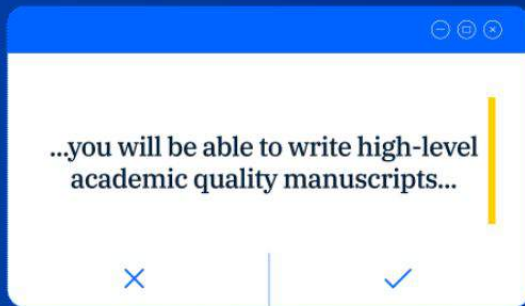


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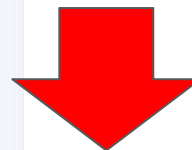


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Capturing customer value perception is crucial for driving supply chain performance improvements. In fact, the core of supplier management resides in its impact on value generation and on end-customer satisfaction. Social media analytics of customer sentiment enables large-scale group decision-making (LSGDM) to support supplier value generation. However, studies in the literature do not elaborate on the linkage between the supply management process and customer value drivers, neither how the customer value perception relates to the value delivered by suppliers. State-of-the-art natural language processing approaches, such as aspect-based sentiment analysis (ABSA), have the potential to address this issue. Nevertheless, such a proposition is not found in the literature. Furthermore, the inherent subjectivity of the mined sentiments and uncertainty of managerial judgments should be accounted for. To overcome this, computing with words with the fuzzy set theory has been applied to support supply chain decisional processes. Therefore, the present study proposes an LSGDM model that combines ABSA with fuzzy inference systems (FIS) to support supplier evaluation driven by customer value perception. The central idea of the proposed model is to track customer perceived value quantitatively over time with ABSA, from social media, and use it as an input to a multiple-FIS based supplier evaluation approach. An application considering the case of a large manufacturer of smartphones illustrates the model's application. The main results show the model capability of capturing customer perceptions and internalizing them as a driver for continuous improvement initiatives in supplier development.



H1 H2 H3 H4 B I U S



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11 sentences ready for review

Article Usage

Furthermore, the inherent subjectivity o...

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Therefore, the present study proposes a...

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Estimation of learning curves is ubiquitously based on the proportion of correct responses within moving trial windows. **Therefore** **Thereby**, it is assumed that the learning performance **remains stays** constant within the moving windows, which may **often** not be the case. In the present study, we demonstrate that this assumption's violations lead to systematic errors in the analysis of learning curves, **and**. We explore the dependency of these errors on window size, different statistical models, and the learning phase. **To reduce** **For-reducing** these errors in the analysis of single subject data, we propose adequate statistical methods for the estimation of learning curves and construction of confidence intervals in a **trial-by-trial** **trial-by-trial** manner. Applied to data from an avoidance learning experiment with rodents, these methods revealed performance changes **occurring** **happening** at

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Available literature, covering a wide range of topics related to measuring and evaluating corporate environmental performance.

One aspect that stands out is the growing number of research articles and academic papers dedicated to this field. A search of reputable academic databases reveals a substantial quantity of publications in the form of journal articles, conference papers, and book chapters. This suggests a strong interest from researchers

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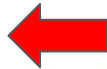
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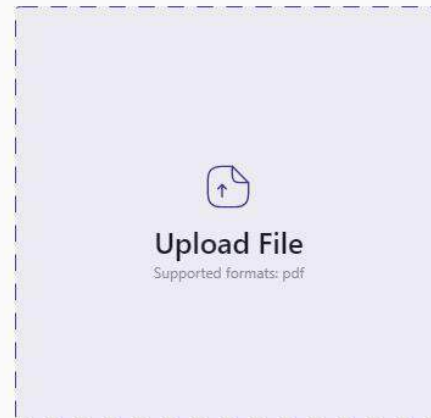




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Customer perceived value and social media analytics: how supplier evaluation can benefit from aspect based sentiment analysis and fuzzy inference

Introduction

User reviews of products and services inherently store competitive value. They serve as reference for other consumers to decide over a purchase, and can be used for monitoring value perception and fostering stronger customer connections (Gandhi et al., 2023). Hence, the vast amounts of behavioral data from social media users, including background, preferences, and daily activities, have the potential to offer fresh perspectives for supply chain management in the present big data era (Wan et al., 2021). It opens the precedent to enable large-scale group decision-making (LSGDM) in this context, especially due to the development of machine learning approaches (Ding et al., 2020). LSGDM refers to the assessment of a collection of viable alternatives based on the preferences of a large number of decision-makers (DMs), at different locations and times, regarding a complex problem (Liu et al., 2019). However, in most of the LSGDM studies, the DMs are often experts or elected representatives, and the general public, that is the customers, is excluded from decisionmaking (Wan et al., 2021). The natural consequence is the loss of information.

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- Integrating Aspect-Based Sentiment Analysis and Fuzzy Inference Systems for Supplier Evaluation Driven by Customer Value Perception 16 words / 131 chars

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Suggested abstract:

User reviews of products and services inherently store competitive value and can be used to monitor customer value perception. There has been a notable surge in the interest surrounding sentiment analysis (SA) and Aspect-Based Sentiment Analysis (ABSA) to detect and categorize opinions, sentiments, and attitudes. LSGDM is proposed combining ABSA with Fuzzy Inference Systems (FIS) to support supplier evaluation driven by customer value perception, allowing for scenario simulation and development of action plans. The process of evaluating suppliers for their segmentation involves multiple criteria, which introduces challenges related to decision makers' subjectivity and the uncertainties associated with assessing qualitative criteria or the lack of sufficient data for quantitative analysis. ABSA can be used to extract information to feedback customer value perception to supply chain management. Furthermore, ABSA can be used to assess customer value perception and improve supplier management decisions.

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Suggested keywords:

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How could a product or service is reasonably evaluated by anyone in the shortest time? A million dollar question but it is having a simple answer: Sentiment analysis. Sentiment analysis is consumers review on products and services which helps both the producers and consumers (stakeholders) to take effective and efficient decision within a shortest period of time. Producers can have better knowledge of their products and services through the sentiment analysis (ex. positive and negative comments or consumers likes and dislikes) which will help them to know their products status (ex. product limitations or market status). Consumers can have better knowledge of their interested products and services through the sentiment analysis (ex. positive and negative comments or consumers likes and dislikes) which will help them to know their deserving products status (ex. product limitations or market status). For more specification of the sentiment values, fuzzy logic could be introduced. Therefore, sentiment analysis with the help of fuzzy logic (deals with reasoning and gives closer views to the exact sentiment values) will help the producers or consumers or any interested person for taking the effective decision according to their product or service interest.

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Research question:

How can fuzzy logic be used to improve sentiment analysis for product and service evaluation?

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Customer perceived value and so analytics: how supplier evaluation from aspect based sentiment ana fuzzy inference

Introduction

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Organizations worldwide have seen improved competitiveness through implementing continuous improvement initiatives like PDCA, Kaizen, Six Sigma, or LeanSigma. Nonetheless, there are numerous examples of unsuccessful attempts to put this initiative into practice. Several authors have documented the reasons behind the challenges faced in implementing or maintaining continuous improvement efforts in diverse sectors. Conversely, agile methodologies have demonstrated their worth in enhancing software development processes. Uncertain improvement goals, changing requirements, multidisciplinary teams, and complex tasks are common characteristics shared by continuous improvement efforts and software development. Generally, continuous improvement activities do not deliver performance improvements during the projects. The traditional software development follows the same pattern. The most crucial delivery is the functional software for the users. However, the agile methodologies have transformed the software development with, for instance, sprints that deliver small testable pieces of software to the customer in order to check if the development is correct. The use of agile methodologies has resulted in improved software development, among other practices. Can the implementation of agile principles and methodologies benefit continuous improvement initiatives? This paper aims to address the question by presenting the findings of a systematic literature review.

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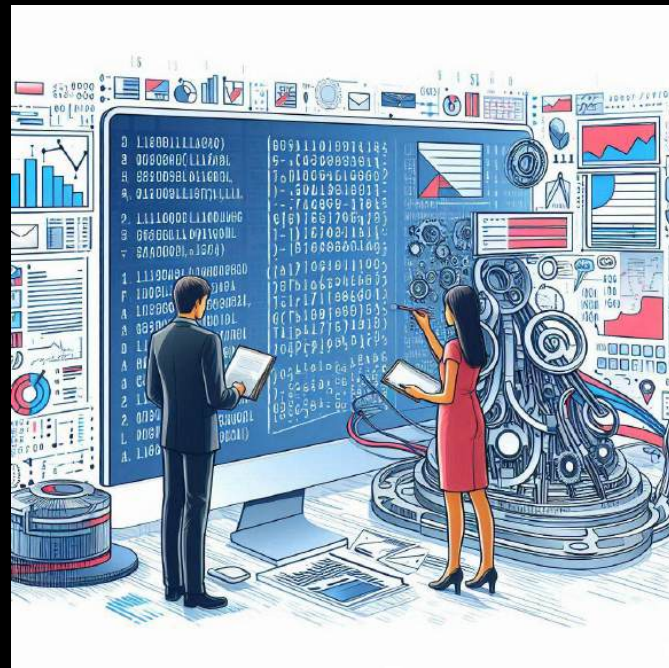
Reflexões e Desafios

- **Humano** deve permanecer no comando
 - julgamento e discernimento
 - ética
 - criatividade e inovação
 - inédito
- Podemos ter um/a **assistente robô** para algumas etapas
 - com ganhos de produtividade e qualidade



Reflexões e Desafios

- Importância dos **prompts**
- **Curadoria** sempre!
- Muitos apps são pagos ou o melhor é pago
- AutoGPT
- Customização de GPTs no ChatGPT e Claude
- Google Notebook
- ChatGPT-Canvas
 - mais interativo




Desafios para Integridade da Ciência

Journal of Computational Social Science (2024) 7:549–569
<https://doi.org/10.1007/s42001-024-00250-1>

SURVEY ARTICLE



GenAI against humanity: nefarious applications of generative artificial intelligence and large language models

Emilio Ferrara¹ 

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The Future of Generative Artificial Intelligence in Scientific Research

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Frontiers in Cell and Developmental Biology, a peer-reviewed journal, published an [article](#) titled “Cellular functions of spermatogonial stem cells in relation to JAK/STAT signaling pathway” on Feb. 13. Within a day of publication, readers pointed out that the figures were clearly generated with artificial intelligence — full of spelling errors, nonsensical diagrams and an anatomically incorrect, [well-endowed](#) rat. Within three days, *Frontiers* retracted the article.



Generative AI in Academic Research: Perspectives and Cultural Norms

Cornell University Task Force
15 Dec 2023

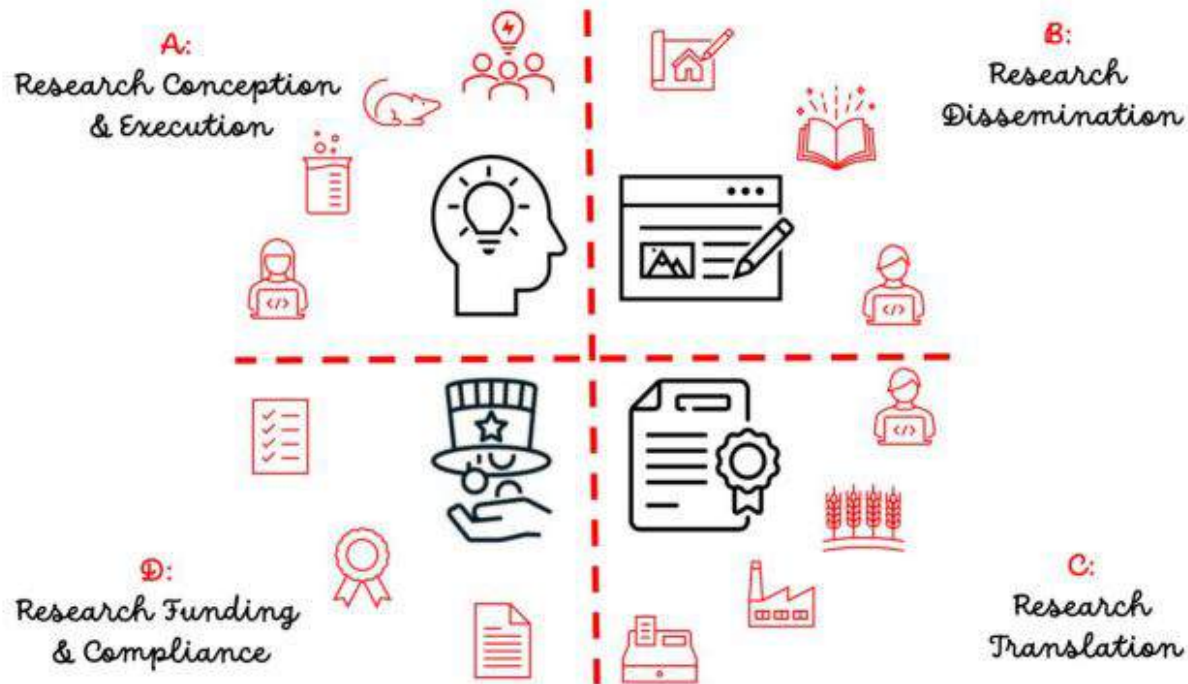


Figure 1: Stages of the academic research life cycle in which uses of GenAI can be envisioned, with considerations of use and duty varying by research stage and by research discipline. While such boundaries across research stages are porous, this framing helps distinguish the tradeoffs and responsibilities of use in context. Image component attributions: Appendix 2.



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