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## Article

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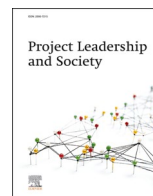
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Empirical Research Paper

# Online naturalistic inquiry for stakeholder issue analysis: Design and implementation

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## ABSTRACT

Social media offers extensive reach and inclusive engagement potential for projects and stakeholders. Current studies document its use for project information dissemination, building project awareness and project stakeholder assessment. However, studies into the use of social media in project stakeholder engagement remains scant. To date, there is lack of theoretically based guidance for project stakeholder engagement via social media in a pragmatic sense. In this paper, we advocate social media as a useful platform for online naturalistic inquiry of stakeholder engagement and propose a methodology for the analysis of stakeholder issues via social media to enhance engagement. We combine netnography, thematic, emotion work, and sentiment analyses to demonstrate operationalisation of the methodology for stakeholder issue analysis in the context of infrastructure projects. In doing so, we outline steps to identify, analyse and prioritise stakeholder issues for infrastructure projects via social media and discuss its implications for research and practice.

## 1. Introduction

Traditional project stakeholder studies tend to use rationalised data collection methods such as interviews and focus groups that require researchers to lead and facilitate. How the researchers' subjective factors affect such data collection processes and outcomes which is difficult to correct in subsequent studies has been recently documented (Ninan, 2020). Naturalistic inquiry, as opposed to rationalised inquiry, respects the natural integrity of the empirical problem under study in its naturally situated setting, without intervention from the researcher (Lincoln and Guba, 1985). Using online data for naturalistic inquiry where possible can help researchers maintain the natural integrity of data when collecting it as the data is free from researcher intervention and is derived organically from naturally situated settings (Athens, 2010). This also allows researchers to evaluate and refine their research question in the exploration process.

In the web 2.0 era of information explosion, and now 3.0 era of web decentralisation and artificial intelligence, social media activity has exploded, and is known to inevitably influence project management outcomes (Andrade, 2013; Gawel, 2022; Kaplan and Haenlein, 2010; Onete et al., 2017; Patel et al., 2022). Some studies report that the use of social media has a positive impact on improving project performance,

stakeholder engagement, project team cooperation and other areas (Daemi et al., 2021; Hysa and Spalek, 2019; Zhao et al., 2016). Yet, the guidelines for projects to use social media is minimal. To date, project researchers have used social media to understand project coalition groups (Williams et al., 2015), project branding (Ninan et al., 2019), stakeholder mobilisation (Barberá-Tomás et al., 2019), stakeholder decision making (Lobo and Abid, 2020). With the growing increase in online naturalistic inquiry, some researchers argue that there needs to be standardised criteria and advanced tools for using social media in project management (Kanagarajoo et al., 2019). As a first step towards this objective, Chung et al. (2023) pointed out that the analysis of stakeholders based on social media should be transformed from the analysis of stakeholders themselves to the analysis of stakeholder issues as the traditional form of stakeholder analysis (Eskerod and Jepsen, 2016) is challenging in the online environment that comprises social media platforms. Compared to traditional stakeholder communication, the online communication environment for stakeholders is more complex. Stakeholders can obtain information through various channels such as search engines, online media, and social media (Hoffmann and Lutz, 2015; Williams et al., 2015). Among these, social media not only provides information to stakeholders but also offers them a platform to voice their opinions and communicate (Wilkin et al., 2018; Williams

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et al., 2015). Based on this online environment, the online stakeholders and online communities discussed in this article differ somewhat from traditional stakeholders and communities. In this article, online stakeholders can be broadly defined as users of all social media platforms (Saxton and Guo, 2014). However, since all social media platforms have large user bases, the potential or active users related to a project are the primary scope of online project stakeholders. Based on these online project stakeholders, a group of stakeholders focused on project-related topics can be considered an online project stakeholder community (Saxton and Guo, 2014; Williams et al., 2015). Compared to traditional stakeholders, the highlighting trait of online stakeholders is their ability to express their views through social media and other media. However, this does not mean a complete separation from traditional stakeholders. Traditional stakeholders, such as community residents, project contractors, or customers, can also voice their opinions through social media platforms in addition to place-based gatherings such as town hall meetings. The online social environment provided by the internet and social media platforms makes it possible for projects to quickly reach or attract a broader range of potential stakeholders (Hoffmann and Lutz, 2015; Williams et al., 2015). Due to limited access to online stakeholders' identity information, the analysis of online stakeholders can only be based on the opinions and content they publish (Chung et al., 2023). Managing stakeholder issues to implement online stakeholder engagement is one of the effective methods to carry out stakeholder management activities online (Ndlela, 2019).

In this study, we propose a novel methodology for stakeholder issue analysis that demonstrates how to conduct an online naturalistic inquiry into online stakeholder engagement using infrastructure development as an example context. Social media provides an environment for online naturalistic inquiry to be implemented, where researchers can use non-participating observations to collect social media data, and at the same time, the behaviour of observed subjects can avoid the subjective influence of researchers (Ninan, 2020). In issue analysis for stakeholders, this study combines thematic analysis, sentiment analysis, and emotion analysis to identify, analyse and prioritise stakeholder issues, providing a novel methodology that is theoretically motivated and practically useful.

Although issue analysis of online stakeholder issues can be applied in various project domains, for the purpose of this paper, our context is infrastructure development. Infrastructure projects often include various forms of commitment to communities, including local communities. Local communities are not a single entity but multiple independent components, which results in the needs and expectations of community stakeholders needing to be aligned (Di Maddaloni and Davis, 2017). As infrastructure projects can both benefit and disadvantage local communities by causing local disruptions, the importance of consulting communities cannot be understated. Local community stakeholders can be perceived, defined and categorised in a project, and sound community stakeholder management can help improve project performance (Di Maddaloni and Davis, 2018). Erkul et al. (2019) supported extensive stakeholder engagement in project planning to optimise operations and services from a social perspective. Today, the explosive growth of social media is changing the way people communicate behaviours, further affecting the possibilities of stakeholder management in project management (Remidez and Jones, 2012; Williams et al., 2015). Chung et al. (2023) contend that it is challenging to utilise ordinary stakeholder analysis process where and when stakeholders and the project interact online. For instance, online stakeholders come and go, and it is sometimes impossible to distinguish who is really represented behind the social media account handles and therefore understanding their motivations and willingness to contribute to the project remains ambiguous. Instead, assessing stakeholders based on the analysis and categorization of issues raised by the stakeholders is a more feasible approach for project response and engagement. Thus, the motivating research question in this paper is: How can online naturalistic inquiry be designed and operationalised for the purpose of online

project stakeholder engagement on social media? In particular, how are project stakeholder issues identified, analysed, and given priority in an online naturalistic environment?

In the following sections, we systematically discuss the theoretical concepts and framework, followed by the methodology used in the study. Then, we describe the infrastructure project as a case study demonstrating the process for data analysis, its operationalisation thereby providing a pragmatic approach for stakeholder issue analysis. Finally, the paper concludes with an overview of the research, its limitations and avenues for further research.

## 2. Theoretical concept and framework

### 2.1. Naturalistic inquiry

Naturalistic inquiry operates in the natural environment and emphasises the critical role of context in shaping meaning (Lincoln and Guba, 1985). Inquiry in a "natural" setting is essential because phenomena acquire meaning from their context (Lincoln and Guba, 1985). Naturalistic inquiry refers to a particular inquiry that respects the natural integrity of the empirical problem under study. To consider the natural integrity of the problem, it is necessary to study the problem in terms of its natural and continuous characteristics rather than imposing a fixed preconceived order (Blumer, 1969).

Based on Blumer (1969), Athens (2010) summarised and concluded three main steps of naturalistic inquiry: exploration, examination and confirmation. In the first stage (exploration), the researcher writes a detailed description based on some preliminary, primary ideas from empirical examples of the problem under study. Exploration requires researchers to perform two tasks (Athens, 2010). The first is to acquire enough first-hand knowledge about the problem under study to build a solid empirical basis for defining the problem and selecting the initial basic ideas to use to investigate it later. The second task is characterising the research question based on information gathered through naturalistic techniques, such as in-depth interviews or participant observation (Athens, 2010). However, Athens (2010) also acknowledged that those traditional data collection methods may harm the research's natural integrity.

Natural sampling differs from traditional methods in prioritizing information over statistics to maximise insight without pursuing generalisations (Lincoln and Guba, 1985). The progress adapts to changing information dynamics, and the decision to stop selection is based on implemented redundancy rather than a set statistical confidence level (Lincoln and Guba, 1985). Various traditional data collection methods require researchers' intervention, while specific data are independent and can be obtained without participation (Ninan, 2020). Naturally generated data facilitate the examination of human communication in an environment free from the researcher's influence, thus allowing the suspension of the inherent knowledge framework for a deeper study of the actual behaviour of the research subjects. Naturalism directs the attention of researchers to phenomena that can be observed visually and audibly, aspects that may be overlooked when relying solely on asking respondents. The lack of preconception in the data collection process in naturalistic data avoids the influence of interview techniques and behaviours of researchers, thus allowing more diversified exploration (Germain et al., 2018; Salmons, 2021).

Traditional qualitative research relies heavily on human involvement in the interview data collection process, thus influencing the subjective awareness of researchers and participants about the data collected. In contrast, passive naturalistic online data collection provides a new way to observe social phenomena in which researchers are not directly involved (Germain et al., 2018; Ninan, 2020; Salmons, 2021). Online naturalism research opens up greater possibilities for studying phenomena across countries and cultures and overcoming physical and geographical barriers (Salmons, 2021). The diversified online information channels help provide richer data sources (Ninan,

2020; Salmons, 2021; Silverman, 2013). Information is naturally collected when the methods used to collect it respect, rather than violate, the natural integrity of the problem. Athens (2010) argues that conducting a study that does not violate the natural integrity of the question under study is impossible. However, using social media data can minimise researcher involvement's impact on the data's natural integrity as much as possible. Unlike the traditional method, naturalistic inquiry chooses purposeful rather than random sampling (Erlandson, 1993). This conscious approach, guided by evolving insights and the problem-centred nature of research, deliberately seeks out typical and different data (Erlandson, 1993). Lincoln and Guba (1985) emphasise that the aim is not to focus on general similarities but to capture the many details that contribute to the unique character of the environment. This method has the dual purpose of providing information for emergent design and grounded theory (Erlandson, 1993).

In the second stage of naturalistic inquiry (examination), researchers analyse the data collected in the exploration stage with the help of the verified basic concepts (Athens, 2010). To examine these data, researchers must perform two related tasks. The first is constructing clearly defined and developed concepts from initial basic ideas. The second task is to build propositions by connecting newly developed concepts. The grounded theory can be appropriately applied to this stage (Athens, 2010). Rooted in data, rather than preceding it as in traditional surveys, grounded theory is a crucial outcome of the naturalistic paradigm, acknowledging multiple realities and linking transferability to local contextual factors. It acknowledges the inability of pre-existing theories to predict the variety of facts encountered in the field or to contain factors affecting the micro level (Lincoln and Guba, 1985). In addition, using grounded theory is essential for emerging design concepts. In contrast to prior theory, which relies on prespecified inspections and detailed design descriptions, grounded theory is vital for and contributes to the continued development of emerging designs (Lincoln and Guba, 1985). Adjustments to the theory shaped the following steps that allowed the research to develop. The grounded theory needs continuous expansion and improvement, and when the potential for such expansion ends, the opportunity for further analysis also ends (Lincoln and Guba, 1985).

The third stage of naturalistic inquiry is confirmation (Athens, 2010). At this stage, the researcher needs to conduct a preliminary test of the examination results. The first task must present the study's results in a testable form, after which the second task is to re-examine all propositions in the study against all cases. This step complements the limitations of naturalistic inquiry in the credibility section. To ensure the credibility of naturalistic inquiry, long-term participation enables researchers to immerse themselves in the cultural context, mitigate distortions and build trust (Erlandson, 1993). While prolonged exposure moderates distortion, continuous observation provides depth to the study by seeking relevant data according to emergent designs (Lincoln and Guba, 1985). Membership checks enhance credibility by allowing stakeholders to verify the reconstruction of the inquirer. As Lincoln and Guba (1985) suggested, reflective journals support credibility, transferability, reliability, and confirmability as diaries documenting the researcher's schedule, insights, and methodological decisions that form part of the research reliability check (Erlandson, 1993).

## 2.2. Netnography

Netnography is an established qualitative research method developed by Kozinets (2010), which integrates the fields of "Internet" and "ethnography." Derived from ethnography, it is flexible and enables scholars to deeply study and elucidate different cultural landscapes (Kozinets, 2014). Ethnography is rooted in naturalism and examines cultural phenomena in a local context to provide insights into naturally occurring behaviours (Kozinets, 2014). This approach produces both descriptive and analytical results, typically providing a detailed and comprehensive description of the online experience of cultural

participants (Kozinets, 2014). Netnography emphasises the role of taking researchers as tools (Lincoln and Guba, 1985) and advocates researchers to immerse themselves in the research environment with computers as carriers (Kozinets, 2014).

Given its naturalistic nature, Netnography draws interpretations from requested and unsolicited data observed and captured as individuals interact online in their everyday environments and activities (Kozinets, 2010). In the study of network culture, intrusion is lower than in traditional ethnography, allowing researchers to accumulate data without significantly affecting the awareness of culture members (Kozinets, 2010).

Netnography is poised to emerge as the predominant methodological approach during data collection, specifically in online ethnographic research. This methodology incorporates diverse methods and techniques, including content analysis, thematic analysis, narrative analysis, and semiotics, to comprehend culture and phenomena in social media (Mkono, 2012; Passebois Ducros and Euzéby, 2020). In contrast to conventional face-to-face social interactions, netnography interactions are rooted in online virtual social communication (Kozinets, 2010), making it well-suited for gathering raw data in social media related to selected topics to discern the perceptions and attitudes of users in these online spaces (Bhattacharyya and Dash, 2020).

Netnography consistently proves to be a more efficient and cost-effective option for data collection than traditional interviews and focus groups while still obtaining rich data by engaging more community members (Bhattacharyya and Dash, 2020). The data collection process in netnography is unobtrusive to users in social media, capturing only public comments already in existence (Frude et al., 2020). These effects on data, respondents and research align current literature on directions for online naturalistic inquiry in project leadership (Ninan, 2020).

Netnography has the potential to mitigate the adverse effects of researcher participation on authentic, spontaneous communication among online users (Frude et al., 2020). Beyond its role in advancing project stakeholder management research, online social media can enhance project stakeholder management practices. Social media is a platform for projects to communicate with local communities throughout the project lifecycle (Ninan et al., 2019).

The social media field has distinct advantages that are rare in traditional fieldwork. Researchers have access to vast repositories of data archived in forums and search engines, providing unparalleled information on cultural membership, values, and structures (Kozinets, 2010). Ethnographers communicate technology to overcome geographical and temporal constraints. Netnography utilises the connective power of the Internet and the capabilities of contemporary search engines to provide accessibility and openness to various virtual voices (Kozinets, 2014).

## 2.3. Social media analytics for stakeholder engagement

Current research on social media guided by netnography has been conducted on brand consumers (e.g. de Oliveira Santini et al., 2020), tourism (e.g. Mkono, 2012), There are abundant studies in the field of medical and pharmaceutical industry (e.g. Bousquet et al., 2017) and crisis response (e.g. Bérubé et al., 2020), while there are relatively few in the field of project management.

Ninan (2020) advocates for the integration of naturalistic data sources, including online data, with existing methodologies in project research which has generally included methods such as case studies, interviews, surveys and more recently, rich pictures from soft systems methodology (Marnewick et al., 2024; Sankaran et al., 2009). The use of social media in projects has both advantages and disadvantages. Social media platforms facilitate communication, stakeholder engagement, knowledge management, and productivity. The main benefit of social media is that it enables the project team to communicate effectively in reach and positively influence the dynamics of the virtual team

(Kanagarajoo et al., 2019). However, Ram and Titarenko (2022) mentioned that using social media in project management faces many challenges in behavioural, cognitive and environmental aspects. Moreover, the tools used at different stages of the project life cycle vary (Kanagarajoo et al., 2019). Lack of infrastructure and different preferences for social media tools across region and the globe may influence adoption (Daemi et al., 2021). The lack of a social media adoption strategy is the main reason for the limited use of social media in project management (Daemi et al., 2021). There is also an apparent lack of maturity in the policies and procedures governing social media adoption and use (Kanagarajoo et al., 2019).

Daemi et al. (2021) argues that the key areas of social media use in project management include demand management, communication management, policy formulation, knowledge management and collaboration. On the other hand, Hysa and Spalek (2019) concluded that social media usually supports project managers and team members in communication, cooperation, participation, knowledge management, work efficiency, project promotion and staff development, with some citing positive impact on effective communication in the delivery of infrastructure construction projects (Amade, 2017). An effective social media strategy can positively impact infrastructure projects (Kakar and Khan, 2021) by managing relationships, building trust, and managing stakeholder expectations (Remidez and Jones, 2012). The threat of using social media in project management concerns project security and sensitive project data loss (Hysa and Spalek, 2019). Hazards negatively impact reputation, employee productivity, and information privacy (Daemi et al., 2021).

The use of social media has been shown to improve information sharing, engagement, and relationships (Daemi et al., 2021). The social media activities between projects and public stakeholders mainly involve information sharing with and responses to other stakeholders (Lobo and Abid, 2020). In the study by Ninan et al. (2019), they chose Twitter (now renamed X) to capture project behaviour and Facebook to gain insight into community feedback. Manetti et al. (2017) believe Twitter is often used for public information messages. Facebook seems more used to posting content from a conversational perspective, thus creating a two-way collaborative dialogue with users. With the increasing development of social media, the demand for opinions, attitudes and emotional perceptions has increased rapidly (Zhao et al., 2016). Social media provides stakeholders with a channel to express their demands but also limited their influence power (Barnett et al., 2020). However, the online stakeholders with the same demand may form clusters and factions such that when the clusters become large and stable, they may attract other smaller clusters, resulting in a high influence power (Williams et al., 2015). Santoso et al. (2020) found that social media owned by local governments was less attractive, and people preferred content and videos with photos. Compared with neutral information, emotional information tends to be forwarded more frequently and quickly (Stieglitz and Dang-Xuan, 2013). Bollen et al. (2011) found that social, political, cultural and economic events did have significant, direct and particular impacts on various dimensions of public sentiment. For these reasons, in this study, sentiment analysis is also used as the leading indicator for issue analysis of stakeholders.

The method proposed in this study focuses on the external stakeholder issues on social media, so the stakeholders' comments are the main data sources. After collecting the data from social media, the first step in the data analysis is thematic analysis (Braun and Clarke, 2006). In the thematic analysis of this method, the main stakeholder issues will be identified and categorised by the researcher's theoretical perspective of the key research problem at hand, such as in the context of infrastructure projects - the triple-bottom-line theory (Elkington, 1998), which connects the relationships between the stakeholder issues and corporate social responsibility (Tate and Bals, 2018). Stakeholders' attitudes towards a project may depend on the value conflicts between the stakeholders and the project (Chen and Kamarudin, 2024). When analysing stakeholder issues, it is crucial to consider the value classification

of these issues. In the example of the triple-bottom-line theory, as a typical corporate social responsibility theory, it can serve as a key theoretical tool for classifying stakeholder values. The triple-bottom-line theory divides corporate social responsibility into economic value, environmental value, and social value, and it is closely related to organisational strategic goals (Westerman et al., 2020), providing for a more intuitive analysis of value conflicts for project and organisational stakeholder management decisions. The second step of the analysis in this method is sentiment and emotion analysis, which aims to identify the main emotions of the stakeholders and divide them into positive and negative sentiments (Canhoto and Padmanabhan, 2015), linking them with the stakeholder issues that were identified from the first step. The last step of the method is the numerical assignment of the emotions adapted from studies in stakeholder social movement (Zietsma et al., 2019). After calculating the value of emotions in different stakeholder issues, the end result is the priority of stakeholder issues based on emotion theory.

### 3. Method

This paper illustrates design and implication of online naturalistic inquiry based on sample social media of a particular case study. The process of data collection followed the standards of naturalistic inquiries. The analysis of the data considered thematic analysis and sentiment analysis where thematic analysis was used to identify project stakeholder issues while sentiment analysis was used to analyse and evaluate them.

#### 3.1. Case study and data collection

In order to understand community stakeholders' attitudes and participation in infrastructure projects, we manually collected social media interactions between the infrastructure project (referring to all personnel in the project team who represented the project in their online interaction) and their online stakeholders (such as local residents, individuals, action groups, media, etc.). Social media provides a naturalistic data collection environment where researchers can observe and document interactions between online stakeholders and project authorities in a naturally situated setting free from researcher intervention. Although third party, open-source and custom software is available for the collection of social media data, they are prone to software updates and subject to social media platform restrictions (e.g. twint – an open source python package for extracting social media data from X, no longer works as meant to after X updated its API and connectivity terms and conditions) which causes data collection issues. Therefore, for the purpose of the study, we focused on first principles of the multi-levelled analyses of stakeholder issue for improving stakeholder engagement over social media. This is done to demonstrate that a manual approach is feasible. Furthermore, whether data is collected by automation or hand, these first principles for analyses still apply and remain unchanged.

For our sample data, we chose an ongoing infrastructure project as an example to illustrate how to apply stakeholder issue analysis using the abovementioned analysis method. Western Sydney International Airport (WSIA) project was the case study for our research. Proposals for a second airport in Sydney were first made and evaluated in the last century, but with a long-term negotiation, the planning of WSIA did not start until 2008. Finally, in 2014, the government officially confirmed that Sydney's second airport would be in Badgerys Creek, and the construction officially began in September 2018. WSIA has established official accounts on multiple social media platforms, including X (formerly Twitter), Facebook, Instagram and LinkedIn. However, WSIA's official Facebook account had most interactions and engagement from both external stakeholders and projects. For this study, we selected all the posts and stakeholder comments published by WSIA on Facebook in 2021, and eventually imported into nVivo – a qualitative analysis software.

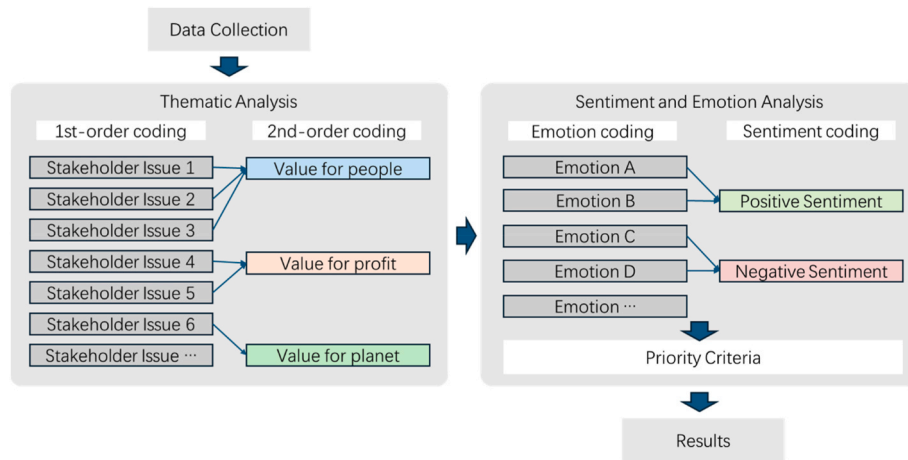


Fig. 1. Data analysis process.

### 3.2. Data analysis

#### 3.2.1. Thematic analysis

We used thematic analysis to analyse the data and the Gioia methodology to guide our process. In the Gioia methodology, the analytical coding of the data is divided into two steps (Gioia et al., 2013). The first step is called “1st-order” analysis, which focuses more on the information expressed in the data rather than coding and analysing the data directly from the perspective of academic context (Gioia et al., 2013). In our research, the topics of genuine concern of online community stakeholders are summarised into the “1st-order” code. The concerns of each stakeholder are different. Some stakeholders may pay attention to the actual construction and implementation of the project, and others may focus more on the changes the project will bring to their lives once it is built. The second step is “2nd-order” analysis, in which researchers analyse and categorise data based on theories and foundations (Gioia et al., 2013). After these two steps, the stakeholder issues are identified in a proper framework.

#### 3.2.2. Sentiment analysis

The generation and change of sentiments among stakeholders in online communities is one of the focuses of our research, and sentiment analysis also plays a crucial role in our framework. Analysing sentiments in social media texts brings additional challenges (Uren et al., 2016). Sentiment analysis is used to extract opinions, emotions and subjectivity in unstructured texts, that is, to identify whether these expressions indicate positive, negative or neutral opinions (Pang and Lee, 2008; Zhao et al., 2016). Sentiment analysis usually involves detecting polarity, only positive or negative emotions rather than discrete ones (Bae and Lee, 2012). Some studies use creating a corpus or sentiment dictionary to manually code or train sentiment analysis algorithms when implementing sentiment analysis (Amina and Azim, 2019; Anam et al., 2022; Habernal et al., 2015; B. Li et al., 2017; N. Li and Wu, 2010). The sentiment analysis in this study focuses on identifying stakeholders’ positive and negative emotions.

#### 3.2.3. Emotion analysis

Due to sentiment analysis only focusing on stakeholders’ sentiments in three categories: positive, neutral, and negative, it may not be diverse enough to assess the issues identified in the thematic analysis. As a result, emotion analysis can be introduced into the stakeholder issue analysis and prioritise progress to supplement the limitation of sentiment analysis. Contemporary research on emotions in social media primarily focuses on emotion sharing (Jin et al., 2017), and analysing sentiment in social media texts poses additional challenges (Uren et al., 2016). The central objective of emotion analysis is to identify whether

stakeholders express emotions, with increasing attention on research related to emotional polarity and states (Canhoto and Padmanabhan, 2015). Social media is crucial for stakeholders seeking relevant information from organisations, providing a more cost-effective direct communication than traditional tools (Jin et al., 2017). Swift responses to posts on social media often contribute to advancing discussions (Hamilton et al., 2017). Overall, social media offers an accessible channel for disseminating information, enabling a prompt response from the focal organisation (Jin et al., 2017). In sentiment and emotion analysis, emotion classification theory is applied to identify the emotions in the data. The outcomes of sentiment and emotion analysis is then associated with that of thematic analysis for the purpose of stakeholder issue analysis and prioritization.

#### 3.2.4. Data analysis process

Overall, Fig. 1 summarizes the steps of the data analysis process. After completing data collection, this method first employs thematic analysis to identify and perform 1st-order coding on the main issues of concern to project stakeholders. Then, by analysing the impact of these issues on the stakeholders using the triple bottom line sustainability framework of impacts to people, planet and profit (Tate and Bals, 2018), 2nd-order coding is conducted. This framework maps each stakeholder issue to one or more of these dimensions. After analysing the stakeholder issues, emotion and sentiment analysis is performed on the identified stakeholder issues data. Emotion coding is done to identify the emotions contained in the stakeholder issues, and each emotion is categorised into different sentiments to complete sentiment coding. Finally, based on the results of the emotion and sentiment analysis, a standard for prioritizing stakeholder issues by emotion is established, and this standard is applied to the identified stakeholder issues to obtain the final prioritization of stakeholder issues.

## 4. Data analysis and operationalisation

In this study, we used the qualitative analysis software NVivo R1 for thematic, sentiment and emotion analyses in the context of the WSIA Facebook account and the comments posted by stakeholders and the project. The aim of the following sections are twofold: (i) to describe the process for conducting each of the analyses and (ii) to demonstrate how the analytical techniques are applied using social media data from the WSIA case study as context.

### 4.1. Thematic analysis results

In the first step of thematic analysis, we identified and summarised “1st-order” themes based on stakeholders’ concerns. In the second step,

all the “1st-order” codes are categorised into “2nd-order” codes, following the triple-bottom-line principles within the corporate social responsibility theory (Elkington, 1998; Loi, 2016; Pedersen, 2006). This involves considerations for people (social value), profit (economic value), and the planet (environmental value) (Tate and Bals, 2018; Westerman et al., 2020), and thus the “2nd-order” categories are named as “value for people”, “value for profit” and “value for planet”. Appendix 1 summarizes examples of each 2nd-order categories and 1st-order codes.

#### 4.1.1. Value for people

The value for people category are those related to the social value that the project will bring to the local area and the experience and daily life of stakeholders, which includes planning and design of the airport, service for passengers, flight paths and communication with the local community.

**4.1.1.1. Plan and design of airport.** One of the core topics of this project is the design of the project itself, which is the common concern of the project and stakeholders and also the embodiment of the core delivery of the project. In this theme, the project presents the main design of the airport to the stakeholders, and the stakeholders’ comment and give opinions and attitudes based on the information they see. In the design and construction of airports, stakeholders pay attention to the main functional buildings of airports: terminals and runways. At the same time, stakeholders are also concerned about the design of airport operating facilities, including fuel supply plans and aircraft take-off and landing systems.

For the terminal, stakeholders were provided with design renderings of the terminal as well as modelled and rendered videos. Stakeholders focus on the aesthetics of the terminal and whether the terminal design can provide a comfortable experience for passengers.

*MS0608: “It’s a pleasant looking facility, but compared to the best airport terminals overseas, it’s hardly a memorable or inspiring gateway to Australia. It has the ambience of a Westfield food court and whilst the ceiling is interesting (mind you it is quite reminiscent of Madrid Terminal 4), it seems to be too low for the space below.”*

*Frankly, the terminal design looks like something designed by a draftsman, rather than a quality architectural experience. I suppose I was expecting something more inspiring.”*

However, not every stakeholder has professional architectural knowledge, and they are more inclined to cite their satisfaction or dissatisfaction with the existing airports worldwide as cases to make suggestions for the project.

*CG0217: “This airport will be superior to the one in Sydney Kingsford Airport by far we are looking forward to its complete day.”*

*LM0210: “Will it operate any better than those disasters in MEL, BNE and SYD. Three of the worst airports in the world, especially if you want to catch an aeroplane.”*

For the runway, stakeholders focused on the number of runways at the airport and launched a discussion on planning runway construction. Some argue that the airport should build both runways simultaneously rather than building a second runway through expansion once the airport is operational. Other stakeholders argue that building only one runway for now might be reasonable. However, stakeholders also stressed that the project should prepared or designed in advance for the next phase of runway expansion during this phase of construction.

*MK0531: “It’s very Stupid to have only 1 runway 🙄🙄”*

*AS0528: “GW0528 you have to wait until 2056 for the 2nd runway ... by that time planes probably won’t need runways but that’s a different story”*

For fuel supply, some stakeholders would like the airport to have a

fuel pipeline to provide a more stable fuel supply for aircraft at the airport. As for the rumoured plans of the airport to use vans and highways to transport fuel, stakeholders expressed dissatisfaction, arguing that this may lead to insufficient fuel supply.

*GM0303: “Has anyone thought how the millions of litres of jet fuel will get to this site once it’s up and running? I’m guessing thousands of b double trucks running 24 hours a day from port botany?”*

Some stakeholders are concerned about the local climate of the airport, where there are often foggy days, so they are concerned about whether the airport can operate in such conditions. The answer from WSIA is that the airport will use advanced aircraft take-off and landing systems to support operations in foggy weather.

*RC0435: “What happens to the planes when the fog comes in wintertime.”*

*WSIA: “Raymond Joyce Collett Western Sydney International will have one of the most advanced runways landing systems in Australia, with the capability for aircraft to safely operate in conditions of near zero visibility. This means our airport will continue to operate in fog conditions that currently shut down Sydney’s skies!”*

In this 1st-order code, stakeholders are concerned about whether the project is user-friendly and have questioned the feasibility and rationality of some aspects of the project’s design. In this topic, stakeholders focus on whether the project’s planning and design meet people’s expectations for the airport. Stakeholders have pointed out unreasonable aspects of the project design from their own knowledge and experience and have discussed the project’s social value. Therefore, this stakeholder issue is categorised under the “value of people” 2nd-order code, where the project needs to focus on the acceptance and understanding of the actual social value brought by the project’s planning and design from the stakeholders’ perspective.

**4.1.1.2. Service for passengers.** From the passengers’ perspective, some stakeholders focus on future passenger service and experience. They asked about the parking area in the airport, including the charging fees for the parking area in the future, which is also a topic of concern to stakeholders. They hope that the parking area can accommodate enough vehicles and that the charging standard can be more reasonable. They put the existing parking lot in Sydney Airport as a negative example.

*RK0606: “How much is it going to cost to park at this airport. Probably more exorbitant than it costs to park at the current airport in Sydney. Compared to pricing at other airports in Australia Sydney Airport is a bigger bush ranger than Ned Kelly ever was and look what happened to him. The pricing will probably be unaffordable for the people in Sydney’s West for an airport that we didn’t want in the first place.”*

Stakeholders are concerned about how the airport connects to local public transport, that is, whether the airport has associated infrastructure projects to meet transport needs, including new expressways and metro projects. Stakeholders hope the project can plan more convenient local transportation modes for airport passengers in advance, making arriving or leaving the airport easier. Especially if the airport is scheduled to operate 24 h a day, passengers departing and arriving during unusual operating hours should have available announced transportation. When the project proposed the highway and subway under construction, stakeholders were concerned about the reasonability of the new highway design and the planned subway station at the airport.

*AC0527: “It should only be opened after train & metro links are running.”*

*CM0512: “My questions to Western Sydney Airport. Where is the support infrastructure. Freeways, rail links etc?”*

This stakeholder issue comes from the passenger’s perspective. Project stakeholders are concerned with the transportation services

provided by the airport. Stakeholders focus on whether there are affordable and convenient transportation options between the airport and any city location to reduce passengers' travel burden. In this issue, stakeholders are concerned with whether the airport's supporting transportation facilities can provide convenient services for passengers, thereby contributing to the airport's social value. Therefore, this issue is categorised under the "value of people" code.

**4.1.1.3. Flight paths.** The topic of flight paths for stakeholders mainly refers to the future operational planning of the airport. The WSIA plans to operate 24 h a day with no curfew, inevitably leaving residents concerned about how they will be affected by the airport's operation. Stakeholders do not want to be surrounded by noise during their downtime.

CN0407: "Will this airport have a curfew like Sydney does?? Or realise that airports need to be open 24 hours a day!!!"

For suburbs or communities closer to the airport, they can be sure that they will be covered by noise. In contrast, for areas farther away from the airport, the extent to which noise will affect them depends on the airport or government's flight path planning. Stakeholders want the airport to publish flight paths as soon as possible so that community stakeholders know if they are in a noisy area.

KD0523: "What are the proposed flight plans and will residents housed within a twenty-kilometre radius receive free soundproofing from the government."

In this theme, stakeholder topics included concerns about the 24-h noise dissatisfaction associated with airport operations while expressing disappointment that there is no curfew under planning for the new airport. In addition, stakeholders continue to press the airport to publish flight paths as soon as possible. However, they are disappointed by the passive or reactive approach taken by the project about the flight path issue.

MC0432: "Hope you discussed in detail the fact that flight paths have not been released yet along with the serious health impacts that a 24/7 operating airport with no cap or curfew will result in."

The project opportunity did not actively post information about flight paths, and stakeholders can only mention the topic in their comments under each post.

In this stakeholder issue, flight paths are closely related to the residents of several communities surrounding the airport, especially after the airport decided to operate 24 h. Stakeholders are very concerned about the noise damage the new airport may cause to the local community's interests and are dissatisfied with the project's evasive attitude towards this issue. This affects the creation of the project's overall social value. Therefore, this stakeholder issue is categorised under the "value for people" code.

**4.1.1.4. Communication with the local community.** This theme is derived from the behaviour of airports trying to communicate with community stakeholders. The airport project chose to build a separate experience centre on the construction site to demonstrate the planning and construction of the project to stakeholders.

WSIA: "Our Experience Centre recently hosted York Public School where the students learnt more about the airport construction and enjoyed a bus tour around the perimeter of the site. For more information on how your school can participate please contact [info@wsaco.com.au](mailto:info@wsaco.com.au)"

WSIA: "Due to today's announcement regarding the extension of the lockdown for Greater Sydney, the Western Sydney International Airport Experience Centre will continue to remain closed until Saturday the 17th of July.

Please send us a message if you require any further information."

WSIA: "We've created a free program to keep you and your little flyers entertained at one of the most exciting projects in Western Sydney and in fact, Australia!

Come and explore the Western Sydney International Experience Centre and let your imagination run wild as you construct, build and create your own airport.

Bookings are recommended so please follow the link to secure a spot for your kids!"

However, due to the outbreak of Covid-19 and extreme weather, the opening of the experience centre has been affected. Due to the lockdown measures, it had to close several times in 2021.

WSIA: "We are happy to report that the Experience Centre is back open after closing for a few days due to the recent dangerous weather conditions.

Come and visit the Experience Centre to learn more about the construction of one of Australia's largest infrastructure projects! ✈️"

This affected the way the project was initially planned to communicate with stakeholders. In addition, the project repeatedly mentioned the engagement between the airport and the Aboriginal community. It proposed the exchange plan between the new airport and the Aboriginal community, aiming to help develop the Aboriginal community by engaging with the Aboriginal community.

WSIA: "Western Sydney is home to one of the largest Aboriginal populations in Australia, which is why we are proud to have started development of our first Reconciliation Action Plan (RAP). The RAP will include a series of initiatives that will guide how we develop and maintain strong relationships with Aboriginal communities, as a culturally competent and respectful organisation creating opportunities for Aboriginal people through employment, skills development, and business participation."

At the same time, some stakeholders also provided opinions and suggestions for the project to engage with the indigenous community and culture based on the topic raised by the project.

The project raised this stakeholder issue. It clarified that they need to establish communication with stakeholders, and the experience centre is a great tool to showcase the project to the local community. However, on social media, the project demonstrated its ability to communicate with the local community by reporting and updating the opening status of the experience centre and some stakeholders' offline experiences at the experience centre to online stakeholders. This combines offline stakeholder communication with online stakeholder communication activities. This reflects the project's actual actions towards achieving social value goals, and therefore, it falls under the "value for people" category.

#### 4.1.2. Value for profit

The "1st-order" themes related to the value for profit category are related to the economic value of the project, including the economic benefits that the project may bring in the future and the resources invested in the current construction of the project. This category includes three themes: future significance, project achievement and governmental issues.

**4.1.2.1. Future significance.** Among the topics mentioned in the project, the contribution of the new airport to the future economic development of the Western Sydney region is one of the core values of the airport. Community stakeholders also value the future benefits of the new airport for the local economy, including attracting more tourists and investors to Western Sydney and driving business and infrastructure projects across the region.

WSIA: “We had a great weekend at the Hawkesbury Show chatting to people about the airport development and the export opportunities the airport will create for local producers! #HawkesburyShow”

EEO432: “Finally we get an airport that’s functioning 24/7 ... what sham Sydney airport curfew. Sydney being the international hub for many transit passengers, how sad some so called local object for 24/7 operations ..”

BF0428: “I’m actually excited for it. I can’t bloody wait! Won’t have to travel 1 hour to go to Sydney airport anymore when I see family in Melbourne 😊😊”

At the same time, community stakeholders expect the project to bring them more employment opportunities and improve the local employment rate. On the other hand, the project also values their contribution to local employment.

GG0415: “Keep up the good work. Plenty of infrastructure and building to come. Employment opportunities by the thousands will be the end result. New rail and road at the foothills of the mountains. Land opportunities with public transport (rail) as far as Lithgow.”

WSIA: “Over half our current workforce are Western Sydney locals, with thousands more jobs to be created when we take off in 2026! 🧑🏻🧑🏻🧑🏻”

The proportion of project employees who are local members in Western Sydney is regarded as an essential indicator.

In this stakeholder issue, stakeholders expect the airport to provide more business opportunities and employment for the Western Sydney area, making a tangible contribution to the local economy. Therefore, the project’s future significance falls more under the “value for profit” 2nd-order code.

4.1.2.2. *Project achievements.* In the middle of 2021, the project is in the construction phase, and during the year, one of the leading construction tasks is the airport’s earthwork. Due to the complex terrain of the site, the airport project has a lot of earthworks, and the project announced that it broke the record for Australian construction projects. Projects often use photos or videos to show their construction sites to stakeholders during project construction.

WSIA: “Did you know that building Western Sydney International is one of the biggest earthmoving projects in Australia’s history?

Trucks like these are flattening the equivalent of a 12-storey building in height difference in preparation for runways, terminals and supporting facilities!”

Stakeholders have different views and attitudes regarding the published achievements of the project.

WC0310: “I would like to acknowledge the earth works team on this mammoth 500.000 QBs of cut to fill. In just one week 🙌🙌🙌🙌🙌🙌🙌🙌 love it keep up the good work team ...”

Some stakeholders were satisfied with the results demonstrated by the project, while others were not. The unsatisfied stakeholders are tired of the frequent mention of earthwork achievements, saying that the project is still in the earthwork stage, which is slow, long after it started in August 2018 (they think it should be accelerated).

LS0321: “The third Istanbul International Airport was built in 42 months. Europe’s largest and the world second largest airport from first shovel into the ground to testing with 4 runways and another 2 to be commissioned. Also, the Highway from Istanbul to the airport which is 50k north was also built in conjugation with the airport. You guys are still moving soil. So, when are we expecting the airport to open again? Can I just add this, the new airport was built on top of a quarry. The took soil from the top

and filled it in, in Sydney we’re working on almost flat land. 42 months compared to 10 years.”

Other stakeholders thought suspending construction for filming was a waste of time. The dissatisfaction of stakeholders with the project results mainly focuses on the dissatisfaction with the construction efficiency, which is considered a waste of time.

Regarding the project’s achievements, stakeholders are concerned with the project’s delivery status. The project demonstrates the reasonable use of its resources to complete the project by posting current progress on social media. Stakeholders are interested in whether the project’s funds have been used appropriately and achieved the desired delivery outcomes. This reflects stakeholders’ concern for the project’s economic value.

4.1.2.3. *Governmental issues.* Another theme related to the value of profit is governmental issues. WSIA is a government-led project, and WSA Co. is a company formed by the government to build the project. Some stakeholders discuss the use of resources by the project from the perspective of government decision-making. In this theme, most stakeholders believe that the project is a waste of money and taxpayers’ taxes, and they believe that the new airport may become a white elephant due to no passengers after completion.

MR0220: “What terrible waste of money!”

Other stakeholders have suggested that political demands from politicians may have driven the project. In addition, the government has been exposed to a corruption scandal regarding the WSIA land purchase, which is also one of the critical concerns of stakeholders.

GH0436: “damn wrong, has not passed feasibility studies but Liberals have bulldozed way in, damn wrong way to go, will not use this airport.”

JS0531: “Yeah, 30 million for 3 million dollars worth, and the deputy prime minister said that it was a good deal. The whole thing stinks!”

Especially after the COVID-19 pandemic spread, international and domestic flights dropped sharply, and some stakeholders became more determined that the new airport was an unnecessary project.

GV0405: “The country is closed down [because of] corona. No overseas travellers. Very few people want to get vaccinated. You cannot travel without being vaccinated. I think it’s a waste of time. Money.”

All of the above stakeholders tend to believe that the new airport will not bring the expected economic contribution to the local area because they believe the project may not project passenger traffic growth in the future. If, as they expect, the project may not produce the expected economic benefits after completion, all the resources invested in the construction of the airport will become a waste.

Since this project is a government-led infrastructure project, stakeholders are concerned about whether the project is based on sound government decisions. Corruption in the project’s construction has also led stakeholders to question the government’s decision to initiate the project. Additionally, due to transportation restrictions during the COVID-19 period, many stakeholders have lost confidence in the airport’s potential to bring economic development in the future. In this stakeholder issue, stakeholders are questioning and discussing whether the government’s decisions regarding the airport can generate the expected economic value. Therefore, it is categorised under the “value for profit”.

#### 4.1.3. Value for planet

Under the value for planet category, there is only one core “1st-order” code: environmental issues. Stakeholders may focus on different aspects of the project’s influence on nature.

4.1.3.1. *Environmental issues.* Environmental issues are the only topic in

this directory, but many topics are included. As the WSIA site was chosen close to the Blue Mountains Nature Reserve, stakeholders were concerned about the project's impact on the natural environment. On the one hand, some stakeholders believe that the airport construction felled the original plants in the area and destroyed the original natural scenery and environment.

JM0216: "Such a travesty to the natural landscape.

Once it's gone it's gone forever"

At the same time, for the animals in the area, stakeholders also pay attention to whether they have properly settled the wildlife inhabiting the area.

NP0304: "Western Sydney International Airport how many native freshwater longneck turtles have u killed in all these farm dams 🐢🐢🐢. And how many have been relocated?"

On the other hand, some stakeholders were concerned about the local air pollution caused by the leftovers from burning fuel by incoming aircraft when the airport began operations. At the same time, some stakeholders also mentioned concerns about aircraft dumping unburned fuel.

DS0417: "When money is more important than clean air that is proof that something is really wrong with us. Tones and tones of jet fuel will be burned above our heads. And some people don't care at all. This is rock bottom."

These conditions can lead to long-term pollution of local flora and fauna.

Stakeholders occasionally mention environmental issues in the on-line discussions about this project. However, the environmental topics related to the airport that stakeholders focus on are scattered and disorganised, rarely forming large-scale discussions. Stakeholders have discussed the natural landscape, wildlife protection, and air pollution issues in Western Sydney, believing that the airport will cause significant damage to the local environment. Therefore, environmental issues are categorised under the "value for planet".

Appendix 1 shows more examples of each 2nd-order Categories and 1st-order codes.

#### 4.2. Sentiment and emotion analysis results

In sentiment analysis, we refer to the basic types of human emotions given by Izard (in Mou and Lin, 2014), and according to the main types of emotions existing in the research data, we chose joy, anger, contempt, and sadness as the four emotions used as the classification basis of sentiment and emotion analysis. Among them, only joy belongs to positive sentiment, while the other three types of emotion belong to negative sentiment. The objective of sentiment analysis in this paper is to assess, analyse and prioritise identified stakeholder issues using the emotion categories generated by stakeholders on different issues.

##### 4.2.1. Joy

Joy is the only emotion discussed in this study that belongs to positive sentiment. Among the issues concerning stakeholders of this project are communication with the local community and planning and design of the airport; both project achievement and future significance gives stakeholders joy.

In the theme of communication with the local community, the joy of stakeholders comes from being satisfied with the experience centre provided by the project to communicate with community stakeholders and the experience in the experience centre.

MB1131: "Love the experience centre! The information and format are awesome 🍷"

The stakeholders who feel happy because of the airport's plan and design are satisfied with the airport design and design presented by the project team to the public and think that it meets or exceeds their expectations.

VT0435: "Another one!!! ... which is cool! ... 🍷🍷🍷🍷🍷"

DS0615: "I think the Airport looks amazing and I'm so glad it is begins built here as it will keep people employed and it will put the zest into some people it brought lots of new roads and Rail well done 🍷"

For the project achievement released by the project on social media, the stakeholders felt joy because of satisfaction and therefore encouraged the project.

KH0623: "What a great idea, good news, you don't get any GOOD NEWS from the Media these days, but I love hearing good news. Thanks for posting."

Some stakeholders recognised the future significance of the project, and they were full of expectations for the development that the project might bring to the local area, so they were happy about the construction of the project.

AM0545: "Copy that WSA 😊😊😊 ..... I reckon the rest of the crew will say the same. As one of the beneficiaries in the community, it's a great privilege to be part of this gigantic project. The Western Sydney International Airport will not only benefit the local communities, it will greatly benefit the whole of Sydney and Australia in general. This project will add to the Economic and Infrastructure development while providing thousands of jobs. On behalf of myself, young operators and trannies, we are grateful for such opportunities to come to our doorsteps. It's the biggest platform anyone can have in the civil industry. The largest earthworks that has ever happened in Australia, working with the best engineers, best superintendents, best Formen and leading hands, best operators and most of all the leading civil construction company Acciona. How good is that .... Can't be better 😊😊👍. One proud man."

AC0520: "Great! the long wait will be worth it! One day it will become the largest airport in Australia and perhaps one of the largest in the world by the 2050's!"

From the above examples, when expressing positive emotions such as joy, stakeholders use many emojis to assist in expressing emotions. In the stakeholder issue analysis, positive emotions usually mean the stakeholders are satisfied with the project performance, and the urgency of the related stakeholder issue can be appropriately reduced.

Regarding the stakeholder issues identified in the thematic analysis, in the "value for people" category, some stakeholders expressed joy in the "plan and design of airport" and "communication with the local community" issues. Additionally, the "future significance" and "project achievement" stakeholder issues in the "value for profit" category also included stakeholders' joy.

##### 4.2.2. Anger

Anger is one of the emotions that project stakeholders often experience. In this study, topics related to anger included flight paths, governmental issues and communication with the local community.

In the game between the project and community stakeholders about flight paths, the stakeholders were dissatisfied with the airport's delay in announcing flight paths and felt concealed and deceived when the project repeatedly tried to shift responsibility or avoid the problem. As a result, many angry comments were generated to accuse the project of such behaviour.

JR0525: "The only answer you will receive here is, spin, spin, spin!"

VK0525: "Western Sydney International Airport lies lies and more lies"

GE05P28: “Blue skies full of pollution from glorified buses with wings.



Show us the flight paths! What are you hiding??”

The sentiment in the comments also generally be negative when the comments are related to the governmental issue. Stakeholders expressed anger at government actions related to the project, including corruption in government land purchases.

PT0416: “How much land was stolen under compulsory acquisition???? Just like transport NSW .....a bunch of criminals”

When stakeholders value the environmental issues that airports may bring, they will be angry about the current construction of airports and denounce the construction of airports as destroying the local environment.

DF0413: “Wow. So proud to be able to destroy more land!!!”

When the project attempts to discuss Aboriginal topics in communication with the local community, the dialogue with stakeholders may develop in a negative mood. Some stakeholders felt that simply trying to communicate with indigenous communities was not enough and that projects should be named using elements from indigenous culture. The comments are often angry.

JA0533: “I requested the site be called after a tribal or nation name! why did government ignore reasonable requests that lines with common sense. ... the bridge is dedicated to Bradfield, a highway called Bradfield and a north shore locality called Bradfield that was eaten away for more dominant suburbs for real estate value! I feel there were much better choices Government Ignored! give Ist nation people something iconic to be proud of for the future!”

Anger should be given more attention when analysing stakeholder issues. Because anger is a strong emotion, it can lead to behaviours and events beyond our control. Therefore, the issue of stakeholders with angry feelings should be given higher priority.

In the identified stakeholder issues, some stakeholders expressed anger in the “flight paths” and “communication with the local community” issues under the “value for profit” category. Additionally, the emotion of anger also appeared in the “governmental issues” (under value for profit) and “environmental issues” (under value for planet).

#### 4.2.3. Contempt

Contempt is often directed at individuals or organisations, and in this study, stakeholders expressed contempt towards the project team in the following themes: project achievement and service for passengers.

When the project demonstrates project achievement, some stakeholders still express contempt for the project team’s gloating over the current achievement because they think the project is inefficient enough (or some stereotypes based on efficiency in the Australian infrastructure field).

HH0529: “TR0529 finally someone with some sense. The speed at which infrastructure projects are done in Australia is appalling, together with the ridiculous price tag. But no accountability ever. I’m sick of things progressing so slowly. To be fair, the NSW LNP has committed to and have finished projects while NSW Labour hardly got anything done in the many years before”.

DB0513: “Colin Murphy you are joking surely! 😂😂😂”

Come on, they have only had 50 years to plan this venture. Infrastructure will be started in 2040”

LS0320: “Inspiration for yah L0320 and S0320 I bet they do 1000 machine hours and 1 idle hour”

Some stakeholders are more concerned about the service for

passengers of the airport, and they are not aware of the construction of the transport infrastructure projects related to the foundation. These stakeholders suspect that when the airport is built, the related transportation projects will not be completed and think it is foolish for the project to put the airport into operation without planning the infrastructure projects related to the airport. In these comments, the stakeholders embody contempt.

PLO430: “I believe at full use it will be a B double every 10 minutes?. and don’t forget it is a 24 hr airport so no time to catchup at night.. imagine what’s going to happen when the first one crashes on the M4 or even M7!!!!”

GH0616: “MD0616 You can’t just plonk an airport on a field without the required infrastructure close by, western end of the airport there will be a fuel farm”

Contempt is often associated with the project team’s efficiency, but stakeholders may never be satisfied with the current efficiency of the project.

In the stakeholder issues identified in the thematic analysis, contempt was found in the “service for passengers” (under value for people) and “project achievement” (under value for profit).

#### 4.2.4. Sadness

Stakeholders expressed sadness about the possible environmental issues caused by airport construction. Individual stakeholders are powerless and saddened by the loss of the natural landscape.

PP0304: “This land was a forest forever times, now serves to greeds forever too. ...”

In the discussions related to the flight path, some stakeholders who were not affected by the noise were also involved and felt sad that the community residents had to endure the noise impact.

MB0517: “Sad that the precious people that live around Mascot airport will not have to endure noise 24/7 but people of western Sydney do .....”

Sadness, which has little influence on practical actions in this study, is often generated when stakeholders feel powerless over an issue. As a result, the project’s priority may be relatively low when evaluating the stakeholder issue with sadness.

Some stakeholders expressed feelings of sadness in the “flight paths” (under value for people) and “environmental issues” (under value for planet) stakeholder issues.

#### 4.2.5. Emotions indicators and stakeholder issue prioritization

Considering that each stakeholder issue may contain multiple emotion categories, we can consider assigning values to different emotions to quantify the analysis results when using emotions for analysis. Take, for example, the emotions selected for this study and the impact of these emotions on infrastructure projects. According to the sentiment and emotion analysis results, this paper uses the above four emotions to conduct stakeholder issue analysis and gives the following numerical criteria. Based on [Boyns and Luery \(2015\)](#)’s research, negative emotions are more likely to prompt stakeholders to engage in negative behaviours that can harm the project, while positive emotions may encourage stakeholders to take actions that advance the project. When quantifying stakeholder emotions, the potential impact of these emotions on the project is the primary consideration. Since negative emotions are more likely to lead stakeholders to harm or resist the project, negative emotions are assigned positive values in the emotional numerical criteria of stakeholder issues ([Collins, 1993](#)). This means that these emotions are ones the project needs to be wary of and take measures against. Conversely, positive emotions typically lead stakeholders to support the project, meaning these stakeholders are less likely to obstruct the project’s progress and may even be willing to help ([Boyns and Luery, 2015](#)). The priority of stakeholder issues with positive emotions can be

**Table 1**  
Emotion numerical criteria.

Emotion	Number	Emotion	Number	Emotion	Number	Emotion	Number
Joy	-1	Angry	+3	Contempt	+2	Sadness	+1

**Table 2**  
Sentiment analysis results for stakeholder issues.

2 <sup>nd</sup> -order Categories	1 <sup>st</sup> -order Themes	Emotions	Score	Priority
Value for People	Plan and Design of Airport	Joy (-1)	-1	D
	Service for Passengers	Contempt (+2)	2	C
	Flight Paths	Angry (+3), Sadness (+1)	4	A
	Communication with the Local Community	Joy (-1), Angry (+3),	2	C
Value for Profit	Future Significance	Joy (-1)	-1	D
	Project Achievements	Joy (-1), Contempt (+2)	1	C
	Governmental Issues	Angry (+3),	3	B
Value for Planet	Environmental Issues	Angry (+3), Sadness (+1)	4	A

appropriately lowered. Therefore, in the numerical process, this method assigns negative values to positive emotions to reflect the lowered priority. Among negative and positive emotions, different emotional energies affect the specific valuation numbers. For example, anger, as a negative emotion with high emotional energy, should be assigned a larger positive value, while sadness, which usually reflects lower emotional energy, should be assigned a smaller positive value. In this step, inter-rater reliability is applied by the research team when assigning values to emotions, ensuring consistency and agreement among the researchers.

According to the above numerical analysis table (Table 1), we prioritized the stakeholder issues identified in the thematic analysis results. The initial sentiment rating of each issue is zero, and we used the assigned emotion and the above table to calculate the sentiment score of the stakeholder issue. Based on the calculation results, we ranked the priority of each issue.

The analysis results in Table 2 can provide a reference standard for the project to respond to the core stakeholders' issues. The project can develop corresponding coping strategies according to the priorities of different stakeholder issues. For the results in Table 3 above, higher priority stakeholder issues do not mean that the project must respond to these issues immediately. However, they should be more cautious when facing these issues and choose response strategies according to the project's actual situation. In addition, for the steps of assigning numerical criteria to emotions in Table 2, the project team can also assign numerical criteria according to the situation of their own projects and professional judgment. We suggest that this process should be undertaken by at least two or more raters in order to achieve consensus and reliability as was done in our case.

As a summary, Table 3 shows the main steps in conducting naturalistic inquiry in project stakeholder issue analysis, outlining the description of each step, along with analysis and examples to illustrate.

### 5. Discussion and conclusion

This paper has discussed design and implementation considerations and guidelines for conducting analysis of stakeholder issues on social

media using a naturalistic inquiry lens, using WSIA project as the illustrative context. Here, we discuss the strengths and limitations of this method. The strengths and limitations of this method are represented in two perspectives: from the users of the method (including researchers and industrial practitioners) and the objects of study (including participants, responders and stakeholders).

For the strengths of this method for the those adopting this method, firstly, this method can maximise the natural integrity of data and reduce the influence of subjective factors of method users on data collection (Blumer, 1969). Secondly, this method can help users overcome the obstacles caused by time factors, and they can obtain rich real-time and historical data. Thirdly, this method also reduces the influence of geographical factors on data collection, and method users can obtain a wide range of views from online objectives in different countries (Ninan, 2020). Finally, the data in this method are all from public social media platforms, so the data can be obtained openly, which saves time and cost for users' data collection (Bhattacharyya and Dash, 2020). On the other hand, for the studied subjects, the content they have posted on social media will be used as the main data, which reduces the limitation of the traditional data collection method for the respondents, and the studied subjects do not deal with questions that may cause inconvenience (Silverman, 2013). In addition, the data in this method is sourced from the studied subjects who express their raw opinions through online texts and pictures, with the ability to organise and edit to express their opinions more accurately and comprehensively.

In contrast, the present method also has some limitations. First, for method users, the data enhanced in this method are all secondary data, and the data's relevance to the research topic is limited (Shamblen and Dwivedi, 2010). In this regard, the users, especially researchers, must reasonably design the research topics and questions to make the research suitable for this method. Secondly, the content of online data in this method has limitations, and method users cannot conduct further in-depth mining of the views of research objects, such as cause analysis, which affects the depth of research results. This may potentially be mitigated by triangulation of findings with findings from other datasets such follow-up interviews, annual company reports, minutes of project meetings, etc. Compared with traditional data collection methods, the

**Table 3**  
Main steps in operationalising naturalistic inquiry for project stakeholder issue analysis.

Steps	Description	Example and Analysis
Data collection	The data collection of naturalistic inquiry in project stakeholder issue analysis focuses on social media, where the text, video and images from the project and online stakeholders posts form the naturally situated data sources.	SG0432: <i>“The Airport brings a new chapter to Western Sydney. In reality when we look to Sydney Airport people got used to flights and do forth. Western Sydney has a lot to look forward too. At the end of the day, we just have to wait and see what the future brings. Great to see young people get opportunity like jobs and so forth. Great for families with various shops and other things. Why go to Sydney CBD when you enjoy shopping in Western Sydney Think of tourists who come to visit Western Sydney, what great news to see more visit various places of interest that Western Sydney has to offer. What more can I say???”</i>
Thematic Analysis	1st-order Themes  2nd-order Categories	From the example, the words “brings a new chapter to Western Sydney”, “Western Sydney has a lot to look forward to”, and “wait and see what the future brings” show that this stakeholder values the future significance of the new airport, hoping the new airport can bring more opportunities to the Western Sydney area, so this comment is coded under the theme named “Future Significance”. The 1st-order theme based on our example is Future Significance, and considering the main focus of this theme is about the future economic development of local area (e.g., employment opportunity, the tourism industry and the small family business), so this 1st-order theme can be category into Value for Profit.
Sentiment Analysis	Sentiment analysis focuses on the positive and negative sentiments of the stakeholder issues identified from the thematic analysis. The positive or negative sentiment decides the essential numerical criteria when analysing the stakeholder issues.	In our example, the words “great” and “enjoy” show a positive sentiment, and under the positive sentiment, considering the context of the words, this comment shows the emotion of Joy.
Emotion Analysis	The emotion analysis supports the sentiment analysis in our method,	

**Table 3 (continued)**

Steps	Description	Example and Analysis
Results	providing various emotions for researchers to have a more detailed insight into the sentiment and expression of the stakeholder issues. Based on the result of sentiment and emotion analyses, researchers develop a numerical criteria for indicating emotion polarity rating for each stakeholder issue to determine their priority.	It is advised to go through the whole database to generate the results to form an overall understanding of stakeholder issue themes, sentiment and emotion towards the project.

textual content of the posts lacks auxiliary information such as respondents’ tone, expression and body language to help users analyse and judge (Ninan, 2020). Thirdly, this study selected an infrastructure project as a case for operationalization of the method. Therefore, only stakeholder issues related to infrastructure projects are illustrated. Furthermore, only posts for a specific year of the project was selected, so the identified stakeholder issues do not represent the entire project life cycle. Researchers and project teams can consider selecting an ideal time period based on their requirements in future research. Finally, in stakeholder issue analysis, sentiment and emotion analysis were the primary analysis methods, and only four representative emotions for analysis were selected, so there may be limitations in the analysis results as more emotion categories are available. In summary, researchers can choose other theoretical dimensions in future research to analyse and prioritise stakeholder issues. When using sentiment and emotion analysis, future researchers can choose more complex emotion models or focus on a single important emotion.

For the studied subjects, given the open access to the publicly available Facebook data, this method has the risk of compromising the subject’s privacy (Dehkhoda et al., 2020) in that the subjects’ personal profile unlocked for the public eye. Furthermore, using the subjects’ statements on social media may involve a dispute over intellectual property rights (Ninan, 2020). Method users can mitigate the risks of these limitations by anonymising and incorporating social media platforms’ privacy and intellectual property policies.

In conclusion, this paper proposes a novel methodology to conduct stakeholder issues analysis in social media. Stakeholder views on social media can be obtained from publicly available information. Scholars and industry practitioners can directly extract information from publicly available web pages for stakeholder issue analysis. When identifying stakeholder issues, researchers and industry practitioners can use thematic analysis to extract the main issues of concern for stakeholders from the data and classify the issues according to the research or project needs. In the analysis stage, sentiment analysis and emotion analysis can be applied to analyse stakeholder issues, to derive the priority of each stakeholder issue according to its sentiments and emotions.

Scholars can use data from social media to conduct netnography studies of online stakeholders and other qualitative studies. For industry practitioners, the project team can directly use the project stakeholder identification and analysis methods mentioned in this paper to analyse the main issues concerned by online stakeholders and select targeted response strategies.

**CRedit authorship contribution statement**

**Jingbo Zhang:** Writing – original draft, Methodology, Formal analysis, Data curation. **Kon Shing Kenneth Chung:** Writing – review & editing, Validation, Supervision, Project administration, Methodology,

Investigation, Conceptualization.

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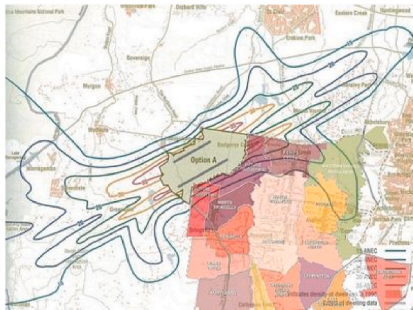
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**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**7 Appendix 1. Thematic analysis result examples**

2nd-order Categories	1st-order Themes	Examples
Value for People	Plan and Design of Airport	<p><b>JB0326:</b>  <b>KC0326</b> that's what the baggage system looks like ahaha kinda like monster inc ahaha  <b>JS0426:</b>                      What about the fog on Monday is it going to disrupt the flights more than Mascot?  <b>FG10511:</b>                      I wonder how many flights are going to be delayed because of fog. It's one of the worst areas in Sydney for fog. I know as I drive past the new airport most days  <b>WSIA:</b>                      Hey <b>FG10511</b>. Our runway will be only the second airport in Australia equipped with a CAT III-B instrument landing system. This means aircraft will continue to operate safely in foggy conditions with virtually no visibility, avoiding inconvenience to passengers by operating in conditions that currently shut down Sydney's skies.                      Chris</p>
	Service for Passengers	<p><b>AM0217:</b>                      Just wait till they sell off the car parking area. Cost you more than it does to fly anywhere  <b>JR0423:</b>                      Looking forward to all the new road and rail opening, With today's aircraft being much quieter. Bring on progress. People have known that this airport for Many years was in the Pipeline. World class facility for western Sydney"  <b>BA0603:</b>  <b>Western Sydney International Airport</b> so that's roughly 27 k passengers per day, being moved around the airport, majority by road. How are the surrounding roads going to handle another 10,000 cars per day- that's just for passengers, let alone staff, utilities etc. Then apparently increasing to 120,000 passenger cars per day, plus staff and utilities. Again, is the infrastructure there now, and planned for the future?</p>
	Flight Paths	<p><b>DM0424:</b>                      Don't be fooled people of western Sydney. When will we know the flight paths over western Sydney? It's fine for the Government to go ahead and build this airport but what are they hiding in regard to flight paths? A PR exercise to brain wash the people of western Sydney about how good this is going to be. But when planes start flying over our homes 24/7 it's to [O] late.  <b>RB0424:</b>  <b>DM0424</b> Flight paths! Liverpool/Bankstown will be one. The other is Camden, Oran Park. Normal flight corridor is closer to the coast. Last six months or so, a plane will fly low over our house Harrington Park, Oran Park. Their way of getting the locals used to sleepless nights.  <b>PL0432:</b>                      Which western Sydney suburbs will be most affected by Sydney's second airport at Badgerys Creek?                      The runway will be positioned North-East/South-West which means the following suburbs will be most affected by aircraft noise.                      5. Bella Vista - 60 db                      4. Blacktown - 65 db                      3. Seven Hills - 68 db                      2. Arndell Park - 70 db - Which is like standing at Leichhardt Oval and listening to a plane fly over to Mascot                      Horsley Park - 80 db                      Increased aircraft noise is expected to impact on house prices in these suburbs. Triple M approached 6 real estate agents in the Blacktown-Seven Hills area for comment ... and NOT ONE responded.</p>
Communication with the Local Community		<p><b>KR0327:</b>                      Miss all the friendly faces at the centre. What an awesome crew                      Visit us during the April school holiday break to enjoy our fun and interactive activities for you and your family.  <b>WSIA:</b></p>



(continued on next page)

(continued)

2nd-order Categories	1st-order Themes	Examples
		<p>Western Sydney’s future airport builders, pilots and engineers were among the hundreds of people who joined us for our community open day today.</p> <p><b>KH0422</b> Wish I’d have known about this!! Will there be another one??</p> <p><b>JX0532:</b> I did enter the naming of the 3rd city competition known now as Bradfeild, John Bradfeild has accomplished a lot in the past century for the city of Sydney. However, 60,000 yrs of Cabrogal clan living on the land where the city is to be built. I suggested the city be named Cabrogal, for many reasons.</p> <p>1_ Acknowledge our First Nations People 2_ International &amp; domestic passengers could learn Australian Indigenous history. Being near Western Sydney Airport 3- We as a progressive nation, are moving forward. And many other reasons, I was surprised, thought it was a no brainer</p> <p><b>SG0432:</b> The Airport brings a new chapter to Western Sydney. In reality when we look to Sydney Airport people got used to flights and do forth. Western Sydney has a lot to look forward too. At the end of the day, we just have to wait and see what the future brings. Great to see young people get opportunity like jobs and so forth. Great for families with various shops and other things. Why go to Sydney CBD when you enjoy shopping in Western Sydney Think of tourists who come to visit Western Sydney, what great news to see more visit various places of interest that Western Sydney has to offer. What more can I say???</p> <p><b>DS0426:</b> It will create so much in jobs for the Western people and the locals so be grateful</p> <p><b>NC0427:</b> Love the NEW AIRPORT, WILL BRING JOBS FOR THE YOUNG PEOPLE AND PROSPERITY FOR THE WESTERN SYDNEY.</p> <p><b>BR0429:</b> Keep up the great work team. That is truly awesome.</p> <p><b>GH0322:</b> <b>AM0322</b> do you have any idea what 25 million cubes of earth looks like to move? never been a single job of this scale before in Australia, they are breaking earthmoving records on site i can assure you</p> <p><b>AC0428:</b> I wonder when construction on things like the runway, taxiways and he terminal will commence?</p> <p><b>RM033:</b> Just wondering if earthworks are now close to complete. How many more cubic metres still need to be moved? Also, when is construction of terminal building due to commence?”</p>
Value for Profit	Future Significance	
	Project Achievements	
	Governmental Issues	
Value for Planet	Environmental Issues	

Data availability

Data was sourced publicly from Facebook

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