



# 社交媒体数据在基础设施项目中的三项应用： 社会许可测量、效益评估与公众态度分析

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## Who is this guy?

- 清华大学管理科学与工程博士、工程管理学士
- 澳大利亚悉尼科技大学设计与社会学院副教授、博士生导师、管理项目硕士 (MPM) 学位主任
- 澳大利亚悉尼科技大学研究生院副教授，主管博士生导师培训项目
- 澳大利亚标准委员会及澳大利亚/新西兰联合标准委员会成员
- Project Management Journal 与 Built Environment Project and Asset Management 期刊编辑
- Engineering (工程管理学科) 青年编委
- 国际建筑研究理事会 (CIB) 政府与社会资本合作委员会 (W122) 联络负责人
- 主要研究方向：基础设施项目管理、政府与社会资本合作 (PPP)
- 发表期刊论文 110 余篇，总被引超过 8820 次，h-index 为 41
- 连续入选斯坦福大学全球前 2% 顶尖科学家“终身科学影响力”和“年度科学影响力”榜单



## 讲座主题与目标

- 本讲座以社交媒体数据为共同工具，呈现三项相互关联的实证研究，探索其在基础设施项目管理中的应用潜力。
  - 1) 基础设施项目的社会许可 ( Social Licence for Infrastructure) ：社交媒体测量方法
  - 2) 社交媒体在交通项目中的应用探索：效益评估与价值创造
  - 3) 澳洲人真的不喜欢中国投资澳洲基础设施吗？：公众态度的情绪分析
- 三项研究共同说明：社交媒体数据可以回答项目治理中三类不同的管理问题——项目获得社会支持了吗？项目运营带来了预期价值吗？公众对特定投资来源持何态度？

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# 基础设施项目的社会许可 (Social Licence for Infrastructure)

## —社交媒体测量方法



# Why does societal approval matter more than ever?

- Community opposition increasingly delays or cancels infrastructure projects.
- Trust and transparency now matter as much as cost and time.
- Legal approval alone no longer ensures public acceptance.
- Projects are expected to earn and maintain a **social licence to operate**.

| Traditional Success       | Emerging Legitimacy Expectations  |
|---------------------------|-----------------------------------|
| On time, on budget        | Trust and transparency            |
| Regulatory approval       | Social licence to operate         |
| Stable technical delivery | Responsive stakeholder engagement |



# Why don't existing SLO concepts fit infrastructure?

- SLO originated in mining and resource sectors with single, long-term operators.
- Infrastructure involves multiple phases with shifting lead entities.
- Legitimacy in infrastructure is linked to the project, not a single organisation.
- Public stakeholders are more diverse: users, non-users, taxpayers, communities.

| SLO in Extractives                   | Infrastructure Projects                  |
|--------------------------------------|------------------------------------------|
| Company-centric, stable operators    | Project-centric, changing lead actors    |
| One-site, one-community relationship | Multi-stakeholder, multi-phase context   |
| Focus on continuous operations       | Focus on legitimacy across the lifecycle |



# What is the structure and value of the SLI framework?

- A sector-specific framework tailored to the lifecycle and governance of infrastructure delivery.
- Structured across two dimensions:
  - **Normative** : What the SLI is – Ownership, Grantors, Status
  - **Operational**: What projects must do – Gaining, Maintaining, Repairing
- Adaptable to context through **external modifiers** (e.g. project type, scale, governance).
- Designed to manage legitimacy dynamically over time and through disruption.



## How can the status of the SLI be measured?

- Traditional SLO measurement uses standardised survey instruments and interviews
- Most widely accepted tool: Boutilier's SLO questionnaire
- These methods are resource-intensive, time-delayed, and difficult to scale
- This study proposes: **a sentiment-based measurement approach**
- Real-time, cost-effective, and scalable
- Captures evolving public attitudes using digital data



## How is the approach demonstrated?

- Case: **Sydney Metro Northwest (SMN)**
- Data source: **Social media posts from Platform X (formerly Twitter)**
- Timeframe: **May 2008 – December 2024**
- 3,057 posts retrieved using project-specific keywords
- Sentiment categories: **Positive, Neutral, Negative**
- Analysis conducted using **ChatGPT-4o**



## How were the social media data collected?

- **Case & platform:** Sydney Metro Northwest, posts retrieved from Platform X (formerly Twitter)
- **Search query:** full project titles in quotation marks – "North West Rail Link" OR "Sydney Metro Northwest"
- **Excluding noise:** added "-Midlands" to remove a UK project with a similar name
- **A deliberate trade-off:** the full title returns precise but smaller samples; shorter terms like "Sydney Metro" broaden coverage but add ambiguity
- **Cleaning:** a Python script removed in-field punctuation and line breaks, producing a structured dataset

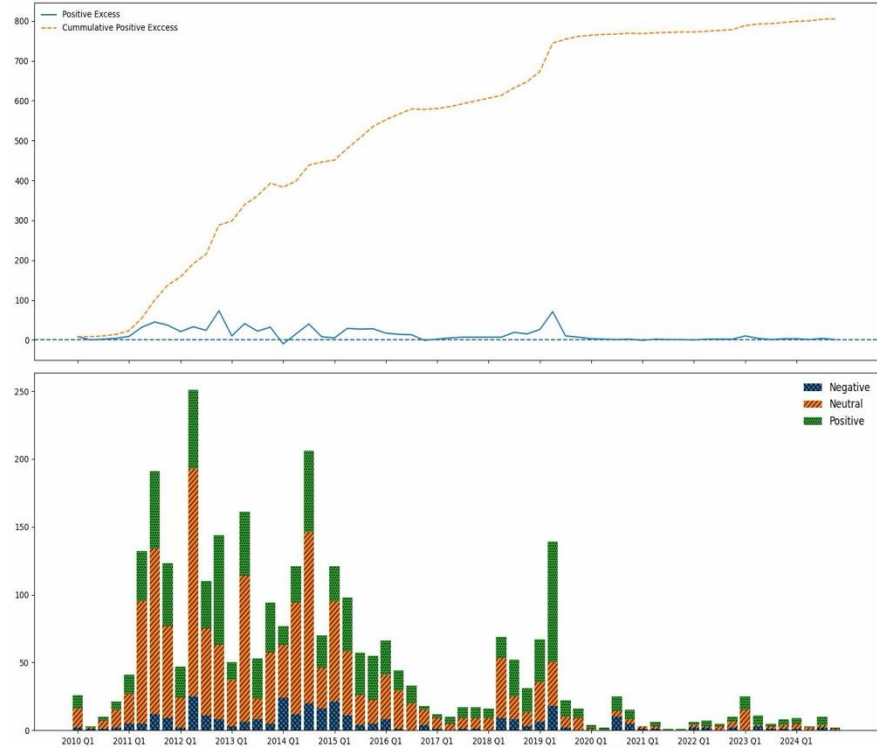


## How was sentiment classified?

- **Tool:** ChatGPT-4o classified each post as Positive, Negative, or Neutral
- **The prompt asked the model to:** read each post and assign one sentiment label reflecting the author's view of the project
- **Positive:** "the conversion of the Epping to Chatswood line has made a huge difference... trains are more frequent and easily accessible"
- **Negative:** "changing the North West Rail Link to an incompatible metro... the South East light rail double the cost"
- **Neutral:** "Sydney Metro Northwest will commence passenger services on Sunday 26 May 2019"

# What insights and applications emerge?

- Public sentiment remained largely positive
- Peaks in online discussion
- Sentiment trends over time
- Granular analysis (e.g. Q2 2019)
- Supports SLI maintenance and repair by identifying emerging issues and guiding adaptive stakeholder engagement





## Reading the sentiment trends (Figure 2)

- **Overall split:** 36.6% positive, 53.2% neutral, 10.2% negative — a broadly positive reputation
- **Upper panel:** quarterly positive-minus-negative line stays above zero; the cumulative line rises steadily
- **Lower panel:** stacked bars show discussion volume per quarter by sentiment category
- **Peak 1 (2011–2015):** aligns with the tendering and construction phase
- **Peak 2 (2018–2019):** aligns with trial operations and the official opening — engagement spikes at milestones



## Zooming in: what Q2 2019 reveals

- **A surge in both positive and negative posts** marked the initial public operation period
- **Praise:** shorter travel times, attractive stations, and novel features such as driverless trains
- **Concerns:** station amenities and minor operational issues
- **Why it matters:** this granular reading directly supports the framework's fourth question — how to maintain the licence
- **Practical use:** operators can target engagement and improvements at the specific issues raised, sustaining the SLI



# What challenges remain and what comes next?

- **Linking Sentiment to SLI Levels**

Sentiment analysis adds a complementary layer to surveys/interviews. Cross-validation can be developed when both data types are available.

- **Validating and Improving the Framework**

Sector-specific SLI requires further case studies across diverse infrastructure projects.

- **Role of AI**

Explore how AI can support multi-source data processing, trend detection, and stakeholder insight—while ensuring reliability.



## What are the key takeaways from this study?

- Infrastructure projects require sector-specific approaches to societal approval
- The SLI framework defines six core elements across descriptive and action dimensions
- Sentiment analysis offers a dynamic way to track public perceptions
- The combined framework and method help manage legitimacy throughout the project lifecycle

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# 社交媒体在交通项目中的应用探索



## PGCS Research Grant Award 2020

- This research was funded by the Project Governance and Controls Symposium
- This project aims to explore the opportunities that social media could offer to project managers at different stages of transport projects
  - Transport infrastructure projects have at least two characteristics that make them unique to study - the scale of these types of projects and citizens who are the future users
  - Citizens can, especially in collaboration, have a strong influence on projects. But their capacity for making their voices heard is limited
  - A critical avenue for individual citizens to be heard is social media, which has become widely used in recent times to be able to express opinions publicly



# Research on Social Media in Project Management

- Improved project learning through social media (Rosa et al., 2016; Winter and Chaves, 2017)
- Better intra-project communication or collaboration through social media (Kanagarajoo et al., 2019; Zhang et al., 2018)
- Social media as a platform for branding (Ninan et al., 2019)
- Social media as a platform for managing external stakeholders (Ninan et al., 2020)
- The combined message of this early research seems to indicate several possibilities for utilising social media in project management



# Exploratory Study of Multiple Transport Projects

- Can social media be used to evaluate the benefits derived from transport infrastructure projects after they are put into operation?
- Can social media be used to create value in infrastructure megaprojects?



## Method

- We looked for meanings from the perception of social reality constructed by citizens as expressed in social media
- We designed this study as a multiple case study
- We chose to study **Sydney Metro Northwest**, and CBD and South East Light Rail
- Twitter is chosen as it provides a search API for the public to search their database with user-defined keywords and time range
- The keywords are the titles of projects



## Benefits Realisation - Analysis Method

- 1<sup>st</sup> attempt: to search benefits keywords in the collected tweets – failed  
End users did not use the same terms in their tweets to describe the benefits as the project promoters used in their mission statement
- 2<sup>nd</sup> attempt: to organise data into first order observations and then assemble them into a more structured aggregate dimensions of benefits by collapsing or clustering the first order observations that seemed to share some unifying benefits



| First Order Observations            | Aggregate Dimensions           | Tweet Example                                                                                                                                                                                                                                                                                         |
|-------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fast                                | Travel time saved              | “On the other side of the fence I’m actually having no problems and it’s faster than the bus for me” (1/08/2019)                                                                                                                                                                                      |
| Time saving                         |                                |                                                                                                                                                                                                                                                                                                       |
| Impressive first experience         | Enhanced customer satisfaction | “New, Sydney Metro driverless trains.... New experience. Pretty impressed, gotta say.” (11/07/2019)                                                                                                                                                                                                   |
| Fun pretending they were the driver |                                |                                                                                                                                                                                                                                                                                                       |
| Cleanliness                         |                                |                                                                                                                                                                                                                                                                                                       |
| Quiet                               |                                |                                                                                                                                                                                                                                                                                                       |
| Aesthetics of the metro stations    | City landscape                 | “There is so much new infrastructure and development happening within the CBD. Sydney’s Pitt Street Station will become the city’s newest landmark with a \$463 million contract awarded to build the new metro railway station and the buildings above it. #sydneyproperty #cityliving” (24/09/2019) |
| More housing choices                | Social benefits                | “Grand Cherrybrook home is just a quick walk to Sydney metro northwest <a href="https://ift.tt/2Gb31t8">https://ift.tt/2Gb31t8</a> ” (12/07/2019)                                                                                                                                                     |
| Better access to services           |                                |                                                                                                                                                                                                                                                                                                       |
| Complaints about doors              | Identified operational issues  | “the USB points in car 0501 don t work FYI” (15/09/2019)                                                                                                                                                                                                                                              |
| Non-functional facilities           |                                |                                                                                                                                                                                                                                                                                                       |
| Lack of parking                     |                                |                                                                                                                                                                                                                                                                                                       |
| Lack of connecting buses            |                                |                                                                                                                                                                                                                                                                                                       |



## Benefits Realisation - Discussions

- Social media has the potential for assessing benefits realisation
- The true-to-life and meaningful stories in the tweets provide credibility that some benefits of the project were realised
- However, benefits could not be quantified, not all registered benefits could be mentioned
- **Supplementary evidence**
- It emphasised the multidimensional nature of benefits in infrastructure projects
- Different stakeholders, in this case citizens, can perceive, value and express these perceptions quite differently



## Creating Value - Analysis Method

- We used content analysis and open coding of the tweets collected to understand what each tweet conveyed
- The process was very iterative and we took multiple readings of the tweets as some categories are often not obvious until the second or third reading
- We employed manual coding



## Creating Value - Results and Discussions

- Addressing real time operational issues
  - An excellent platform where users post day to day operational issues surrounding the projects
  - We can create more value if we can systematically collect this big data, analyse them through algorithms, and efficiently communicate it to the service team to mitigate the current issue through timely action
  - *“The lift between the concourse and the platforms at North Ryde is out of service” (29 Sept 2019)*



## Creating Value - Results and Discussions

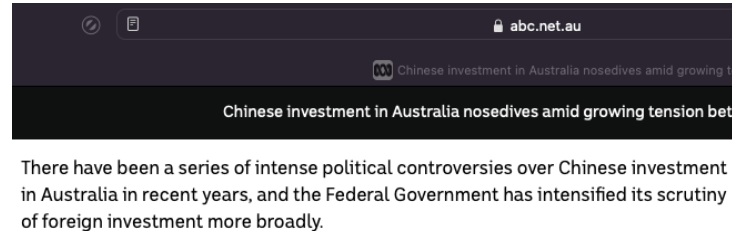
- Collecting suggestions to improve
  - In contrast to operational issues, suggestions to improve are more than addressing an operational defect on a particular day
  - Collecting such suggestions to improve can help the project create more value for the society as decision makers would know the main issues raised by the community
  - *“Your 15 second door opening is stupid and dangerous. People cannot get off the train in the fifteen seconds. Fix it before people get hurt” (16 Sept 2019)*

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澳洲人真的不喜欢中国投资澳洲基础设施吗？

# Australia-China Relations Institute Funding

- This research was funded by the Australia-China Relations Institute
- The government officers claimed that Australia's policies on screening do not discriminate against Chinese investments
- Still, some case studies confirmed Australian anxiety and discourse on China, which led to actual discrimination (McCarthy and Song, 2018)
- Mainstream media has been expressing the same anxiety towards Chinese investment





## Research Question

- It is unknown whether the general public holds the same attitude
- It is important to understand the public perceptions, one of the proved factors influencing business decision
- This research hence aimed to examine the public perceptions of general Australians on Chinese investment in Australia on social media

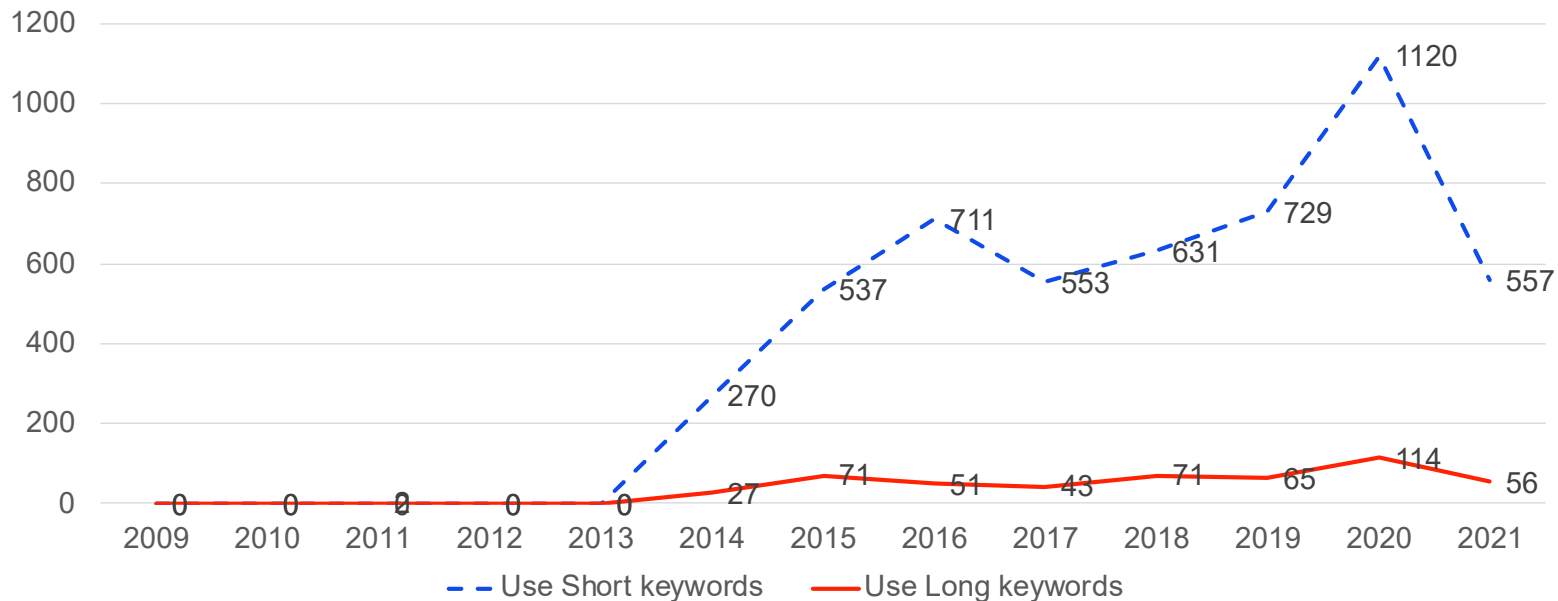


# Research Method

- The infrastructure sector was chosen to study
- The Twitter platform was chosen for data collection
- We used Python to retrieve tweets using pre-defined relevant keywords and a time range from 1st January 2009 to 31st December 2021
  - Short: (China OR Chinese OR Beijing) and (invest OR investment OR FDI OR deal OR bid OR acquisition OR acquire OR buy OR purchase OR sale) and Location: Australia
  - Long: \* and (infrastructure OR megaproject OR construction OR port OR road OR land OR asset OR mining OR healthcare OR energy OR metro OR rail)
- After cleaning the data, sentiment analysis was conducted to examine the public attitude towards Chinese investment in Australian infrastructure over time

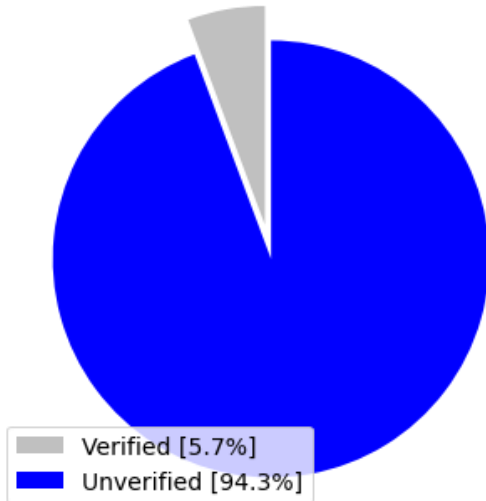


## Tweets Counted by Year

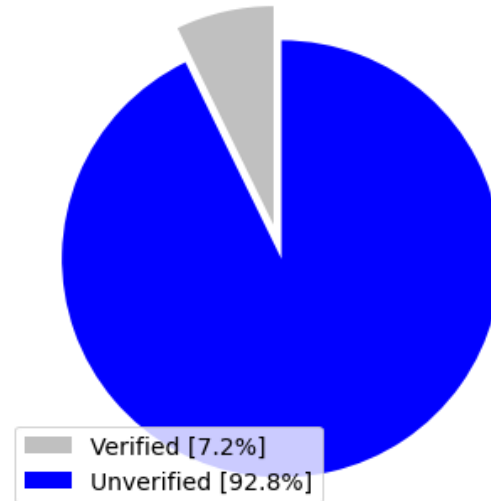


# Numbers of Different Account Types

Verified vs. Unverified (Short keywords)

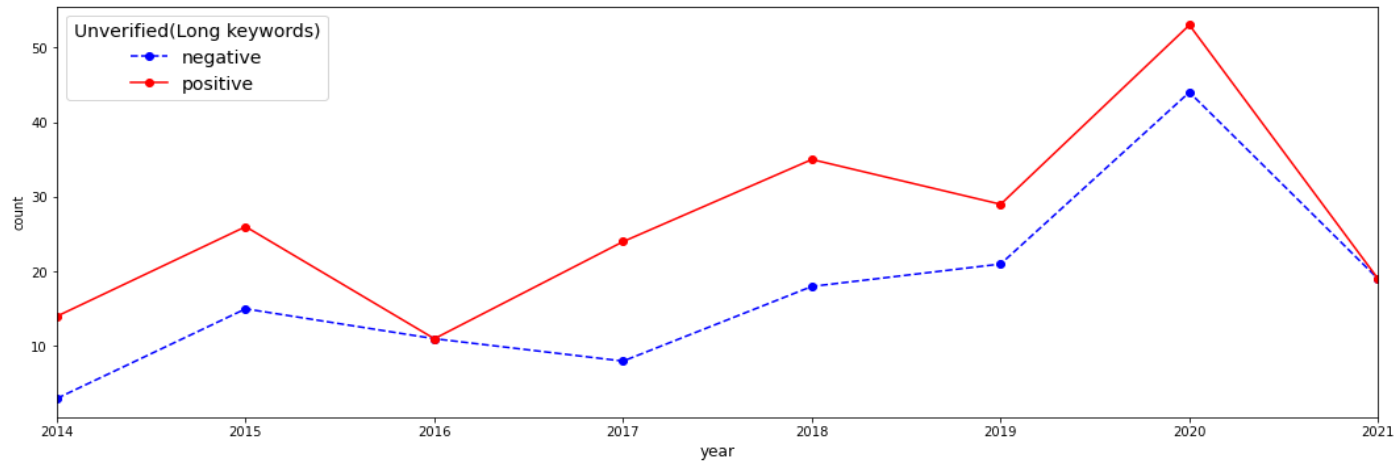
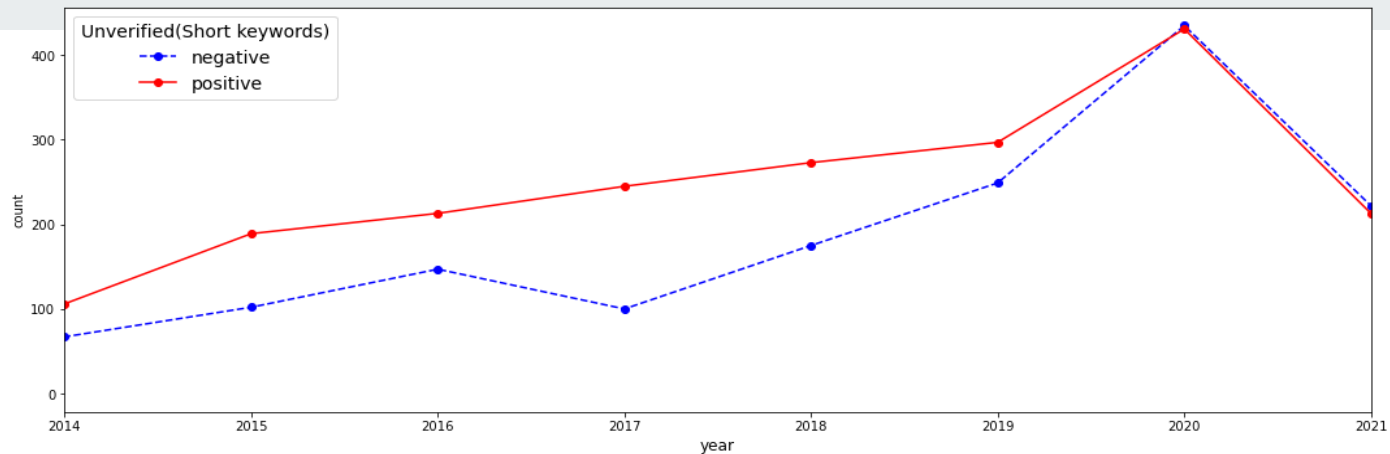


Verified vs. Unverified (Long keywords)





# Unverified Accounts' Sentiment





## Discussions

- The general public is not sharply against but slightly towards Chinese investments in Australian infrastructure
- A noticeable decrease in sentiment was seen in 2016 due to a discussion on the lease of Darwin Port to China
- In 2021 because the Federal government teared up Victoria's Belt and Road agreements with China that year
- The number of tweets is too small → If we have a large number of tweets, we could monitor the sentiment changes weekly → We could identify influencing factors



## 三项研究的共同价值与启示

- 社交媒体数据作为低成本、实时的公众信息来源，在基础设施项目管理中具有多元应用潜力
- 三项研究对应社会接受度、运营价值、地缘政治情绪三类管理问题，展示同一数据来源的多维应用
- 社交媒体是传统调研方法（问卷、访谈）的补充而非替代，两者结合可提升信息的及时性与覆盖面
- 局限性：数据体量有限、情绪分析需人工校验、平台可及性存在偏差，结果解读须谨慎
- 未来方向：人工智能辅助的多源数据整合、跨项目比较研究、与SLI框架的系统性结合