

Poster Abstract: *ConStory*: Automatic story investigator of public perception on the mega urban infrastructure project

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ABSTRACT

We evaluate the North Houston Highway Improvement Project (NHHIP) in Texas by analyzing social media data (Twitter) to determine the public perception on a series of issues in the project. We analyze the pertinent tweets since the project announcement (2008 to 2021). Our initial analysis is based on three distinct periods in which the volume of tweets has changed according to notable events: 1) release of the alternative design by the agency and 2) project pause, using topic modeling. Our results show a long-term public opinion shift from project itself to community and demolition. Although 'Neighborhood and Homes'-related tweets were inconsiderable in 2015, they became a critical discussion issue when the project was paused. We suggest that public opinion mining should be implemented through different information sources to overcome challenges that exist in identifying the interaction between citizens and the mega urban infrastructure projects.

CCS CONCEPTS

• **Applied computing**; • **Human-centered computing**;

KEYWORDS

social media, data analytic, human-centric urban infrastructure

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1 INTRODUCTION

Evaluating public perception through social media has extensively gained popularity in different sectors: e.g., sales, marketing, services, and politics. In recent years, there also has been a growing interest in such application for human-infrastructure interaction since the infrastructure performance has significant impacts on the public [2]. The active engagement of the public improves public satisfaction and stakeholder management through informative

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directions in planning and construction of the mega project: e.g., Macao bridge [5], Leslie & Ferrand Transit Stations [4], and Three Gorges Project [3]. Even their clear benefits on our society, they also have influenced surrounding communities on aspects of their equity and economy, frequently in an adverse fashion. The advancement and proliferation of social media have expedited the use of social media in expressing their feelings and opinions, thereby being enthroned as an alternative public sphere. Project managers can use the social media's capabilities to improve communication and public engagement for better stakeholder management between different project parties, including internal and external stakeholders. Moreover, public opinions in different project's life cycle phases are likely to be varied [5] which is essential for identifying public interest and addressing user needs and equity.

2 METHODOLOGY: CASE STUDY OF NHHIP

We select the North Houston Highway Improvement Project (NHHIP) as a case study project that received high public attention. NHHIP is a \$7.9 billion project by TxDOT, including three main segments to improve road capacity and reduce congestion by redesigning and rebuilding I-45 through the downtown Houston area between US 59 and Beltway 8 North. Since the project plan initially involved the demolition of residential units and businesses in the affected community, it has aroused public attention and critics over the project. Through the several public meetings, the performing agency proposed an alternative design to address the issues affecting people.

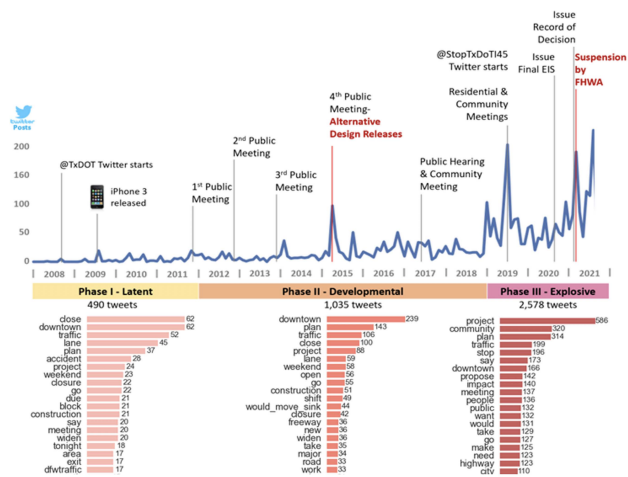


Figure 1: Top: Number of Tweets between 2008 and 2021, Bottom: Most used words in posted tweets for each phase

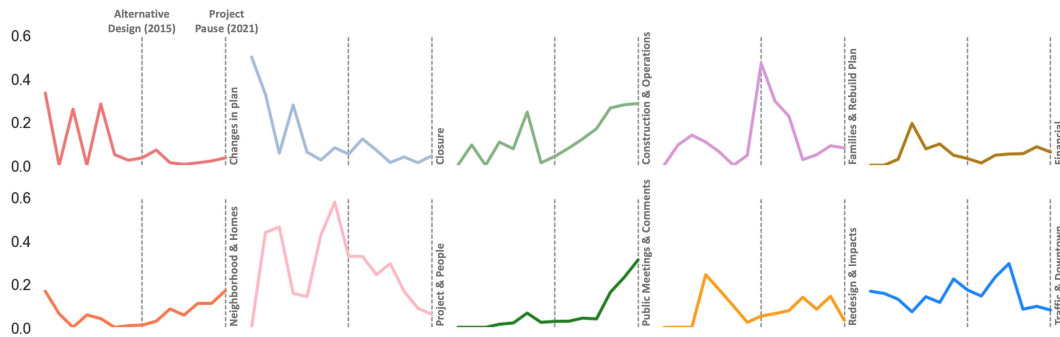


Figure 2: Weights of extracted topics based on the appearing in the number of tweets posted in each year

Despite the release of the alternative design for review in April 2015, the progress of the project was paused by the Federal Highway Administration (FHWA) due to civil rights and environmental concerns in March 2021 for additional assessments.

To understand public opinion, we initially collect 350,275 tweets on 'I-45' posted since the project beginning, between 2008 and 2021. Specific keywords then are used to filter the tweets related to the I-45 expansion, leading to narrowing down to 4,103 tweets for analysis. The final collected data include tweets content, retweets, likes, location, and date. We evaluate public opinion in the project based on two critical events using topic modeling, including alternative design by the agency and project pause by FHWA. Then, we analyze word frequency and perform topic modeling [1] to investigate the changes of public perceptions over the project period.

3 RESULTS

Figure 1 shows that the number of tweets in the first stage started increasing as the project was developing in the planning and pre-construction phases. The public opinion shifted from traffic-related to project-related issues. The discussion was boiled down to more community-related issues, i.e., the people presented their ideas about external issues. In other words, as information was getting available, they were more concerned about the project's effects on their community rather than the project itself. By comparing the frequency of the words, we observe that people were more concerned about traffic-related issues. During the second phase and after public meetings, the number of tweets peaked when an alternative design was released, which was the highest public reaction. Compared to the first, people mostly reacted to the project-related issues. The number of Tweets was increasing in the third phase as controversy about the project was raised due to the agency's plans to demolish buildings adjacent to the project. At the same time, the @StopTxDoTI45 account was created, and people primarily addressed community-related issues caused by the project.

To understand the representative contents of public opinion, we perform topic modeling on 4,103 tweets with 10 topics. Then, we visualize the trend of each topic by normalizing with respect to the total number of topics assigned to each tweet for each year (figure 2). 'Families and Rebuild plan' and 'Project and people' topics were dominant in 2015 when the project was redesigned. Meantime, tweets containing the 'Traffic and downtown' topic accounted for a

significant portion. In 2021, when the project was paused, the tweets related to the 'Public Meetings and Comments' were one of the most discussed topics. The second and third most important topics are related to the 'Construction and Operations' and 'Neighborhood and Homes', respectively, which might be due to the demolition of buildings, displacement of the community, and possible violation of civil rights. Overall, topics show intense discussion between the project impacts and neighborhood communities in tweets rather than the project's advantages. At the same time, people's ideas about the project contradicted the provided documents by the performing agency. Contrary to the agency's intended benefits for the public, such as reducing traffic and air pollution, it turned out that people concern more about their houses and demolition.

4 DISCUSSION AND CONCLUSION

The construction sector can better interact with the public and overcome limitations in the communication by accommodating public opinions collected through a new emerging public sphere, social media. Public engagement based on the accurate understanding public needs should occur in a dynamic environment of feedback loops between the public and project stakeholders. This can be achieved by utilizing a combined approach for collecting data from different social media sources. At the same time, future studies can also improve public opinion mining by developing methods to extract opinions and feelings from pictures and emojis for replied tweets. Furthermore, social media content can be used not only for managing and identifying mismatches among stakeholders but also for better risk and cost management in construction.

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