Highways and Humor

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Abstract

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This research examines whether humor effectively communicates traffic safety messages across Variable Message Signs (VMS) and social media platforms, addressing the growing but controversial practice among U.S. Departments of Transportation. Through systematic content analysis and case studies applying the Step approach to Message Design and Testing (SatMDT) framework, this thesis reveals that humor's efficacy for safety is inconclusive, and for public sentiment is highly context-dependent, varying by platform constraints, audience demographics, and message design.

While humorous messages demonstrate superior attention-getting capabilities and enhance source credibility, a critical "message discounting" phenomenon creates a gap between engagement and persuasion; audiences process humorous content more deeply yet simultaneously dismiss it as entertainment rather than actionable guidance. VMS humor faces additional challenges from severe time constraints and safety-critical contexts, while social media platforms enable more sophisticated humor strategies without distraction risks.

Table of Contents

List of Figures

List of Tables

Introduction

Transportation planners have always had an odd sense of humor. Ask any planner the funniest joke on the planet, and they'll tell you, "one more lane'll fix it."

Traffic safety communications need to achieve two goals: to be understood quickly and to be understood by as many affected drivers as possible. There are widely varying results in studies approaching the topic of the efficacy of humor for improvements in safety and traffic congestion when Departments of Transportation (DOTs) utilize it for public communications. Simultaneously, humor coming from the same agencies is on the rise, and growing even more experimental every day. These humorous messages are employed largely as part of Behavioral Traffic Safety (BTS) campaigns in Variable Messaging Signs (VMS) and social media, among other non-traditional safety messages.

Are humorous messages about traffic effective? If so, when, how, and why? With the conflicting data from existing studies, how should agencies move forward? Transportation professionals must navigate the complex intersection of engagement psychology, technical constraints, regulatory requirements, and safety efficacy to develop evidence-based humor strategies.

Why is the most popular DOT post on social media to date, with global reach and attention, a highway closure announcement from the state of Utah? Non-traditional safety messages challenge traditional assumptions about government authority and communication tone. Conventional wisdom suggests that safety messaging requires serious, authoritative presentation to convey importance and urgency. However, non-traditional approaches operate on the premise that breaking these expectations can create stronger cognitive engagement and emotional connection than standard approaches.

This research shows that the data on the efficacy of these messages for their intended safety behavioral changes is limited; with no conclusive evidence on longitudinal impacts and limited information on immediate effects. Rather, these messages are successful in boosting public sentiment and affective dispositions towards DOTs, and those outcomes are highly dependent on audience demographics including age, sex, race, education, and cultural qualities. The SatMDT framework, developed by Lewis et al. (2016), is recommended for use by all DOT agencies to create, test, and evaluate humorous messages for deployment.

This research performs a meta-analysis of existing literature, examines case studies of successes and failures, and recommends a framework for how best to incorporate humor campaigns for audience appreciation based on cognitive frameworks, advertising research, and empirical studies conducted by DOTs.

Research question: Is humor an effective tool for traffic safety communication across different platforms?

This research paper explores the gap in knowledge around a contemporary phenomenon. Current research on humorous messages is centered around two areas: advertising and public-health messaging. This project will use multiple case studies to triangulate best practices and transferable lessons from cases of humor in public relations across disciplines and combine them with knowledge gained from global traffic studies on messaging and attention.

What makes government use of these jokes and memes notable is the officiality and authority of these accounts. Should an official voice of the government make jokes? This paper aims to measure the successes and failures of these various messaging campaigns, examine existing research on messaging and apply it to the transportation information context, and create

an evaluation criteria for best-use cases for humorous messages coming from departments of transportation across the US.

Thesis statement

While humor in traffic safety communication can increase attention and engagement, its impact on behavior is contested, and its studied efficacy varies significantly based on platform constraints, audience characteristics, and message design, requiring a strategic approach that balances attention-getting benefits against potential comprehension and persuasion limitations.

Literature Review

I. The Emergence of Humor in Traffic Safety

While humor is relatively new in the field of traffic safety, it has its roots in corporate advertising, including billboard advertising, which itself has evolved through the years. With the advent of web-based communications, limited attention spans, and the short hooks social media depends on, humor has become a tool that can quickly capture and engage the audience.

A. Background on Traffic Safety Communication Challenges

Most U.S. drivers have seen a VMS, the oft-orange calculator-text signs that display whatever message is needed for impending traffic information. Debuting on the New Jersey turnpike in the 1950s, using predetermined messages made of neon tubes before the invention of LEDs, these signs have been used globally to warn drivers of traffic pattern changes and hazards ahead (Roads and Bridges, 2011). With global population and traffic increasing, VMS signs are a key safety measure employed by departments of transportation today.

In 1993, traffic information was only disseminated in a handful of ways: local newspapers broadcasting upcoming construction events, VMS, or through monotone announcements in real-time over AM radio. That year, the National Highway Traffic Safety Administration (NHTSA), the agency within the Federal Department of Transportation tasked with motor vehicle safety standards, had experimented with rhyme-scheme public safety campaigns around seatbelt usage, beginning with the familiar "Click It or Ticket" safety encouragement in North Carolina and, in later years, the 1999 advent of "Drive Sober or Get Pulled Over."

These mnemonics, while not quite delving into the realm of humor, used basic advertising principles of rote memorization to promote safe driving. The messages, now standardized as BTS, are commonly displayed on VMS, not to warn of any immediate hazards, but to spread general and always applicable safety messages.

B. Humor in Corporate Advertising

Traditional advertising has traditionally been nontraditional; that is to say, unconventional messaging is part of the advertising ethos for over a century, as indicated in Figure 1(Kinsey & Hancock, 2008).

Irreverence in the private advertising world is not new. For the purpose of this paper, we will focus on the American advertising industry, as what is considered funny, overtly sexual, or offensive in nature varies greatly by locality and time period. For example, many European ads are considered more liberal with subjects that would be deemed taboo in the United States.

One does not have to look far from the origins of this paper to find controversial absurdism in the advertising industry. The following example is an advertisement for Rainier Beer, brewed in Seattle, Washington in 1907, depicting happy children in a traditional Germanic

maypole dance, centered around a giant bottle of beer, including the caption ‘essential to healthy growth’ (UW Libraries). While drinking attitudes over one century ago were different, it was still vernacular absurdity to depict children drinking, with facetious text promoting health.

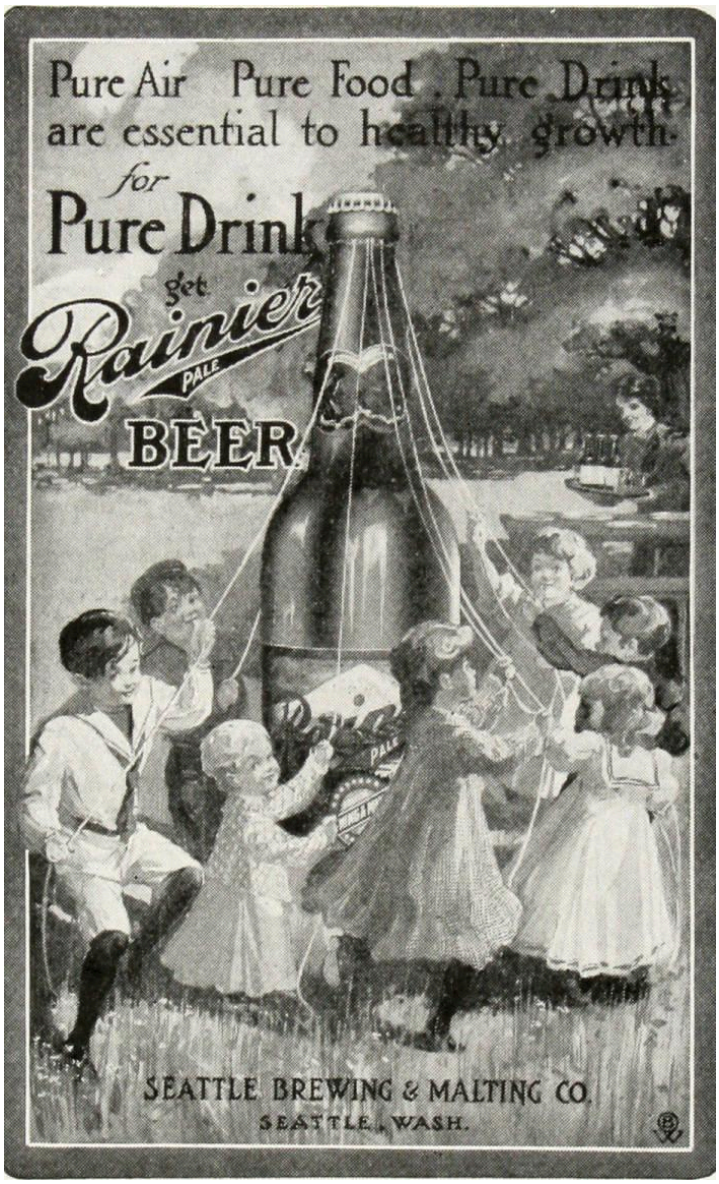

Fig 1. Kinsey & Hancock, 2008

In addition to absurdism, the humor in the ad is controversial for its time period, with the American temperance movement in full swing and the ad appearing less than two decades before prohibition became federal law.

A common place in America to find funny business is the highway-side billboard. Since the dawn of the interstate highway system billboards could serve more customers than ever, with thousands of new and repeat eyes per hour zooming by a 14-by-48 foot message of the advertiser's discretion. Many of these messages are made to shock for attention, as the average highway driver is moving at 65 miles per hour with limited time to pay attention to the messaging placed before them.

Humorous messages to grab driver's attention is an art form predating VMS. South Dakotans proudly boast their highway billboards for the classic Americana tourist trap Wall Drug that humorously greet a driver's approach along a 650 mile stretch of interstate 90, which began as an advertisement for free water 60 miles away in the 1930s. For more than 20 years, Philadelphians have been privy to the daily dose of "I hate Steven Singer" billboards that encircle the city.

Fig 2. Braithwaite Communications, 2019

The advertisements are actually for jewelry, but have garnered significantly more press and attention than a more straightforward ad campaign ever could. A more recent law firm campaign in Philadelphia features the notorious “I’m Jawn Morgan” billboards, using the colloquial Philadelphia slang “Jawn,” a noun that can be substituted as a placeholder for any noun, with roots in African American Vernacular English (AAVE), to garner attention for an injury law firm using wordplay. As such, many of these advertising campaigns have become synonymous with local culture.

Since the advent of the internet, advertising techniques have been rapidly evolving, as showin in Figure 3 (@KFC_UKI Instagram). Social media exploded in popularity in the 2010s with Facebook, Twitter, and Instagram at the forefront. New paradigms in advertising stemming from social media include the *influencer*, in which a parasocial following is developed for a person or brand through a cultivated online personality. Advertisers have used both named and anonymous influencers to create brand followings (Malodia et al., 2022). An example of a named influencer may be an established celebrity, who then promotes the brand through the trust

and following associated with their name. Meanwhile, an anonymous influencer may use a social media account directly under the brand's name, while creating a "personality" character and engaging with users. An example of this would be the Kentucky Fried Chicken of the United Kingdom and Ireland, @KFC_UKI, which has amassed a following of nearly 670,000 followers by posting trendy and erratic memes, which are frequently within the definition of *brainrot* and *shitposts*.

Fig 3. Tung Tung Tung Sahur (@KFC_UKI Instagram)

C. Public Sector Developments in the 2010s and Social Media

With the changing culture and technology of the 2010s, government agencies began experimenting with humor on VMS for public safety campaigns. A hard shift from the purely informational AM announcements, this new style of messaging began to proliferate in the age of

social media, coinciding with the established use of GPS in cars, whether dash-top style, built-in, or via smartphone, giving drivers alternative sources of real-time traffic information.

A parallel phenomenon to humor in VMS messaging is much broader than the transportation field, with the rise first of official government social media accounts, and the proceeding "meme-ification" of many of these accounts. While far from the first, a notable example is the @PATreasury Twitter account launched in 2019, an official Pennsylvania State Treasury account known for posting memes featuring Michael Scott of the hit TV Show 'The Office' and relating them to government activities (Gross, 2019). This type of meme-humor was not new to advertising campaigns, as many for-profit corporations began meme/trend-driven campaigns more or less at-pace with internet culture.

In December 2023, the Federal Highway Administration (FHWA) released a regular update to the Manual on Uniform Traffic Control Devices (MUTCD), which has dictated standard practices for signage, road surface markings, and signals on roads across the US since 1935. The update included a single paragraph strongly discouraging the use of humor on VMS boards; encouraging simple, direct, and non-confusing messaging. It was widely reported over the next couple of weeks that the FHWA had "banned" humor in VMS, which by 2024 had become an important part of some states' cultural identity. By late January 2024, an FHWA spokesperson released a clarifying statement that there was not a blanket ban in place, but strong recommendations for time and place restrictions (Safety+Health, 2024).

There is a major difference between VMS signage and social media, and that is the immediacy of message importance. VMS humor is employed as part of BTS campaigns, such as drunk driving, buckling seatbelts, or event traffic acknowledgements. Otherwise, VMS is used for straightforward immediate traffic information, such as "CRASH AHEAD."

While individual political figures have been free to joke since the beginning of the United States, federal and state governments have very rarely used comedy when speaking in an official capacity. In the past 15 years, jokes from DOTs have been used on VMS in at least 21 US states. (Shealy, et al., 2020) At least 10 states have posted memes on official social media accounts, and countless cities engage in online meme culture (Instagram, 2025).

When DOTs use these social media tactics, it is fully contemporary and within the limits of acceptability in advertising techniques that the private sector has been practicing over the past decade. The key differences are message intent and message origin. Government agencies are expected to be factual, professional, and politically neutral to all citizens they serve. DOT use of humor on highway signs and memes online is among the most salient forms of government communication in America that is presented as official expressions of humor coming directly from agencies.

Government accounts beyond DOTs have notoriously engaged in meme culture, especially since the first Trump administration, which has successfully campaigned on trolling. Notably, the New Jersey state's official Twitter account @NJGOV is known for posting joke rivalries with Pennsylvania and New York's accounts. The first voice behind @NJGOV, born in 1997, became Deputy Director of Platforms for Joe Biden's social media team from 2022-2025 after garnering positive attention through the joking attitude and memes on the New Jersey Twitter (Wildstein, 2025).

Fig 4. The Official White House Twitter Account in 2025 (@WhiteHouse X.com, 2025)

The unique aspect of DOT social media is the use of jokes to convey safety information. Many government accounts, including the White House itself, often post jokes and memes for the sake of humor and engagement. While DOT accounts seek to accomplish the same thing, the ultimate goal of DOT social media is to inform the public of immediate and upcoming transportation circumstances across the state. The humor used by DOTs is often much more

successful at spreading the underlying message to drivers and transit riders than straightforward information.

Memes and humor on DOT social media are often used for upcoming or widespread traffic events with no immediate safety implications. By using humor, DOT accounts have found significantly increased spread of information compared to plain messaging, which improves the performance of the ultimate goal of the DOT account.

II. Theoretical Frameworks for Understanding Humor in Public Safety Communication

The use of humor in public safety communication can be viewed through several different lenses. One lens is that of scientific or psychological basis: how do people respond to and process humor? Another lens is philosophy: is a message delivered by humor considered important? Another is government intent: does the use of humor encourage people to act in a way that benefits society? Science and philosophy have been found to coalesce with parallel findings. A very awesome overview of these frameworks organized from foundational cognition to application is found in the appendix.

A. Scientific Models: Communication Theories Relevant to Traffic Safety

Understanding how traffic safety messages influence driver behavior requires examining the complex cognitive processes that occur between initial message exposure and behavioral change. The goal of a traffic safety message is to journey into a driver's mind beginning with the inception of noticing it, and ending with retaining and adhering to it. the This section presents theoretical foundations beginning with how drivers notice and process messages, then exploring

how emotional engagement shapes responses, and finally examining why attention doesn't automatically translate to safer driving.

Before any message can influence behavior, it must first capture attention. Social Learning Theory (SLT) emphasizes attention as a necessary first step for individuals to learn and imitate modeled behaviors observed in media (Oliver et al. 2019). If a message isn't perceived with any form of attention, it won't be perceived at all. The competition among ideas for our finite individual and collective attention is known as the attention economy in advertising and psychology (Weng et al. 2012).

But capturing attention is merely the beginning of the journey. The Limited Capacity Model of Mediated Message Processing (LC4MP) guides our understanding of what happens next. This model posits that individuals have limited cognitive resources when processing media messages. These limited resources must be distributed among fundamental processing tasks: attention, encoding, storage, and retrieval of information. The allocation of these cognitive resources is influenced by the message's characteristics, signal properties, and motivational relevance (Oliver et al. 2019). If a message is deemed worthy of further cognitive effort, it moves forward.

Humor's foundation rests on Incongruity Theory, which posits that humor efficacy derives from the cognitive processing required to resolve unexpected juxtapositions between familiar contexts and surprising elements (Weinberger & Gulas, 1992). In traffic safety applications, this manifests as messages that combine serious safety imperatives with playful language, cultural touchstones, or linguistic creativity that violates audience expectations about government communication norms. This violation creates a moment of cognitive surprise that demands attention and processing.

Once attention is captured, the brain must decide how to process the information with it's limited resources. Dual-process models, the Elaboration Likelihood Model (ELM) and the Heuristic-Systematic Model (HSM), explain how attention and cognitive effort lead to persuasion and information processing (Oliver et al. 2019).

The ELM describes two alternative routes to attitude change. The Central/Systematic Route is characterized by careful, analytical thought (elaboration). Higher motivation and ability to process information lead to this route, resulting in more enduring attitude change. The ELM's multiple roles postulate suggests that any variable can influence the degree of elaboration, act as a peripheral cue, or affect the valence of elaboration, highlighting message processing complexity. The Peripheral/Heuristic Route involves superficial thinking or reliance on simple cues, a low-resource route the brain uses to process information quickly with lower cognitive effort.

For traffic safety messaging, this creates a strategic tension: do humorous messages encourage drivers to think carefully about safety behaviors (central route), or do they provide a momentary entertainment that's processed superficially (peripheral route)?

Messages don't exist in an emotional vacuum. Protection Motivation Theory (PMT) offers a model for fear appeal efficacy in attitude change through perceived threat severity, probability of occurrence (perceived susceptibility), and perceived efficacy of response (ibid.). The Extended Parallel Process Model (EPPM) expands this with a fourth vector: perceived self-efficacy of carrying out that response. EPPM predicts that when threat appraisals are stronger than efficacy appraisals, individuals will engage in maladaptive behaviors like source denigration and rationalization, which lead to message discounting instead of acceptance. As driving is inherently a defensive action, fear appeals are often used in traffic safety

communications and are often grouped in with humor as non-traditional messages in BTS campaigns

But what about positive emotional responses? Affective Disposition Theory (ADT) explains how individuals derive enjoyment from media narratives based on their affective dispositions (feelings) towards media characters and the subsequent outcomes these characters experience (ibid.). Viewers generally enjoy seeing good things happen to characters they like, and bad things happen to characters they dislike. Viewers will also be more susceptable to accept messages from characters they enjoy or identify with. For DOT social media campaigns that tell stories or feature characters, these emotional connections can enhance engagement and message retention.

The Entertainment Overcoming Resistance Model (EORM) builds on the ELM and ADT to explain how narrative storytelling reduces message resistance via masking persuasive intent, fostering parasocial interaction with characters, and facilitating identification with characters experiencing consequences (Moyer-Gusé & Nabi, 2010). While EORM was developed studying entertainment-education TV programs on sensitive topics like teen pregnancy, its mechanisms apply to traffic safety: masking persuasive intent is applicable for humor in both VMS and social media, while parasocial interaction and character identification are most applicable to more elaborate social media content, with characters such as Greg the Geoduck (see Social Media Case Study C).

In the social media context, Warranting Theory explains how informational authenticity is verified through the social dynamic of likes and shares by like-minded individuals (Oliver et al., 2019). Similar to ADT, this model describes how positive disposition towards personal connections strengthens belief in the media messages that those connections have signaled

appreciation for, amplifying message reach and perceived credibility. This can apply to sentiments towards humorous VMS through lenses such as local news comments online, although it does not apply to unfamiliar messages when encountered on the road.

Despite these sophisticated frameworks for understanding how messages capture attention and engage emotions, a fundamental paradox emerges in humor's efficacy for persuasive communication: humor successfully captures attention but often fails to convert that attention into persuasive outcomes, what researchers call the message discounting phenomenon (Nabit et al., 2007).

Research demonstrates that humorous messages consistently attract more attention than non-humorous messages, enhance source appreciation and perceived credibility, increase processing depth and motivation to engage with content, and reduce counterargument through entertainment-based processing. Yet despite these seemingly positive effects, humorous messages are generally no more persuasive than serious messages in changing attitudes or behaviors (Oliver et al., 2019).

Nabi et al. (2007) identify message discounting as the critical factor creating this gap, where audiences simultaneously process humorous messages more deeply due to entertainment value while discounting the message as "just a joke" and irrelevant to serious decision-making. This creates two counteracting forces: enhanced (but not critical) message processing weighed against message discounting that undermines persuasive impact.

This gap has profound implications for transportation agencies. It creates an attention trap where agencies may be drawn to humor because it demonstrably increases engagement metrics such as likes, shares, views, and offline responses like news articles about clever VMS messages, but this engagement doesn't necessarily translate to safer driving behaviors. The research reveals

a comprehension paradox: humor can make safety messages more memorable and easier to process, yet audiences may simultaneously dismiss them as entertainment rather than actionable safety guidance.

The discounting effect may be particularly problematic for government agencies that need to maintain institutional credibility for safety messaging to be effective. How audience factors influence message reception, including demographics, cultural lens, and individual risk tolerance, becomes critical in determining whether message discounting is initiated or overcome.

However, the research also reveals grounds for optimism. This gap may not be permanent. Under certain conditions, particularly when humorous messages are attributed to credible, liked sources, a sleeper effect can occur where persuasive impact actually increases over time as the discounting cue (humor) fades while the substantive message content remains in memory (Nabit et al., 2007; Oliver et al., 2019; Moyer-Gusé and Nabi (2010). This suggests that the gap between attention and persuasion in humorous safety communication may be bridgeable through strategic message design that accounts for both immediate discounting effects and longer-term persuasive potential.

Understanding these theoretical frameworks, from initial attention capture through cognitive processing routes, emotional engagement, and either acceptance or discounting, provides the foundation for developing traffic safety messaging strategies that maximize humor's attention-grabbing benefits while minimizing its persuasive limitations.

B. Audience Factors

1. Demographic considerations

a. Age, gender, and education differences

In 2019, Weinberger and Gulas conducted a literature review of humor research in advertising for the International Journal of Advertising. The review found growing support for the use of humor among practitioners (Weinberger & Gulas, 2019). Studies from across the timeframe examined concurred that humor was best suited to audiences that were younger, male, and better educated. However, Hornik, Ofir, and Rachamim (2016) conclude from their large meta-analysis that overall, women respond better to humor than men. This result is in contrast to the majority of individual studies from prior reviews and must be tempered by a number of factors including the type of humor being tested. Across old and new studies, education correlates positively with appreciation of humor.

b. Cultural and regional variations in humor appreciation

There are both universal and culturally specific aspects to humor. One universal quality in humor is incongruity, or the use of something unexpected. Pornpitakpan and Tan (2000) examined the efficacy of incongruity humor. Their results support the conclusion drawn by Raskin (1985) and Alden, Hoyer, and Lee (1993) that Incongruity Theory can be applied globally and that cognitive models can explain humor effects (ibid.).

Lee and Lim (2008) examined the interaction between cultural orientation in China at an individual level using Hofstede's framework. Hofstede's framework is a tool for understanding how cultural values shape behavior in societies and organisations, primarily focusing on individualism versus collectivism as a widely studied dimension to explain cultural variation.

China, Korea, and many other east Asian countries are considered collectivist societies, which emphasize achieving in-group goals over personal ones. In contrast, the U.S. and western societies are considered individualistic, where personal goals are valued more highly than group goals. In Korea, citizens reported greater support for the censorship of harmful messages

compared to Americans, and demonstrated a stronger preference for entertainment messages that elicit contradictory emotions, such as laughing and crying, than U.S. viewers (Lee & Lim, 2008).

Combining these findings, audiences from collectivist societies may be more receptive to humorous messages than the average U.S.-born driver, while they may also be less receptive if those messages are controversial, leading to an ideal approach with light-hearted, inoffensive humor.

Lee and Lim, in agreement with a finding from Weinberger and Gulas from 1992, suggest that the efficacy of incongruity resolution humor depends on the recipient's socialized orientation towards uncertainty avoidance, and the efficacy of arousal-safety humor depends on the cultural group's tolerance for uncertainty and/or its individualist or collectivist orientations.

2. Driver characteristics and risk profiles

An Australian study focused on mobile phone safety campaigns from 2024 was composed of 350 drivers, of whom 200 admitted to cell phone use while driving in some capacity (Stefanidis, et al. 2024). Drivers were sorted into groups based on self-perception; 32% showed comparative optimism (believed their risk was lower than similar drivers), 25% had similar judgments (believed their risk was about the same), and 43% exhibited comparative pessimism (believed their risk was higher than similar drivers). Drivers with comparative optimism (who see themselves as lower risk) found all safety campaigns significantly less relevant compared to those with similar judgments or comparative pessimism. All three groups responded similarly to injury-based, sanction-based, and humor campaigns, but drivers who perceive themselves as lower risk (comparative optimism group) are the group who find all types of safety messages less personally relevant, believe they will be less influenced by campaigns,

and may be less likely to change their behavior. The authors concluded that more personally relevant messages were needed to address this challenge.

Comparative optimism creates a dangerous disconnect where drivers may agree with safety campaign messages intellectually but don't perceive the information as personally relevant. This means safety campaigns may be subsequently diluted for this group. For example, drivers who speed more frequently actually recognized they were at increased crash risk, but these same drivers still showed comparative optimism about their driving ability. The bias makes people dismiss the importance of safety messages embedded in campaigns**.**

For humor implications, humor was found to be just as effective as other messaging types. Social media platforms are the best place to address personally relevant messages as they can be audience specific.

C. Philosophical Perspective: Ngai's "Theory of the Gimmick" Applied to Traffic Safety

For a critical look at humor as a method of communication, ‘Theory of the Gimmick’ (2020), by University of Chicago professor and cultural theorist Sianne Ngai, provides a philosophical perspective on gimmicks and humor. Ngai takes a harsh lens to gimmicks, including written humor and visual gags, as they relate to life in a capitalist society, the type of society in which American DOTs operate.

Much of the verbiage used on VMS, and many of the types of memes shared by DOTs would qualify as groan-worthy. DOTs often employ repetitive, simple jokes to maximize understanding. So, do these jokes hold merit when delivering important information to inform the populace?

1. Humor as an attention-getting device vs. substantive communication

Driving puts humans in a defensive frame of mind, in which we increase vigilance and risk assessment. According to Ngai (2020), the gimmick “arrests attention,” but only “in the process to relax the demands put on it.” It triggers initial alertness followed by a "slackening" as the form is perceived as disappointing. This discourages paying attention to the suspicion it activates. A driver may therefore be more relaxed and receptive to a humorous message than to a factual message, which would explain why a Virginia DOT study concluded that humorous messages were significantly more understood than negative factual messages on VMS (Shealy et al., 2020). For both memes and VMS, Ngai presents evaluating gimmicks as a public activity.

> “Clear’s identification with the dubious “magic” at its center underscores that evaluating gimmicks is a public activity people enjoy, unleashing their critical and comedic capacities.” (Ngai, 2020)

By proving one’s own understanding of a gimmick such as a joke, reference, or wordplay, a person can develop a personal sense of accomplishment. Personal attachment will strengthen the bond to the message, and allow for it to reside with the audience.

By understanding the gimmick, one becomes part of an in-group, which can foster a sense of community. This is particularly important to the formation of online groups like New Urbanist Memes for Transit Oriented Teens (NUMTOT), which generate community through mutual understanding. NUMTOT is an unorganized Gen-Z centric group for sharing transit related memes across the world, with many locally-based subgroups. In the case of “USE YA BLINKAH,” perhaps the most famous humorous BTS campaign in the U.S., Ngai posits the people of Massachusetts felt a strengthened community bond through the recognition and public canonization of their accent.

The lower the barrier to understanding the joke, the broader the audience reach with the benefits of personal attachment and identity formation without requiring an increase in audience specificity.

In summary, Ngai presents humor and comedy not merely as ways for gimmicks to grab attention without substance. Instead, the humor is often the medium through which the gimmick's compromised aesthetic, its relation to labor and value, and its inherent contradictions are perceived, judged, and communicated. The humor arises from the ambivalence, the discrepancy between promise and performance, and the social dynamic of evaluation that the gimmick provokes. It is a complex, irritating, yet attractive aspect of the gimmick's form that contributes to, rather than simply distracts from, a critical engagement with it.

2. Labor, value, and timing considerations in message processing

Ngai goes on to discuss the dilemma faced by the FHWA when deciding to restrain the use of humor.

> "These texts suggest that when the gimmick takes the form of a labor saving device, in particular, it is closely attended by its shadow: the becoming 'superfluous' of value productive labor and rise of more uncertainly productive kinds."

> "The gimmick is thus a judgment on and about judgment. It is also, uniquely, comprised of a multiplicity of interlacing judgments: "works too hard" / "works too little"; "technologically outdated" / "too advanced"; "cheap" / "overpriced." These measurements of excess and deficiency seem economic as opposed to aesthetic." (Ngai, 2020)

In essence, using jokes to try to ease the audience into receiving factual or negative messages risks the information becoming discounted as superfluous and discrediting the agency. This philosophical conclusion aligns with the cognitive theories outlined in Oliver et al.

Driving has multiple measurable economic costs involved: the cost of gas, the cost of vehicle wear-and-tear, the cost of mental energy, and the cost of time. According to Ngai, a DOT

would want to avoid the “cheapening” of a message as an insult to the labor value of the audience. However, there is a happy medium in which the delight of a humorous message, the satisfaction of understanding, and the sense of in-grouping outweigh the perceived lower value of a joke, instead rewarding the audience during a time of considerable costs. This explains why, from comment sections on local news outlets all over the country, to Reddit and Twitter, the outsized response to the FHWA’s decision was negative, and a general sentiment that the government is taking a small joy away from the misery of the daily commute.

3. Ambivalence in audience reception

According to Ngai, ambivalent perceptions to jokes coming from a DOT may increase affective attachment to them, thereby bringing the underlying message closer to the audience.

> “To call something cute can be either to admire or express contempt for it— and usually both…This uncertainty does not mean that our aesthetic experiences feel weak. As we learn from Freud’s theory of ambivalence and the thinkers who treat it seriously, the copresence of negative and positive effects strengthens the overall intensity of our attachment to an object.” (Ngai, 2020)

Authority subversion is the deliberate adoption of casual, irreverent, or unexpected tones that contrast with traditional government communication styles to create attention through violated expectations. Examples include "We'll be blunt: Don't drive high" (using cannabis terminology for anti-impaired driving messages) and "Don't make us write you a ticket" (adopting a parental rather than authoritative tone). These messages risk undermining institutional credibility while potentially increasing audience receptivity through perceived approachability and authenticity.

Ngai's ultimate sentiment is anti-gimmick as a reflection of how capitalism impacts human behavior. However, not all humor qualifies as a gimmick, and the inherent qualities a gimmick possesses can aid in their use as a tool for government communication as we exist in a capitalist society.

D. Institutional Perspectives

The deployment of humor in government traffic safety communications fundamentally alters the traditional relationship between transportation authorities and the public, creating complex dynamics that can either enhance or undermine institutional efficacy depending on implementation quality and audience reception. Transportation departments operate within established frameworks of governmental authority that have historically relied on serious, directive communication styles to convey the gravity of safety imperatives and the legitimacy of enforcement mechanisms. The introduction of humor into this context represents a calculated risk that must balance potential engagement benefits against the possibility of diminished authority perception and reduced message credibility.

1. DOT motivations for adopting humor

DOT interest in humor adoption stems from positive results. While it requires empirical studies to quantify direct behavior changes due to signage, it is easy to gauge public sentiment. Humorous VMS messages across the country have been met with local news articles and merchandise campaigns. For DOT social media managers, there is a clear tie to increased engagement and use of humor. Displaying a personality through social media fosters a community following while allowing better information spread.

a. "Softening" authority through humor

A surge in research on humor in government communications emerged during the COVID-19 pandemic, with the timing of the pandemic coming after the introduction of humor on government social media, as well as the pandemic being heavily concentrating public activity on the internet during social distancing. While this research is anchored in public health outcomes, it has implications for DOTs, as public safety outcomes have many similar characteristics.

A study by Matwick and Matwick (2022) from Nanyang Technological University in Singapore examined the history of its government using humor in public health campaigns dating back to the 1960s. Singapore is a unique case study due to its rapid modernization over the past century, owing much to the ability of the government to communicate with its population during times of change. Relating to a public campaign to increase the country's use of toilets:

> "Humor is shown throughout to serve as a powerful discursive strategy to educate the public and make the content relatable, while addressing the taboo topic of bathroom business." (Matwick & Matwick, 2022)

While DOT signs do not cover taboo subjects, drivers interpret them in a defensive mindframe. This softening alleviates the "taboo" of delivering safety information to a driver that must then take a laborious action upon themselves in response.

Often, traffic safety information is bad news for drivers. Nobody wants to hear that their commute home from work is going to get 20 minutes longer next week. But displaying such information as a silly, crudely drawn Microsoft Paint map, as the Washington State DOT did in Figs. 7 and 8, can deliver joy to soften the blow. Matwick and Matwick conclude that humor in these government-sponsored comics makes the instruction less direct and aggressive, reducing

the perception of strict authority and encouraging citizens to adopt desired behaviors through relatability, reduced social distance, and a sense of voluntary participation rather than coercion.

b. Building relatability and decreasing social distance

Singapore's bathroom campaign featured extensive use of cartoon posters, put on display in public streets. These posters are akin to the use of memes on social media today, due to the visual gag structure. These visual gags exhibit what is known as "visual-verbal synthetic personalization" (Matwick & Matwick, 2022). This involves using illustrated characters and dialogue to create an apparent familiarity and reduce social distance between the government message and the individual viewer. This technique is akin to practices observed in corporate media and online contexts to prompt social action by creating a sense of connection with the everyday person. While Singapore conducted this campaign in the 1960s, it found similar conclusions to the EORM study years later.

While many memes posted on DOT social media do not often utilize human characters, they often utilize repeated formats of popular memes unrelated to safety or any onerous message. Sometimes, DOTs will employ cartoons or animals as recurring characters, such as cats with hardhats. DOT social media managers form a tone of voice as an influencer, that is in itself a character. The bubble of familiarity is formed in following a trend of memes generally intended to amuse and delight.

c. Addressing difficult behaviors through indirect approaches

The use of humor is framed within Foucalt's concept of "governmentality," where the government seeks to influence behavior by encouraging individuals to follow social norms through their own governance (Matwick & Matwick, 2022). This is contrasted with a direct show of "sovereign power." While "USE YAH BLINKAH" is a direct command from the government

to the driver, the use of humor puts the ultimate power in the hands of the person. It serves as a reminder of the government's stance, with a tone of friendly suggestion, allowing the audience to ultimately make the decision for themselves.

The mentality of having formed a decision and coming to one's own conclusion increases personal attachment to the idea, which can increase retention. Humor can also be framed as "collective invitation" (e.g., "Let's make this happen," or using the pronoun "we") rather than strict commands. The government is joking with you, not at you. This "solidarity move" encourages mutual obligations and self-governance (ibid.).

2. FHWA motivation and regulatory considerations

Due to conflicting study results on the efficacy of humor on VMS, a safety-focused organization would err on the side of caution and discourage any safety risks. Some studies even warn of fatality increase due to humor, hence the FHWA announcing its guidance against humor on VMS. Unlike the Pennsylvania treasury, communications on and around highways carry the risk of mortal danger. However, there are clear benefits to humor that have been linked in the research, and behavioral impacts require further studies. For now, the FHWA will allow humorous VMS to continue, and studies must continue as well.

3. Balancing innovation and standardization

Oliver et al. (2019) states that researchers in media effects face an ongoing struggle to develop "consistent, clear, and valid" conceptualizations when studying rapidly evolving technologies, which are described as "blurry, constantly moving targets." This creates a perpetual threat of irrelevance and obsolescence for theoretical frameworks.

IV. Empirical Research on Humor in Variable Message Signs

The efficacy of humorous Variable Message Signs in changing driver behavior remains one of the most contentious questions in contemporary traffic safety research. While theoretical models suggest humor can enhance attention and message processing, translating these cognitive effects into measurable behavioral outcomes presents significant methodological and practical challenges. This section examines the empirical evidence and notable contradictions surrounding VMS efficacy, from real-world behavioral tracking studies that question whether these messages produce any meaningful change in driver actions, to laboratory research revealing important demographic variations in how different populations process humorous content.

The evidence presents a complex and sometimes contradictory picture. On one hand, neurocognitive research demonstrates that humorous messages activate brain regions associated with emotional processing and comprehension, with miscomprehension rates as low as 2.67% for certain message types (Shealy et al., 2020). On the other hand, vehicle-by-vehicle tracking studies show that up to 87.5% of VMS messages fail to induce desired behavioral changes in real-world driving contexts (Basso et al., 2021). Yet another study showed VMS is still relevant in the age of cell phones (Mwende et al., 2024). These conflicting findings are further complicated by methodological variations across studies: from laptop-based simulations, to active driving environments, to neuroimaging without simulation, each capturing different aspects of the driver experience but yielding divergent conclusions about humor's efficacy.

Adding another layer of complexity are fundamental constraints in how drivers process information while operating vehicles. Early research on VMS legibility revealed that approximately 25% of drivers are weak readers who struggle with sign comprehension, while all drivers face severe time constraints, typically just 8 seconds to read and respond to messages at

highway speeds (Proffitt and Wade, 1998). These cognitive processing limitations raise critical questions about whether humorous messages, which may require additional mental effort to decode wordplay or cultural references, can effectively reach diverse driver populations under real-world conditions. Understanding these empirical findings and their contradictions is essential for developing evidence-based policies around non-traditional traffic safety messaging.

A. Traditional VMS Efficacy

The behavioral outcomes of traditional VMS messages vary. For example, drivers are less likely to obey messages related to road works compared to accidents or stopped vehicles. The traveling public generally views the display of BTS messages on VMS as useful and valuable, and most drivers support them as good reminders. However, drivers prioritize real-time information about traffic conditions over BTS (Ullman et al., 2022).

B. Literacy and Cognitive Processing Capabilities

1. Impact on weak readers

In research for VDOT, Proffitt and Wade (1998) found that approximately 25% of Virginians over age 16 are weak readers who will likely encounter problems reading VMS. Additionally, about 8% of participants had profound difficulty reading. This is significant because reading literacy is not required to obtain a driver's license.

2. Processing time constraints in driving environment

This early VDOT study reveals important data about reading comprehension. Average adults read about 250 words per minute (4 words per second) during normal reading, and each word takes approximately 250 milliseconds to read (Proffitt and Wade, 1998). Abbreviations are particularly problematic for comprehension; they take 800-1000 milliseconds to read, which is 3-4 times slower than the normal 250 milliseconds per word. All VMS, humorous or not, should

avoid abbreviations (ibid). Information must be remembered until it becomes relevant for action, so by simplifying the message and reducing cognitive load, retention is increased.

3. Implications for message design

In 2022, the Behavioral Traffic Safety Cooperative Research Program (BTSCRP) conducted a test exclusively on two-phase BTS messages in Ullman et al. While VDOT's cognitive-ergonomic guidelines are most applicable to directional signage, the BTSCRP expands on these foundations and adds new guidelines, including instructions on proper use of two-phase messages. An additional guideline added is a conclusion found across multiple studies including Hall and Madsen (2022) for TXDOT, and Shealy et al. (2020), stating that displaying negative statistics on VMS are to be avoided. Together, these findings make up a list of cognitive-ergonomic practices for VMS message design regardless of traditional or non-traditional messaging content. Many of these findings have been incorporated as official guidelines by the FHWA. These guidelines are specifically related to empirical conclusions about basic legibility and comprehensibility of any form of VMS messaging, with conclusions on humor's effects omitted. The combined conclusions across 24 years of research are synthesized as follows:

Table 1. Cognitive Ergonomic Standards

VDOT 1998 (Proffitt and Wade)	BTSCRP 2022 (Ullman et al.)
Avoid abbreviations	
Provide context through symbols - Use arrows and other familiar symbols to give background information about what the message concerns (like lane changes)	Messages should not include telephone numbers, website URLs, or hashtags
Standardize messages - Use the same words and phrases consistently so weak readers become familiar with common messages through repetition	Messages should not include scrolling lines, animation, flashing displays, punctuation, or graphic symbols or icons not included in the MUTCD
Keep messages short and distinct - Avoid messages with opposite meanings (like "Right lane closed - Merge left") that require holding multiple pieces of information in memory	Each phase of a two-phase VMS message should be understandable by itself regardless of the order in which the phases are viewed
Maintain sign legibility - Ensure VMSs are clean and functioning properly, as degraded signs disproportionately affect weak readers	A BTS message thought or phrase should not be split between two VMS phases.
Use mixed-case letters when possible - Though most VMS technology limitations prevent this	Each line of a message should be centered on VMS
Signal words such as CAUTION are ineffective, messages should be direct in instruction	Each new thought in the message should start on a new line on VMS.
TXDOT 2022 (Hall and Madsen), VDOT 2020 (Shealy et al.)	BTS messages be limited to no more than 16 words total, and only 11 words or fewer in high-workload environments
Do not present negative statistics on VMS	Two-phase BTS messages should be related to one topic

These guidelines do not inherently conflict with the use of humor and can serve to enhance legibility and comprehension for any form of VMS communication. The combined findings serve as a minimum threshold for VMS comprehensibility that a message must adhere to with or without humor. An overload of VMS information, especially on graphical signs, can decrease legibility distance and comprehension accuracy.

C. Measuring Real-World Impact

Across multiple studies, there is little empirical evidence that directly measures the efficacy of VMS in changing behavior in real-world scenarios. While certain messages are perceived as effective, or generate positive public feedback, this often does not translate into actual changes in driver behavior or safety. One such attempt at gathering this real-world data was done in Chile, using instruments called loop detectors, which are non-intrusive monitoring devices that collect traffic data such as number of vehicles and travel speed, thus avoiding biases related to changes in driver behavior when they know they are being observed.

Basso et al. (2021) presents a novel vehicle-by-vehicle (VBV) approach to assess the real-world efficacy of VMS on driving behavior, using comprehensive data from automatic vehicle identification (AVI) technology on a Chilean urban highway. Unlike previous research that relied on simulated environments, surveys, or aggregated traffic data, this study tracked individual vehicles through their license plates to examine two specific behaviors: speed reduction in response to "stopped vehicle" warnings and lane changes in response to lane obstruction messages. The researchers analyzed 341 lane change messages and 8 speed reduction messages over six months, comparing driver behavior on message days versus control days.

The findings challenge much of the existing literature that suggests VMS are effective tools for influencing driver behavior, including studies for VDOT, the Minnesota DOT, Kansas

DOT, and BTSCRP (Shealy et al., 2020., Harder et al., 2008, Kondyli et al., 2021, Ullman et al., 2022). For speed reduction messages, Basso et al. finds 87.5% of studied messages failed to induce the desired behavioral change, with statistical significance found in only one of eight cases. Lane change messages performed somewhat better but still showed limited efficacy, with only 28.15% of messages producing statistically significant behavioral changes.

The study revealed important differences by vehicle type: heavy vehicle drivers and low-mileage drivers were more likely to follow lane change messages, while lightweight vehicles like motorcycle drivers showed virtually no response to VMS instructions. The researchers attribute these disappointing results to their more rigorous methodology that tracks individual vehicle behavior rather than relying on aggregate data, which can mask the reality that while some drivers respond to messages, the overall population-level impact remains minimal. This suggests that current VMS strategies may be far less effective than previously believed and highlights the need for alternative approaches to traffic safety communication.

An external validity issue with this study is that it was only conducted on a single highway in Chile, which has cultural specificity not applicable to American contexts, as well as regional contexts within Chile that may not be accounted for. One such context is Chile's significantly more collectivist attitude than the United States, scoring 23 on Hofstede's Individuality (IDV) index, compared to America's 91 on a 0-100 scale with 100 being the most individualist (Hofstedes's Globe, 2025). The efficacy of VMS may vary significantly across different countries, cultures, and highway systems, limiting the generalizability of these findings to other contexts.

The study only measured two specific behaviors, speed reduction and lane changes, and cannot speak to other potential VMS impacts such as increased alertness, full route diversion, or

longer-term safety benefits from BTS that may occur beyond the immediate behavioral changes of instructional messaging.

D. Defining Non-Traditional Safety Messages

Non-traditional safety messages used in BTS campaigns represent a fundamental departure from the direct, instructional communication strategies that have dominated traffic safety messaging since the inception of modern highway systems. While conventional traffic safety messages follow standardized formats emphasizing directional commands ("USE ALT ROUTE," "REDUCE SPEED") or factual warnings ("CONSTRUCTION AHEAD"), non-traditional messages deliberately employ qualities such as humor, unconventional linguistic structures, cultural references, and rhetorical devices to capture attention and enhance memorability through cognitive surprise and emotional engagement.

Shealy et al. focused on non-traditional messaging for BTS campaigns, and created the most robust categorization system for non-traditional messaging. Categorizing messages can be challenging, as it is an attempt to quantitatively actualize abstraction. Many of these messages overlap in categories or don't fit one box neatly. For the study, typologies were created, and then condensed for empirical purposes. For example, intended behaviors like speeding, aggressive driving, and tailgating are grouped into "general aggressive driving" during testing. Similarly, many themes such as reference to books, movies, songs, and TV were grouped under pop culture. Holidays and sports remain separated from general pop culture as they are temporal.

In total, each message is classified by all three overarching categories: Intended Behavior, Emotional Response, and Theme, and tagged by one of each of those categories' corresponding subcategories. Initially devised of 1,108 unique and real messages collected from

21 U.S. states, 80 messages were selected to be shown to participants, and they are broken down as follows:

Table 2: Message Typology Classification Matrix (Shealy et al., 2020)

Intended Behavior				
General safe driving	Seat belt use	Impaired/drowsy driving	Aggressive driving	Distracted driving
Emotional Response				
Humor		Negative Emotion		Emotionless
Message Theme				

Pop Culture	Wordplay/Rhymes	Holiday/Seasonal	Sports	Statistics	Sayings	Command	No theme

1. Intended Behavior (Target Behavior)

Intended behaviors were narrowed to five empirical subcategories: general safe driving, driving without a seat belt, impaired and drowsy driving, general aggressive driving, and distracted driving. Seat belts were separated from other safe driving behaviors due to frequency, while impaired and distracted driving are negative risky behaviors separate from aggressive behaviors.

2. Intended Emotional Response

Emotional responses were separated into just three subcategories: humor, negative emotion (e.g., fear, threat, sadness), and emotionless (non-emotional appeal messages).

3. Message theme

Empirical testing for themes was divided into eight subcategories: pop culture, wordplay and rhymes, holiday/seasonal, sports, commands, statistics, sayings, and no theme. Holidays, sports, commands, and statistics are self-explanatory, and 'no theme' messages covered non-commanding statements such as "NO TEXT IS WORTH A LIFE" (Distracted Driving, Negative, No Theme) and "IT'S OK TO BE A SLOW POKE" (General Aggressive Driving, Humor, No Theme).

Pop culture references offer powerful engagement mechanisms through shared cultural experiences but require sophisticated understanding of audience demographics, cultural currency, and reference lifespan. Examples include seasonal references to popular entertainment ("WINTER IS COMING, DRIVE LIKE IT" – HBO's 'Game of Thrones'), technology integration ("YOUR UBER RATING IS 5 STARS, KEEP YOUR DRIVING RATING THERE TOO" – Uber App), and social media terminology adaptation ("DON'T LET FOMO LEAD TO NOMO" – Fear Of Missing Out lead to No More You). The primary challenge involves cultural reference accessibility across diverse populations and temporal relevance decay as popular culture evolves rapidly. References that resonate powerfully with target demographics may simultaneously exclude others, creating potential equity concerns that require careful audience analysis and community input during development phases.

Wordplay represents the most technically sophisticated category of humorous traffic safety messaging, employing various forms of linguistic manipulation including puns, double entendres, semantic ambiguity, and phonetic similarities to create cognitive engagement through language-based surprise. These messages rely on phonetic patterns and semantic associations to create cognitive stickiness while maintaining clear behavioral directives. The efficacy of

wordplay depends on what psycholinguistic research terms “semantic processing fluency,” the cognitive pleasure derived from successfully resolving linguistic puzzles. Successful examples include "DON'T LEAF SAFETY TO CHANCE" during autumn campaigns, "ICE TO MEET YOU, BUT SLOW DOWN" for winter driving, and "DONUT TEXT AND DRIVE" combining food imagery with safety imperatives. However, wordplay presents significant risks for comprehension, particularly among populations with limited English proficiency or varying educational backgrounds, as understanding requires rapid semantic processing that may interfere with the primary safety message (Proffit and Wade, 1998).

Rhyme schemes provide cognitive scaffolding that enhances memory retention and recall through what researchers term "phonological loop advantage," the brain's tendency to retain rhythmic and rhyming information more effectively than prose. Classic examples include "CLICK IT OR TICKET," "ARRIVE ALIVE, DON'T TEXT AND DRIVE," and "DON'T DRINK AND DRIVE, STAY ALIVE." Neurological research demonstrates that rhyming activates both language processing centers and musical pattern recognition areas, creating dual encoding pathways that improve long-term retention. The simplicity of rhyming reduces cognitive load compared to complex wordplay, making these messages more accessible across educational and linguistic backgrounds (Shealy et al., 2020). However, the constraint of maintaining rhyme schemes can compromise message precision or force awkward phrasing that reduces overall efficacy, requiring careful balance between phonetic appeal and semantic clarity in message development processes.

“Sayings,” which are composed of local dialect integration, create cultural authenticity and community identity reinforcement, but demands careful consideration of inclusivity and comprehension concerns. Massachusetts' "USE YAH BLINKAH" campaign became popular

because it reflected genuine regional pronunciation patterns while maintaining clear safety messaging, creating cultural pride and community ownership of the safety message. Similarly, the Texas DOT's occasional use of "Y'ALL BUCKLE UP" leverages regional linguistic identity to enhance message relatability.

Dialect-based messaging risks excluding recent immigrants, temporary residents, or cultural outsiders while potentially reinforcing regional stereotypes. Research indicates dialect efficacy correlates strongly with audience familiarity and positive associations with the referenced culture, suggesting pre-testing with diverse community representatives is essential for avoiding unintended alienation or offense (Ullman et al. 2022).

E. Cognitive Activation and Attention Using Humor

1. Analysis of neurocognitive responses to humorous VMS

Shealy et al. is solely dedicated to studying the efficacy of non-traditional messaging via VMS, unlike previous studies that mixed traditional and non-traditional messaging. The experiment comprised 300 participants, brain scanning technology, and surveys.

Cognitive response to 80 selected messages was measured using Functional Near-Infrared Spectroscopy, or fNIRS, which records a change in oxygenated blood in the brain. Participants wore the scanners as a cap and were free to move around while wearing them, which reduced extraneous factors that might affect how participants felt during the experiment. An increase in oxygenated blood in the brain indicates increased cognitive activity.

An important piece of the survey design is that no participants were asked to evaluate the efficacy of the messaging on themselves, rather to imagine how effective it would be for other drivers. This method serves to reduce the bias of the comparative judgements found by Cauberghe et al. (2009), similarly treated in Stefanidis, et al (2024). As stated in Shealy et al.:

> A common trait among these prior campaign studies, including about gender and age, is the use of surveys and interviews to measure perceptions of efficacy (Cauberghe, De Pelsmacker, Janssens, and Dens, 2009; Dun and Ali, 2018; Glendon et al., 2018; Glendon and Walker, 2013; Lewis, Watson, and White, 2010). A limitation of surveys and interviews is how drivers perceive themselves may not align with actual performance or behavior change. For example, drivers generally report in surveys that campaigns are not effective for themselves but are effective for other drivers (Cauberghe et al., 2009; Jeihani and Ardeshiri, 2013). One approach to overcome this limitation is through empirical studies observing behavior or performance with and without the presence of a stimuli. However, empirical studies also come with limitations: sample size (Gwyther and Holland, 2012; Hill Corey, Elefteriadou Lily, and Kondyli Alexandra, 2015), recruitment of diverse drivers (Glendon and Walker, 2013; Harbeck, Glendon, and Hine, 2018), and the time to complete this type of study (Harms, Dijksterhuis, Jelijs, de Waard, and Brookhuis, 2018). Generally, observational studies are also limited to one instance of observation and may lack generalizability (Dun and Ali, 2018). Confounding variables like car speed, type of roadway, time of day, car type, and the presence of surrounding vehicles can also influence performance and behavior change (Chan and Singhal, 2013).

In this study, general safe driving messages using negative statistics like fatality counts had a 34% miscomprehension rate, while humorous messages against distracted driving were found to have the lowest miscomprehension rate of 2.67%.

While fear appeals are agreed to be more effective on females than males, multiple studies have shown that messages plainly stating negative statistics were not only the least comprehended, but also increased traffic accidents (Hall and Madsen, 2022, Shealy et al., 2020), and fear appeals are generally countereffective in individualist societies like the United States (Oliver et al., 2019). This well-documented phenomenon is also predicted by the EPPM. The threatening nature of the message leads to message discounting (ibid.).

Of the 80 non-traditional messages shown to the 300 participants, over 90% of participants did not perceive a single message as inappropriate. The most frequently cited message for being inappropriate was “Get your head out of your apps,” with 6 participants finding it suggestive, or 2% of all respondents. While the tolerance window for inappropriate

content should be as low as possible from a DOT, the highest rate of offense in the entire country was 2%, with the next most offensive message only being cited by 1% of respondents. This shows that the majority messages DOTs have utilized are within the threshold of cultural acceptability for a sample size of average Americans. Shealy et al. concludes with five new recommendations for crafting VMS messages.

- Distracted driving messages should represent a high proportion of non-traditional safety messages. Messages about distracted driving, in all of the data collection methods, elicit the intended response: high perceived efficacy, comprehended by most drivers, the most frequent recall, and elicit the highest cognitive attention.
- Messages should address a specific behavior change (e.g., wearing a seat belt, not driving impaired). The more specific the intent, the more likely the message will be correctly understood by drivers.
- A larger portion of messages should evoke an emotional response.
- Messages should use word play, rhyming, or statistics where possible.
- Messages should avoid sports.

Sports were found to be the most exclusionary non-traditional messages, but still only reached a 10% rate of misunderstanding. Sports may still be appropriate during wider cultural phenomena, such as messaging within a city participating in that year's superbowl.

2. Gender and age differences in processing humor

Shealy et al. found that males are more likely to demonstrate increased cognitive activation (oxygenated blood) in response to humorous messages compared to females. This suggests that males engage more with humor-based messages. Female participants, on the other hand, perceive negative emotional messages (e.g., fear, threat, sadness) as more effective than humor-based messages.

The study shows that those over 65 were most likely to believe that humorous messages would be effective on the road, while brain scans showed that the younger the driver, the greater the increase in message engagement in the brain region associated with emotional control and

word processing. Older populations therefore had greater buy-in to the messaging (believing it would be impactful for others), while younger drivers demonstrably comprehended and digested those same messages at a higher rate.

F. Research Conflicts in VMS Humor Comprehension

Working for the BTSCRP, Ullman et al. (2022) produced a portion of the cognitive-ergonomic VMS guidelines displayed above. BTSCRP exclusively studied 2-phase BTS messages and found that drivers have limited time to read and process messages on VMS, typically around 8 seconds total at 60 mph. It further found that fewer than 50% of subjects understood the safety topics of VMS messages that included humor or pop culture references, compared to 85% of subjects understanding non-humorous messages in a laptop-based simulation, directly conflicting with Shealy et al.

There are other conflicting findings on the cognitive load and distraction from non-traditional VMS. A study from the University of Groningen found that placing a humorous VMS before a detour instruction actually resulted in higher compliance than the control group, which only received a plain message to adhere to the detour (Harms, et al., 2019). The advertisements group, as the experimental group was called, also exhibited no speed dips when approaching VMS as opposed to the control group, which would slow down their vehicles to process the message.

Groningen concludes that when it comes to VMS safety, very little cognitive processing at all is required, and humorous messages do not cause significant distraction, especially to populations used to seeing them. The Groningen study simultaneously agrees with Shealy et al. by concluding humor is effective generally and has a positive impact on driving outcomes, while conflicting with the level of cognitive processing humor triggers. This creates a paradoxical

conflict with Hall and Madsen (2022), which specifically cites its disagreement with Shealy et al., stating:

> Shealy et al. (15) find, in a laboratory setting, that showing drivers non-traditional safety messages, including fatality messages, increases their attention and cognitive load, which they interpret as a good thing. In contrast, we show that this can have costly consequences. We show, contrary to drivers' and policymakers' expectations, that increasing awareness of the risk of driving via fatality messages causes additional traffic crashes.

Hall and Madsen conclude that non-traditional safety messages cause too high of a cognitive load, and thus creates unsafe driving conditions, especially when using fear-based messages and BTS campaigns should cease operations due to counterefficacy.

Other methodological differences across the various humor efficacy studies could explain the significant variation in results. Harms, et al., the Illinois DOT (Zhai & Ouyang, 2024), and Kansas DOT (Kondyli, et al., 2021), all utilized similar active driving simulations, and Shealy et al. utilized neuroimaging with no simulation. The BTSCRP study utilized a laptop-based simulation and participants were asked to simultaneously perform a secondary task to mimic the cognitive load of driving, while being exposed to 18 2-phase VMS messages. Additionally, Harms et al. pre-tested its messages, which were in Dutch, to comply with cognitive-ergonomic VMS guidelines ahead of the experiment, while all other studies devised ergonomic guidelines in conclusions to the experiment.

The simulation, known as Critical Tracking Task (CTT), requires both visual attention and use of fine motor skill via a joystick controller. CTT has been used in the automotive industry to assess distractions from in-vehicle systems. However, these secondary tasks did not directly simulate driving. These tasks do not have the repetitive exposure that drivers have to operating a vehicle, which elicits an automatic response (Profitt and Wade, 1998).

Fig 5. The Driving Simulation (Harms et al., 2019) Left, and CTT (Ullman et al., 2022) Right.

The BTSCRP secondary tasks may have had a significantly higher cognitive load than a familiar driving task, and there was no neuroimaging used to capture this discrepancy. Additionally, 2-phase messages require more than double the cognitive resources as a single-phase or static message, as the subject must comprehend both phases, and be drawn to the second phase either through continuous attention or regained-attention during the second phase with processing to tie both phases together. A summary of the conflicting findings is found in Table 3 below.

Table 3: VMS efficacy Studies Summary

Study	Year	Method	Sample Size	Key Finding	Non-Traditional Message efficacy
Virginia DOT/ FHWA Shealy et al.	2020	fNIRS brain scanning + surveys	300 participants, 1,108 messages analyzed, 80 empirically tested	Humorous distracted driving messages: 2.67% miscomprehension rate; Negative statistics: 34% miscomprehension rate; 90%+ found messages appropriate	**Strongly Positive** - "Messages should use word play, rhyming, or statistics where possible; A larger portion of messages should evoke an emotional response; Messages that provoke humor or a negative emotional response outperform emotionless messages in both drivers' perceptions of efficacy and in the cognitive attention that these messages provoke in drivers."
BTSCRP Ullman et al.	2022	Laptop-based simulation with secondary cognitive task	120 participants, 54 total 2-phase messages analyzed	<50% understood humor/pop culture messages vs. 85% comprehension for non-humorous messages	**Strongly Negative** - humor is significantly worse comprehension for non-traditional over traditional messaging "BTS messages to be displayed on VMS not include humor, wit, or pop culture references in the message."
Illinois DOT Zhai & Ouyang	2024	Computerized driving simulation + survey	118 participants, 15 1-phase messages analyzed	Humor is effective in certain cases and ineffective in others	**Positive** - humor is effective when used in appropriate situations

Kansas DOT Kondyli et al.	2021	Computerized driving simulation + surveys	60 participants, 27 1- phase messages analyzed	All messages tested were found to have a mean perceived efficacy greater than neutral (>3/5)	**Positive** - humor is effective when used in appropriate situations
University of Groningen Harms et al.	2018	Computerized driving simulation studying 2 phase messages, 1 humorous and 1 command + surveys	32 participants, number of messages undisclosed. 1 group treated with prior exposure to messages, 1 control.	Humorous VMS before detour instruction = higher compliance than control; No speed reduction (distraction indicator) when approaching humorous VMS	**Strongly Positive** - humor more effective for instructional compliance than traditional messaging and induce no cognitive load
Stefanidis et al. (Australia)	2024	Survey of mobile phone safety campaigns	350 drivers (200 admitted to phone use while driving)	Humor campaigns equally effective as injury-based and sanction-based; Comparative optimism (32% of sample) found ALL messages less relevant	**Neutral** - humor no better or worse than alternatives
Basso et al. (Chile)	2021	Vehicle-by-vehicle tracking using automatic vehicle identification (AVI)	341 lane change messages, 8 speed reduction messages over 6 months	87.5% of speed reduction messages failed to induce desired behavior; Only 28.15% of lane change messages produced significant behavioral changes	**Negative** - VMS messages of all forms are generally ineffective

TXDOT Hall & Madsen	2022	Longitudinal study on real Texas roads over 7 years	61.7 milion observations analyzed	BTS campaigns caused an increase in crashes	**Strongly Negative** - non-traditional messages can induce a cognitive load that is harmful rather than helpful, especially negative fatality statistics, increase fatalities

V. Social Media as an Alternative Platform for Humorous Traffic Safety Messages

The ability to get public transportation safety messages out used to be limited to where the vehicles in transit were; now, messages can be received over the internet – anywhere the audience is at any time. The best way to use this powerful resource depends on a number of factors.

A. Platform Affordances and Constraints Compared to VMS

1. Visual capabilities (memes, graphics, video)

Content on social media features many characteristics that VMS is neither suited for nor capable of. VMS messages must be text-based, short, and to the point. DOT social media content frequently deploys internet memes, which are essentially formless. A meme could incorporate audio, video, text, images, or some combination of the above. There is a greatly increased capability of mental stimulation online, as well as a wholly different setting and context. Memes do not require immediate understanding to be effective; they can even be enticing in their esotericism.

Many memes today participate in what is known as “engagement bait,” in which the post deliberately attempts to garner reactions, comments, likes, shares, and/or tags. A common example of engagement bait will contain a deliberately incorrect statement or nonsensical concept presented in the content in order to garner interaction discussing or correcting the statement. This type of engagement bait, content appearing so bizarre or dumb it grabs attention, has been labeled by dictionaries as “shitposting” or “brainrot,” a tactic frequently employed by the Utah DOT. These nonsensical concepts often take place in popular memes, generating the incongruity response to generate humor (Weinberger & Gulas, 2019).

Such confusion would be highly inappropriate in the context of VMS, but could be harmlessly employed on social media. A DOT must be cautious with this type of messaging as it represents the voice of the government, and each DOT social media account should have a strong understanding of its existing user base in order to tailor content effectively.

2. Time and attention considerations

Online memes do not follow the same time and attention considerations as VMS. The goal of a meme is to spread, and timeliness is based on the DOTs’ knowledge of their own velocity and reach of communications to its target audience. For example, a meme announcing a road closure could be shared the morning of, or a week prior, based on internal metrics of how the meme will perform and how it will work in conjunction with other DOT communication strategies.

Because memes are not intended to share real time information for drivers, salience, processing speed, and distraction are not a safety consideration. Memes are best utilized to gain maximum attention, and can be as glitzy and intrusive as necessary to break a user’s scrolling habits and have the user stop and observe the meme. There is no safety risk to startling the

audience of a meme; an audio clip of a sudden loud scream paired with the words “highway closure tonight” could qualify as a useful communication tool online.

As with VMS, meme processing considerations fall under the LC4MP (Oliver et al., 2019). A core component of the LC4MP is the role of motivational activation, which underlies emotional experiences and affects how cognitive resources are distributed. When the appetitive (approach) system is activated, leading to positive emotional experiences, more resources are generally allocated to the encoding and storage of message information. When the aversive (avoidant) system is activated, leading to negative emotional experiences, resource allocation to encoding is expected to first increase and then slightly decrease. This aligns with Shealy et al. where humorous messages were better comprehended than negative messaging.

The rise of social media and other digital platforms has dramatically increased the amount of information available to consume, leading to increased competition in the attention economy. A study primarily focused on Twitter shows that a user's breadth of attention remains relatively constant despite the overall diversity of information in the system, indicating a limit on the diversity of memes a user can attend to (Weng et al., 2012). This implies that memes compete, and some survive at the expense of others. For example, if there is an unplanned road closure announcement, higher attention-grabbing methods may be required than the characteristics of content sharing a planned road closure days ahead.

There is a wealth of information on best times to post on each social media platform, taking into consideration years of statistics on when maximum attention is given to each. Factors include the work schedules of the target audience, meal times, and other browsing habits. Each case is unique to the DOT’s audience and the platforms they are operating on, making the landscape quite dynamic.

One factor that is consistent across all social media platforms is the importance of posting consistency for both cognitive persistence (Oliver et al., 2019) and algorithmic performance (Lang, 2025). A regular rhythm and steady flow of content is essential to maintain and grow a social media presence. Social media managers must take into account user behavior and each platform's unique algorithmic behavior.

For example, Instagram has boosted video content significantly over still images, selecting an example video to appear at the top of more feeds on an app open than a still image (Sonnenberg 2025). For an end user, the algorithm appears to randomly produce content to scroll through to the home page, or the "for you page" as it is known on TikTok. However, a social media manager must understand the intricate weights and levers put on content, which goes far beyond #hashtags in 2025, with photo and video recognition, viral sounds, and source considerations all taken into account by social media algorithms to categorize and distribute each piece of content within the platform's internal systems.

3. Interactive potential (sharing, commenting)

VMS signs are not intended to be shared or photographed, rather to deliver a short and fleeting message to reach driver cognition. Social media allows DOTs to spread messages designed for interaction and sharing without causing a roadside hazard. Interactive and participatory messages encourage audience engagement through questions, challenges, or calls for user-generated content that transforms passive safety message consumption into active participation. The city of Calgary, Canada's Traffic Tuesday program frequently poses questions like "What's your excuse for not wearing a seatbelt?" or challenges drivers to share their safety commitments, creating two-way communication that extends message reach through user

amplification while building community engagement around safety behaviors (City of Calgary, 2025).

4. Using humor as an entry point for deeper engagement

One unique aspect of participatory messaging is the ability to form community engagement. In some circles, engagement in urbanism and transit has become a meme of its own, from various groups such as the NUMTOTs, to the unorganized fanbases of individual DOT accounts, which foster micro-communities waiting for the next joke that may also happen to be a useful traffic PSA. Civic engagement is often a dry and uninteresting subject for most citizens, but using humor to soften the message and increase persuasion has seen major successes in garnering interest, attention, and returning participants.

B. Examples of Non-Transportation Government Social Media Humor

1. Analysis of Pennsylvania Treasury and NJGOV approach as analog

In 2019, under the office of Pennsylvania state treasurer Joe Torsella, staffer Mike Connolly opened a Twitter meme account under the name @PATreasury including the tagline "We handle all of the money." Connolly ran a multi-account strategy, wherein @JoeTorsella and @PATreasurer (with an er) would deliver straight-laced government messages, while @PATreasury would produce provocative memes and contemporary humor. @PATreasury's following had surpassed the 8-year old Torsella account in under 2 months of its inception (DiStefano, 2019). Connolly said of the account's success:

> "Government is abysmal at all levels of doing social media, 95% of it is just drivel nonsense," Connolly said. "So, it wasn't that our content was so great, it was that everything else was so bad. (Forman, 2023)"

The PATreasury account posted memes critical of billionaires such as Jeff Bezos and Mark Zuckerberg. Engagement exchanges included the other accounts, all run by Connolly, having to "reel in" PATreasury for going too far (Gross, 2019).

The account ran for only one year before Torsella was unseated, but in that year the account garnered a mass following which resulted in multiple online obituaries for the account upon closure. In its farewell message, the account posted that its content strategy was an:

> "[...]experiment began as a direct result of [Torsella's] vision to rebuild community and reconnect people with a government that is supposed to serve them… It's been an experiment that we believe has been a success, and one we hope other government institutions follow." (Caruso, 2020)

Shortly after @PATreasury began, the Twitter account @NJGov launched a new strategy as a humorous alternative voice for New Jersey governor Phil Murphy, run in part by Gen-Z memer Megan Coyne, who went on to work on the social media team for Joe Biden. The account grew from 17,000 followers in December 2019 to 439,000 in August 2022, becoming one of the fastest growing state-run social media accounts in the country (Wildstein, 2025).

@NJGov went so far as to reply "your mom" to a comment questioning who was running the account, garnering 71,000 retweets and a jump from 17,000 to 40,000 followers in the following 3 days (New Jersey [@NJGov]. (2019, December 6), Twitter).

This comment served a purpose greater than being ridiculous and provocative; it garnered attention to a government account that would also deliver agenda-focused messages. Today, the @NJGov account continues to operate with around 450,000 followers, a gain of only around 2.3% in the past 3 years since its initial 5-year 2500% surge, while taking a more serious approach to messaging the follower base than it had grown during its more comedic period. The

@NJGov official profile image persists as a picture of the broadly-considered cute Star Wars character Grogu, commonly known as ’Baby Yoda,’ holding the shape of the state of New Jersey.

Both accounts garnered a fair amount of controversy for making political statements in addition to the use of irreverent humor, while succeeding in their goals of increasing civic engagement. DOT accounts are distinctly different, in that they are essentially apolitical and focused on information related to traffic and safety rather than partisan politics.

C. Efficacy Measures Unique to Social Media

1. Engagement metrics and "shareability"

While DOTs can estimate traffic flow and choose signage location for maximum viewability, social media offers granular statistics on viewership including demographics, most popular viewing time, follower growth rate, and more. The increased specificity of viewer sentiment allows social media managers to tailor content much more narrowly to their audience. While VMS messages must strive towards broad accessibility, a social media manager will have access to information such that 80% of their Instagram audience is aged 16-24, and choose to make bizarre posts using wordart and old pop hits to appeal to their demographic’s sense of humor.

2. Brand recall and message retention

Brand recall is closely related to brand accessibility and top-of-mind awareness, which are considered crucial when consumers need to make a purchase decision. Advertising aims to make a brand the most accessible in memory for consumers. While DOTs do not “sell” anything as a brand in the traditional sense, the first aim of a DOT in spreading a message is to maximize awareness to the target audience. Repeated exposure to advertising can increase brand accessibility and top-of-mind awareness. People often learn advertising messages through

low-involvement learning, which is passive and occurs with repeated exposure, even without conscious effort (Oliver et al., 2019, Weinberger and Gulas, 2019).

Studies show humorous ads have a more positive effect on brand recall for unfamiliar brands (Fryklund & Stenlund, 2023). Following a similar concept to the adage "all press is good press," attention is the most important factor for an unknown brand. While an established high-end brand like Gucci had lowered success with humorous social media advertising (ibid.), DOTs as brands are generally unknown or subconsciously known to the average population. Minnesota DOT employees in 2001 felt that the DOT's image with the public was "fuzzy and unclear," and the FHWA has encouraged DOTs to increase branding awareness for over 20 years (Stein & Sloane, 2001).

These studies lead to a standardized strategy of social media brand campaigns, which is to attempt to grab attention with every post, and to post often and post consistently. Humor is an attention-getting tool and serves as the hook and anchor to many of these campaigns.

3. Relationship to behavior change

In addition to the difference in urgency and immediacy contexts, social media has several integrated aspects that impact behavioral change differently than VMS use cases.

a. The Amplified Role of Interpersonal Influence

Following Affective Disposition Theory (ADT), social media can engage in character-based messaging which VMS is unable to achieve (Oliver et al., 2019). Social media managers can create a parasocial relationship between either an anonymous account or a named influencer in order to build rapport with the audience. This influence is reinforced through audience targeting, which matches the personality of the messenger to the audience increasing likelihood of behavioral change.

b. User Agency, Mass Self-Communication, and Participatory Culture

Unlike VMS, users can and do reply to social media accounts. User agency allows conversational propagation, fostering natural discussion between followers around DOT's goals. For example, a single act of retweeting from a follower about an upcoming highway closure could double the reach of the event if that follower has a large following of their own. NUMTOT is another example of mass self-communication, in which a community environment precipitates around DOT goals, directly aided by DOT social media presence which can engage with these groups without directly running them.

c. New Forms of Social Feedback and Normative Cues

In addition to popularity metrics aiding social media managers in message targeting and account performance, public-facing metrics like likes, shares, and retweets form a conceptual "Social Proof" that creates a self-reinforcing feedback loop. A Tweet with thousands of likes will serve to increase influence and behavioral change over the reader due to the social pressure of its stated popularity. This phenomenon also creates a feedback loop through the warranting theory (ibid.).

D. Evaluation Frameworks for Integrated Campaigns

1. Message tailoring considerations using SatMDT framework

The Step approach to Message Design and Testing (SatMDT), developed by Lewis, Watson, and White (2016), provides a robust theoretical framework that could significantly enhance the systematic development and evaluation of humorous traffic safety messages across both VMS and social media platforms. Initially created to evaluate public health messaging, the SatMDT framework concludes that effective message development must be tailored based on systematic understanding of the target audience rather than using generic approaches. The

framework explicitly states that presenting a "one size fits all" approach would not be cognisant of the complexities associated with successful message development (Lewis et al., 2016).

This framework is especially helpful for social media managers crafting robust and involved messages, but it should also be applied to consider audience contexts of a locality when working crafting and evaluating sub-16 word VMS campaigns.

The SatMDT framework is arranged in a four-step process, using established social psychological theories, including the Extended Parallel Processing Model, the Elaboration Likelihood Model, and Social Learning Theory, creating a comprehensive approach to message development that moves beyond ad-hoc humor creation toward evidence-based communication design. The steps are summarized in Table 4 as follows:

Table 4: SatMDT Framework

Step	Focus Area	Key Actions
Step 1: Pre-existing Individual Characteristics	Audience Research	• Identify specific target demographics (age, gender, socio-demographics) • Elicit salient beliefs, motivations, and strategies from the actual target audience through qualitative research • Understand the target's extent and nature of involvement with the risky behavior • Conduct pilot work with members of the intended target audience rather than making assumptions
Step 2: Message-related Characteristics	Message Design	**Focus:** Tailor message content to either challenge perceived benefits OR emphasize perceived disadvantages based on what the target audience believes **Content considerations:** • Choose an appropriate emotional appeal type (fear-based vs. humor-based) based on audience characteristics • Include behavioral modeling relevant to the target • Provide concrete strategies (response efficacy) that the audience can actually use
Step 3: Individual Responses	Concept Testing	• Test whether emotional and cognitive responses align with intentions • Ensure messages are functioning as intended and being perceived as intended by the target audience • Check for unintended emotions that could undermine message efficacy
Step 4: Message Outcomes	Evaluation	• Evaluate with representative samples of the intended target audience • Compare responses across different demographic groups to understand differential efficacy • Assess both message acceptance and message rejection

Applying this framework to a DOT humor campaign, Step 1 would involve identifying target audience characteristics such as age, gender, and humor preferences—crucial for determining whether a Massachusetts accent-based joke or a Gen Z meme format would be most effective.

Step 2 would systematically develop humorous message content tailored to these audience insights, ensuring that jokes attract attention and serve a persuasive goal rather than merely entertaining. Step 3 would assess immediate audience responses to the humor, measuring both comprehension and emotional engagement with experiments like surveys or natural observations like behavior tracking and social media statistics. Step 4 would evaluate longitudinal message outcomes including behavior change and campaign efficacy.

The framework has demonstrated feasibility in road safety advertising contexts, with studies showing how the systematic approach leads from qualitative exploration of driver motivations through concept testing to final evaluation of message persuasive effects (ibid.). Applying SatMDT to humorous traffic safety communications would address many of the current gaps in the research by providing standardized methods for pre-testing humorous content, measuring efficacy across diverse populations, and ensuring that humor enhances rather than undermines safety message goals, ultimately creating a more scientific foundation for the growing use of comedy in government transportation communications.

A key finding from the creation of the SatMDT framework is that humorous health messages may be relatively more effective for males, and fear-based appeals may be more effective for females. This finding is in alignment with both Shealy et al. and Ullman et al.

Methodology

VI. Retrospective Evaluation Framework Component

The below framework is an expanded SatMDT that fulfills the steps with the corresponding methods from the literature review that is recommended for all DOTs to utilize for message creation, analysis, and testing. For the purpose of this paper, the green components are fully implementable, while response performance metrics are highlighted yellow for partial implementability, limited to public-facing metrics for social media campaigns. Behavioral performance is highlighted red. It is omitted due to the lack of existing data. This framework should be utilized in full when employed by a DOT with all data available.

Table 5. SatMDT Framework with Substep frameworks

Component	Subcomponent	Data Sources	Analysis Methods	Key Questions Addressed	Limitations
Content Analysis (SatMDT 1+2)		Content of the message including words, audio, pictures, and video	Systematic Review	What was communicated? To who and How?	
	Empirical Review	Academic literature; practitioner guidelines	Standards comparison; best practice assessment	Does it follow evidentiary best practices?	Subjective without audience testing
	Peer Comparison	Other agencies' campaigns	Benchmarking; comparative case study	How does this compare to other strategies?	Contextual differences threatening mutual applicability
Individual Responses (SatMDT 3)		Audience Response	Human Testing, Surveys	How did individuals perceive these messages?	Human factors such as comparative judgements
Message Outcomes (SatMDT 4)		Observational and experimental data	Quantitative analysis on various results	What was overall message efficacy?	Data dilution through social media, quantifying abstracts
	Public Response and Media Coverage	Comments, news coverage, social listening	Sentiment analysis; thematic coding Media analysis; reach estimation	How did public audiences react? What broader impact occurred?	Self-selected samples, Filtered through media lens
	Response Performance Metrics	Social media analytics; VMS logs	Descriptive statistics; trend analysis	Did messages reach audiences?	Correlation not causation
	Behavioral Performance Metrics (SatMDT 4)	State databases; enforcement records	Time-series analysis; before-after comparison	Did behaviors change?	Many confounding variables

For the following case studies, a limited-scope framework is derived from the final recommended framework, in order to retrospectively analyze existing campaigns using only publicly available data. Retrospective evaluation without active participants has significant limitations, most critically, the inability to establish causation or directly measure comprehension and behavioral effects. However, this framework enables agencies to systematically assess the message's characteristics and audience alignment (content analysis), document outcomes that can be measured (public engagement and media sentiment), generate hypotheses for future controlled testing, learn from experience to improve subsequent campaigns, benchmark progress against peers and standards, identify problems that need correction (empirical readability, appropriateness, equity concerns), and make informed decisions about strategic direction (even if incomplete). The limited analysis will be conducted as follows, summarized in Table 6:

Table 6. Limited SatMDT Methodology

Component	Analysis Step	Methods
Content Analysis	SatMDT Step 1 Audience Characteristics	Demographic Information
		Cultural Considerations Framework Audience Analysis
	SatMDT Step 2 Message Characteristics	VDOT Message Typology
		Cultural Considerations Framework Message Analysis
	Empirical Review	Discounting Risk Assessment
		Cognitive-Ergonomic Standards Assessment (VMS only)
	Peer Comparison	Qualitative Comparisons
Public Response / Media Coverage	SatMDT Step 4	Sentiment overview, reach estimation
		Performance Metrics (Social Media Only)

A. Content Analysis

The first component of the framework is content analysis, following the SatMDT framework. The SatMDT Framework is developed to guide the start-to-finish creation, implementation, and review of new messages; however, it can be divided into individual steps for analysis of messaging campaigns, including post-hoc evaluation. The authors themselves, including studies by Professor Lewis utilize only the only step 3 (individual responses) for research, including a study conducted to analyze messages aimed at reducing smartphone use

among young drivers (Gauld et al., 2019). As such, SatMDT steps 1, 2 and 4 will be implemented and step 3 is recommended for future research.

1. **Audience Characteristics**

SatMDT Step	Actions for VMS	Actions for Social Media	Measurement
1. Audience characteristics	Identify demographics of route users	Survey followers, analyze analytics	Demographics, behavior patterns

A basic framework for gender and education level responses to humor is devised below. Each state driving population will be analyzed by gender and education.

Table 7. Simplified Demographics Table

Demographic	Humor efficacy	Preferred Message Type	Processing Characteristics	Source
Males	Higher cognitive activation than females	Humor	More engagement with humor	Shealy et al., 2020
Females	Lower cognitive activation than fear for humor	Negative emotional appeals	Better response to fear appeals	Shealy et al., 2020
Higher education	More positive	Complex humor	Better appreciation	Weinberger & Gulas 2019
Weak readers	More negative	Simple, standardized humor	Struggle with VMS generally	Proffitt and Wade, 1998

Demographic and cultural considerations derived from Oliver et al.'s findings on individualist and collectivist humor preferences set up a framework that will be applied to

describe audience factors for step 1 of SatMDT. Consideration for population split over/and under 65 has been removed due to its mixed results and lack of available data on active drivers over 65 in state populations. Drivers' licenses are the primary form of identification in the United States, and a renewed license does not correlate with active driving status.

Hofstede's cultural framework was only applied to whole countries, with the United States hitting the highest score of 91 IDV out of 100. All case studies below are United States-based examples, so Vandello and Cohen's collectivism scale (1999) relative between US states, is applied to the target audience using the correlated cultural dimensions and humor preferences found in Oliver et al. For the methods section onwards, Oliver et al.'s findings will be labeled "Media Effects", the title of the study. In this scale, 100 is the most collectivist, and the states are ranked 1-50 with #1, Hawaii, being the most collectivist. It should be noted that the bottom ten, least collectivist states, were all found west of the Mississippi river.

Table 8: Cultural Considerations Framework

(Vandello & Cohen,1999; Oliver et al., 2019; Lee & Lim, 2008)

Media Effects	**Collectivist Societies**	**Individualist Societies**	**Humor Implications**
Censorship Support	Higher	Lower	Use safer, lower-risk humor in collectivist appeals. Individualist audiences have higher tolerance for risky messages
Effective emotional appeal	Contradictory emotions welcomed as complementary, Fear-arousal is accepted	Contradictory emotions seen as opposing	More complex emotional evocations are effective in collectivist cultures
Effective humor types	Sentimentality, Incongruity without resolution	Sentimentality in moderation, Incongruity with resolution, Pleasure maximization	Tailor to cultural context
Humor receptivity	Higher overall	Moderate	Audiences more open to humor in collectivist contexts

For the four individualist/collectivist correlations to the media effects' findings above, each will be considered equal weight.

2. Message Characteristics

SatMDT Step	Actions for VMS	Actions for Social Media	Measurement
2. Message characteristics	Choose humor vs. fear based on audience	Tailor content type and character	A/B testing, engagement metrics

The typology classification matrix developed by Shealy et al. for VDOT is chosen for its robustness to standardize categories for both VMS and social media messages when applying SatMDT step 2. For VMS messages, the cognitive-ergonomic practices list for VMS comprehensibility from the combined VDOT and BTSCRP conclusions will be checked for compliance. The Individualism/Collectivism framework is applied again to determine the characteristics of societal appeal that the message expresses, which is then compared to the audience's characteristics to analyze how well the humor aligns to its audience.

Table 9. Risk Assessment Matrix for Humor Implementation

Discounting Risk Factor	**VMS Impact Baseline**	**Social Media Impact Baseline**	**Mitigation Strategy**
Miscomprehension	High (safety-critical)	Low (non-urgent)	Pre-test with diverse samples
Cultural offense	Medium (broad audience)	Medium (targeted possible)	Multi-stage community review
Credibility Rejection	High (immediate audience action needed)	Medium (sleeper effect possible)	Use credible sources, repeated exposure
Authority undermining	Medium	Low	Balance humor with serious content
Processing overload	High (time constraint)	Low	Avoid long, complex messages with multiple directions
Literacy barriers	High (25% weak readers)	Medium (visual options)	Avoid abbreviations, use symbols

This risk assessment for potential sources of message discounting is developed from the theoretical frameworks of message acceptance in the literature review, specifically the frameworks listed in sections II, II and, IV in Appendix (X). The assessment is used to chart overall discounting risk level of a message, which is then applied to the message's risk alignment in the cultural considerations framework, with individualistic cultures having a higher risk tolerance and collectivist cultures having a lower risk tolerance. For the purposes of this study, the impact of each factor is scored High, Medium, or Low, with point values assigned 3, 2, and 1, with 1 being the lowest. The average score on a scale of 1-3 will be used to determine Low-High overall risk. Justifications for each factor's point value is given in each table.

Cultural Considerations Framework for Messaging

The cultural considerations framework is repeated with the characteristics of the message, rather than the audience for this section. The overall risk factor from the step above is applied to the risk category.

B. Empirical Review

(VMS Only) Cognitive-Ergonomic Checklist

(Proffitt and Wade, 1998; Shealy et al., 2020; Ullman et al., 2022; Hall and Madsen, 2022)

As compiled by the literature, there are cognitive-ergonomic standards that apply to all VMS messages to reach a threshold of acceptability for use. Providing context through symbols, use of mixed-case lettering, and maintaining physical sign legibility have been removed from this applied checklist due to irrelevance and/or impossibility in this message analysis. Standardization and repetition is omitted as this analysis comprises unique non-traditional messages. Telephone numbers/URLs and animations/unapproved symbols are removed from the checklist as all messages analysed are in compliance.

Table 10: Simplified Cognitive Ergonomics Checklist

VMS Cognitive-Ergonomic Practices
Avoid abbreviations
Keep messages short and distinct
Messages should be direct in instruction
Message makes sense individually if used in phases
Full message not split across phases
Center Each Line
New line for every thought
16 word maximum
Two-phase BTS messages should be related to one topic
Do not Present Negative Statistics

C. Other Components

1. Public response, media coverage, and social media performance is overviewed for each case.
2. Two peer comparison case studies are conducted, one each for a group of VMS messages and a group of Social Media campaigns

Analysis

This analysis synthesizes the theoretical frameworks, empirical evidence, and practical applications examined throughout this research that were formed to address the central question: Is humor an effective tool for traffic safety communication across different platforms?

With the frameworks employed and the data available, this question cannot be readily answered. Rather, the likelihood of the messages analyzed being well-received by the audience can be tracked to real-world performance. The evidence reveals a complex landscape where humor's efficacy cannot be reduced to simple yes-or-no conclusions; rather, it depends critically on platform constraints, audience characteristics, message design, and institutional objectives. This section examines the key tensions and opportunities identified through the research, explores the implications for transportation agencies, and provides recommendations for evidence-based humor strategies.

A sample of VMS messages are analyzed, and campaigns are analyzed, from the three most popular state DOT Instagram accounts: Utah, Washington, and Arizona. These three states exceed the follower counts of the four largest state DOTs in the United States, and all city DOTs including New York, Los Angeles, and Chicago (Instagram, 2025). Meta Platforms are the most popular social media networks, and Instagram captures the widest demographic, with the broadest age range from base users, and additional reach to older users through Facebook crossposting (Statista, 2025).

For the purpose of this research, TikTok posts and Twitter posts will not be analyzed. Both TikTok and Twitter face state-specific bans on government devices due to political reasons, limiting DOT presence on these platforms. For example, UDOT is banned from operating on TikTok by state law as of December 2022, and the agency’s accounts on the platform are deleted

or inactive. UDOT had been the number one most followed DOT on TikTok and the most popular government agency in Utah on Tiktok when the account was taken down (Transportation.org, 2023).

Due to its structural text-first layout, Twitter is a less prevalent platform for image-based communications, and images constitute the majority of memes. For both WSDOT and UDOT, the automated traffic alert Twitter accounts are >1.5x more popular than the human-run Twitter accounts that engage in memes. While WSDOT has more Twitter followers than Instagram, it receives significantly less engagement, having received 0.5% of the number of likes on Twitter for Social Media Case Study C, despite being published simultaneously.

VII. VMS Case Studies

A. Watershed Case Study: MassDOT's "Use Yah Blinkah" VMS Campaign

The floodgates for DOT humor opened in 2014, with the Massachusetts Department of Transportation using VMS to broadcast the message “CHANGING LANES? USE YAH BLINKAH.” “Blinkah,” a riff on the colloquial Boston-metro pronunciation of blinker (turn signal), was a same-day sensation, garnering news media attention, social media spread, and even a merch campaign, which still sells today.

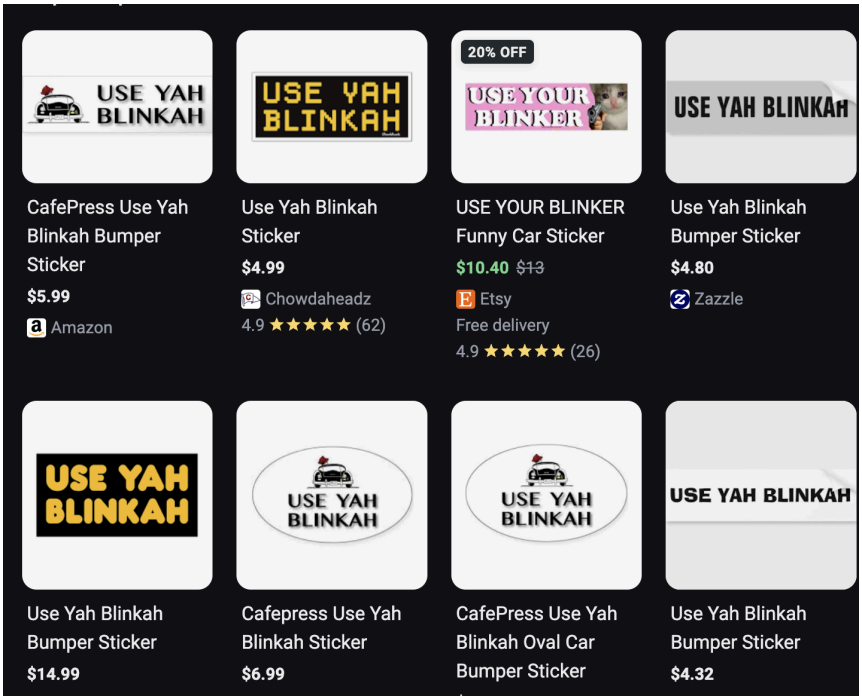

Fig 6. (Google Shopping top results, 2025)

Same-day is not an exaggeration; it is an earmark of the viral media culture of the 2010s, allowing people to post pictures across platforms like Twitter the minute the signs were first spotted by the public.

The Massachusetts Department of Transportation's "Use Yah Blinkah" campaign exemplifies the humor approach by transforming the mundane act of signaling into a culturally resonant message that simultaneously instructs and entertains through dialectical authenticity. While the message is a command, it is softened through humor, and directed towards the community at large rather than any individual.

Content Analysis

1. Audience characteristics

Demographics (FHWA Registered Drivers, 2022; FRED, 2024):

Sex		**Higher Education**	
Male	Female	Yes	No
49.05%	50.95%	48.3%	51.7

Cultural Demographic Targeted (Vandello & Cohen,1999): Leans individualist, 46/100 collectivist. #32 out of 50 states.

2. Message Characteristics

Intended Behavior	**Emotional Response**	**Message Theme**
General Safe driving	Humor	Command

Discounting Risk Factors	**Impact Level**	**Assessment**
Miscomprehension	High 3	Novel, unfamiliar message, safety-critical
Cultural offense	Medium 2	Culturally referential
Credibility Rejection	High 3	Immediate audience action needed to succeed

Authority Undermining	Medium 2	Discounting effect
Processing overload	High 3	Time constraint
Literacy barriers	Medium 2	Literary message
Overall	High 2.5	-

Media Effects	**Collectivist Characteristics**	**Individualist Characteristics**
Audience Orientation	Community-aimed	-
Risk	-	High
Humor Types	Sentimentality	Incongruity with resolution, Pleasure maximization
Emotional Appeal	-	Non-contradictory
Humor Prevalence	-	Moderate
Overall	-	**Lean Individualist**

Cognitive-Ergonomic Practices	**Message Adherence**
Avoid abbreviations	Yes
Keep messages short and distinct	Yes

Messages should be direct in instruction	Yes
Message makes sense individually if used in phases	Yes
Message not split across phases	Yes
Center each line	Yes
New line for every thought	Yes
Up to 16 words	Yes
Two-phase BTS messages should be related to one topic	N/A - single phase message
Do Not Present Negative Statistics	Yes
Overall Compliance	Message follows all cognitive-ergonomic practices

Public Response/ Media Coverage: High/Positive

This campaign is widely considered successful and a trendsetter for non-traditional messages. While humor skews towards male efficacy, this campaign was still successful in a state where the population slightly skews female. Massachusetts has been #1 in education nationally for the duration of this campaign, which boosts humor acceptance (McCann, 2025).

As there are no behavioral studies tied to this campaign, its lasting legacy of continued use and merchandising is its most measurable behavioral outcome. The message ultimately aligned with its audience culture and has persisted. When the FHWA released its guidance to cease the use of humor on VMS, 78% of readers responding to a poll on Boston.com disagreed (Boston.com, 2024) with readers offering their own perspectives that have been backed by science:

"The kitschy signs draw attention to important safety matters, and if the same old boring signs come back – they will fade into the background and not have any effect!" –Stephanie, Mission Hill

"If the message is clever, it's more likely to stick with me. None of the messages I have seen are confusing, and I appreciate the creative talent behind them." –Margot, Boxborough

B. Comparative Case Study: Combined Message Samples

Shealy et al. (Henceforth, VDOT) and Ullman et al. (Henceforth BTSCRP) came to heavily contrasting conclusions about non-traditional messages. A sample of 6 messages used in each study will be cross-analyzed. There are not exact matches for each combination of intended behavior, emotional response, and theme across both studies; so messages matching at least 2 of 3 categories will be compared directly. For example, VDOT did not empirically test any messages with a combination of seat belt / humor / pop-culture as BTSCRP did, so a combination seat belt / humor / saying will be compared.

The messages are presented in the centered, line-break format as they appear on VMS screens.

Table 11. VMS Comparative Case Study Samples

Message No.	Categories			BTSCRP Samples	
	Intended Behavior	**Emotional Response**	**Message Theme**	**Phase 1**	**Phase 2**
1.	General Safe Driving	Negative emotion	Statistics	SLOW DOWN ENJOY THE RIDE	1200 TRAFFIC DEATHS THIS YEAR
2.	Seat belt use	Humor	Pop Culture	SURELY YOU BUCKLE? YES I DO AND DON'T CALL ME SHIRLEY	ALL YOU NEED IS LOVE… AND A SEATBELT
3.	Distracted driving	Negative emotion	Sports	EYES ON ROAD HANDS ON WHEEL MIND ON DRIVING	HORNS UP PHONES DOWN IT CAN WAIT
4.	Aggressive driving	Negative emotion	Wordplay/ rhymes	LIFE IN THE FAST LANE TAKE IT EASY	TELL YOUR LEAD FOOT TO LIGHTEN UP
5.	Distracted driving	Emotionless	Sports	DON'T DRIVE INTEXTICATED	BE SAFE DRIVE SMART FARMERS FIGHT
6.	Impaired/ drowsy driving	Humor	Holiday/ seasonal	NOBODY RELISHES A PICKLED DRIVER	DON'T BE A TURKEY DRIVE SOBER

Message No.	Categories			VDOT Samples
	Intended Behavior	**Emotional Response**	**Message Theme**	
1.	General Safe Driving	Negative emotion	Statistic	843 VA FATALITIES THIS YEAR DRIVE SAFELY
2.	Seat belt use	Humor	Saying	DON'T MAKE ME STOP THIS CAR! BUCKLE UP
3.	Distracted driving	Negative emotion	No theme	ONE TEXT CAN END IT ALL
4.	Aggressive driving	Negative emotion	Command	KEEP YOUR DISTANCE SAVE A LIFE
5.	Distracted driving	Emotionless	Sports	DON'T LET SAFETY BE A HAIL MARY DRIVE ALERT
6.	Impaired/ drowsy driving	Humor	Holiday/ seasonal	DON'T BE TRICKED DUIS ARE NO TREAT

(Table 11 Continued)

Empirical Review

The shortest number of lines used in BTSCRP's 2-phase study is 5 total lines across 4 messages out of 54. VDOT's shortest messages are 2 total lines, comprising 27 of the 80 messages. In total, BTSCRP considers a total of 320 lines to equal 54 complete messages, while VDOT considers 213 lines the equivalent of 80 complete messages. This creates a conflict of scale, with BTSCRP considering a total line count 50% larger than VDOT's sample to make up 32.5% fewer messages. In BTSCRP's own study, it states that only 10% of responding agencies

exclusively use dual-phase messaging, 35% use both single and dual-phase, and 55% of agencies exclusively use single-phase messaging.

BTSCRP cites cognitive load as a negative aspect of humorous messages, while testing messages that are double to triple the number of lines as what was considered one message by Virginia, Kansas, Illinois, and the majority of DOT agencies.

Table 12: VMS Comparative Case Study Cognitive Ergonomic Compliance

VMS cognitive-ergonomic Practices	**VDOT Message 1**	**BTSCRP Message 1**	**VDOT Message 2**	**BTSCRP Message 2**
Avoid abbreviations	Yes	Yes	Yes	Yes
Keep messages short and distinct	Yes	Yes	Yes	**Violated** - message in phase 1 creates literary dissonance
Messages should be direct in instruction	Yes	Yes	Yes	**Violated** - no clear instruction on either phase
Message makes sense individually if used in phases	Yes	Yes	Yes	Yes
Single message not split across phases	Yes	Yes	Yes	Yes
Center each line	Yes	Yes	Yes	**Violated** Use of ellipses in Phase 2 creates a visual decentering of line 2

New line for every thought	Yes	Yes	Yes	Yes
Maximum 16 words	Yes	Yes	Yes	**Violated**
Two-phase BTS messages should be related to one topic	N/A	Yes	N/A	Yes
Do Not Present Negative Statistics	**Violated**	**Violated**	Yes	Yes
Compliance	**No**	**No**	Yes	**No**

VMS cognitive-ergonomic Practices	**VDOT Message 3**	**BTSCRP Message 3**	**VDOT Message 4**	**BTSCRP Message 4**
Avoid abbreviations	Yes	Yes	Yes	Yes
Keep messages short and distinct	Yes	Yes	Yes	Yes
Messages should be direct in instruction	**Violated** - no clear instruction	Yes	Yes	Yes
Message makes sense individually if used in phases	Yes	Yes	Yes	Yes
Single message not split across phases	Yes	Yes	Yes	Yes
Center each line	Yes	Yes	Yes	Yes

New line for every thought	Yes	Yes	Yes	Yes
Maximum 16 words	Yes	16 words	Yes	Yes
Two-phase BTS messages should be related to one topic	N/A	Yes	N/A	Yes
Do Not Present Negative Statistics	Yes	Yes	Yes	Yes
Compliance	**No**	Yes	Yes	Yes

VMS cognitive-ergonomic Practices	**VDOT Message 5**	**BTSCRP Message 5**	**VDOT Message 6**	**BTSCRP Message 6**
Avoid abbreviations	Yes	Yes	Yes	Yes
Keep messages short and distinct	Yes	Yes	Yes	Yes
Messages should be direct in instruction	Yes	Yes	**Violated** Message does not provide specific instruction	**Violated** Message does not provide specific instruction
Message makes sense individually if used in phases	Yes	Yes	Yes	Yes
Single message not split across phases	Yes	Yes	Yes	Yes
Center each line	Yes	Yes	Yes	Yes

New line for every thought	Yes	Yes	Yes	Yes
Up to 16 words	Yes	Yes	Yes	Yes
Two-phase BTS messages should be related to one topic	N/A	**Violated** Message Phase 1 and 2 would fall under separate categories using VDOT framework	N/A	Yes
Do Not Present Negative Statistics	Yes	Yes	Yes	Yes
Compliance	Yes	**No**	**No**	**No**

Following the cognitive-ergonomic guidelines, in this overview 4 of 6 messages from VDOT and 3 of 6 messages from BTSCRP violate cognitive-ergonomic practices and should not be used in current form. As both studies concluded individually that multiple messages tested by their methodologies should be avoided, it is given that more messages will fail a combined threshold. Harms et al. only used messages that passed pre-determined cognitive-ergonomic guidelines for messages in Dutch, and future studies that filter messages with the guidelines developed from VDOT and BTSCRP will have new conclusions to draw from, as the standard errors to be avoided for American English are now well documented.

The major notable difference between the samples used by VDOT and BTSCRP is line and word count. VDOT's 6 messages equate to 15 lines, 43 words, and 199 characters. BTSCRP totals 36 lines, 80 words, and 397 characters for messages that intend to convey highly similar or the same intended behavior, emotions, and themes as VDOT.

VIII. Social Media Case Studies

A. Longitudinal Case Study: WSDOT MS Paint Maps

The Washington State DOT Microsoft (MS) Paint Maps may serve as one of the best examples of a longitudinal study for DOT memes, which are inherently short-lived. The campaign began in 2016, and is in its ninth year of utilization at the time of writing.

Washington state's unique weather and geography result in a very short window for road construction during the summer months, which compounds traffic with tourism, sports, concerts, and other events that are heavily concentrated in the summer. Every summer, WSDOT employs crudely drawn doodles of high-profile events made in the archaic and simple drawing tool MS Paint over maps of the region to convey weekly traffic information across its social media platforms. The maps depict construction closures and major events across the Puget Sound region, Washington's most populous and densely populated region. According to WSDOT's blog, the maps are considered "infotainment." These maps have become the primary source of information for weekend traffic during the summer in Western Washington (The WSDOT Blog, 2024).

In 2025, WSDOT announced the return of its paint maps on Reddit on Memorial Day, along with a detailed text explanation and an additional professional map. The archetype for this professional map is actually derived from the MS Paint Map, rather than the other way around. These maps were initially developed on a white board in a PSA video in 2015. The combination of various popular events impacting traffic extended beyond traditional WSDOT technical information, which would only include construction impacts and sporting events.

Over the years, the genesis of these maps has served to inform and entertain, but also overwhelm the audience.

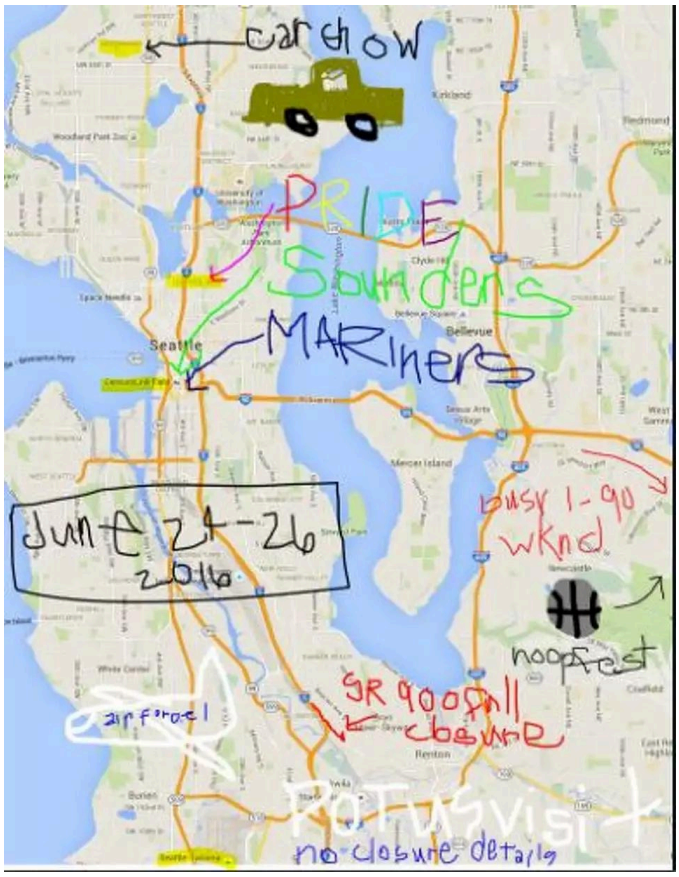

Fig 7. WSDOT's first MS Paint Map in 2016 (WSDOT Blog, 2024)

Compare this map to weekend maps in 2024:

Fig 8. (@WSDOT Instagram, 2024)

In these examples, the map itself is nearly illegible with the crowding of images. Instead, there is a clearer message: BUSY / HEAVY TRAFFIC EVERYWHERE. These maps serve less to inform navigational information and instead convey a behavioral intention: do not drive if you don't have to. A rough pixel analysis shows that the first MS Paint map covered about 10% of the map with doodles, while the labor day weekend 2024 map was 33% doodles.

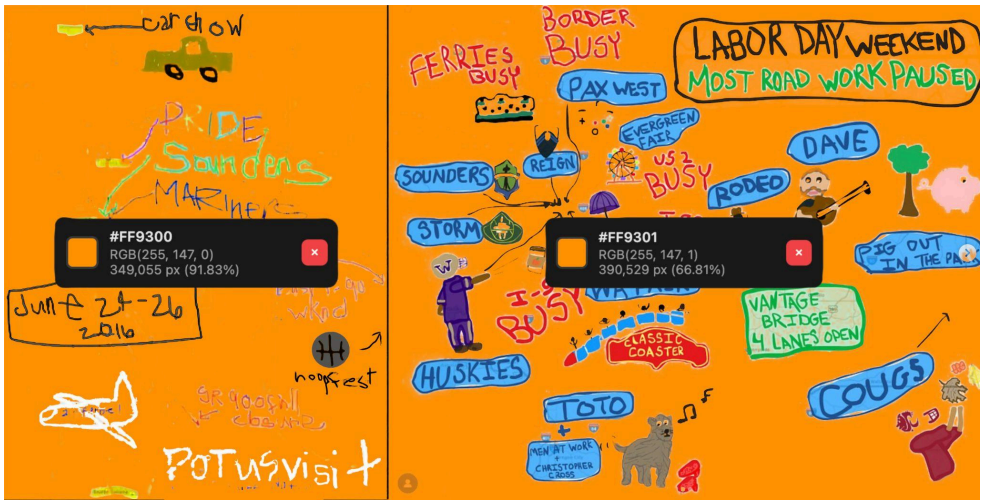

Fig 9. WSDOT MS Paint Map Pixel Analysis

Washington was among the fastest-growing states in the country from 2010-2020, and the MS Paint map campaign has evolved with it. These maps have become WSDOT's signature meme on social media, and are well-known throughout the state. As the population expanded, the maps move from a novel and risky yet community-oriented message to a low-risk, familiar, yet individually-oriented directive with fear appeals.

Content Analysis

1. Pre-existing characteristics

Demographics (FHWA Registered Drivers, 2022; FRED, 2024):

Sex		**Higher Education**	
Male	Female	Yes	No
50.97%	49.03%	41%	49%

Cultural Demographic Targeted (Vandello & Cohen,1999): Individualist Society, 37/100 Collectivist, #43 out of 50 states.

2. Message Characteristics using VDOT typologies

Intended Behavior	**Emotional Response**	**Message Theme**
General Safe driving	Humor	Pop culture

Message Cultural Appeals:

Early: Mixed

Discounting Risk Factor	**Impact Level**	**Assesment**
Miscomprehension	Low 1	Non-urgent and interpretable message
Cultural offense	Low 1	Non-sensitive subjects
Credibility Rejection	Medium 2	Sleeper effect possible
Authority Undermining	High 3	Discounting Effect
Processing overload	Medium 2	Non-urgent
Literacy barriers	Low 1	Visual medium
Overall	Medium 1.667	

Media Effects	**Collectivist Characteristics**	**Individualist Characteristics**
Audience Orientation	Community-aimed	
Risk		Medium
Humor Types	Sentimentality	Incogruity with resolution Pleasure maximization

Emotional Appeal		Non-contradictory
Humor Prevalence	High	

Later: New Mix

Discounting Risk Factors	**Impact Level**	**Assessment**
Miscomprehension	Low 1	Message Familiarity
Cultural offense	Low 1	Non-sensitive subjects
Credibility Rejection	Low 1	Message Familiarity
Authority Undermining	Low 1	Message Familiarity
Processing overload	Medium 2	High information density, non-urgent
Literacy barriers	Low 1	Visual medium
Overall	Low 1.1667	

Media Effects	**Collectivist Characteristics**	**Individualist Characteristics**
Audience Orientation		Individual-action aimed
Risk	Low	

Humor Types	Sentimentality, Fear-arousal	
Emotional Appeal		Non-contradictory
Humor Prevalence		Moderate

Public Response/ Media Coverage: High/Positive

This campaign is successful enough to continue for nearly a decade. Washington skews male, and has been #10 in education nationally for the duration of the campaign, which aligns with the campaign's humor style (McCann, 2025). Even after nine years of running, the campaign still receives parodies in 2025 from local satire websites.

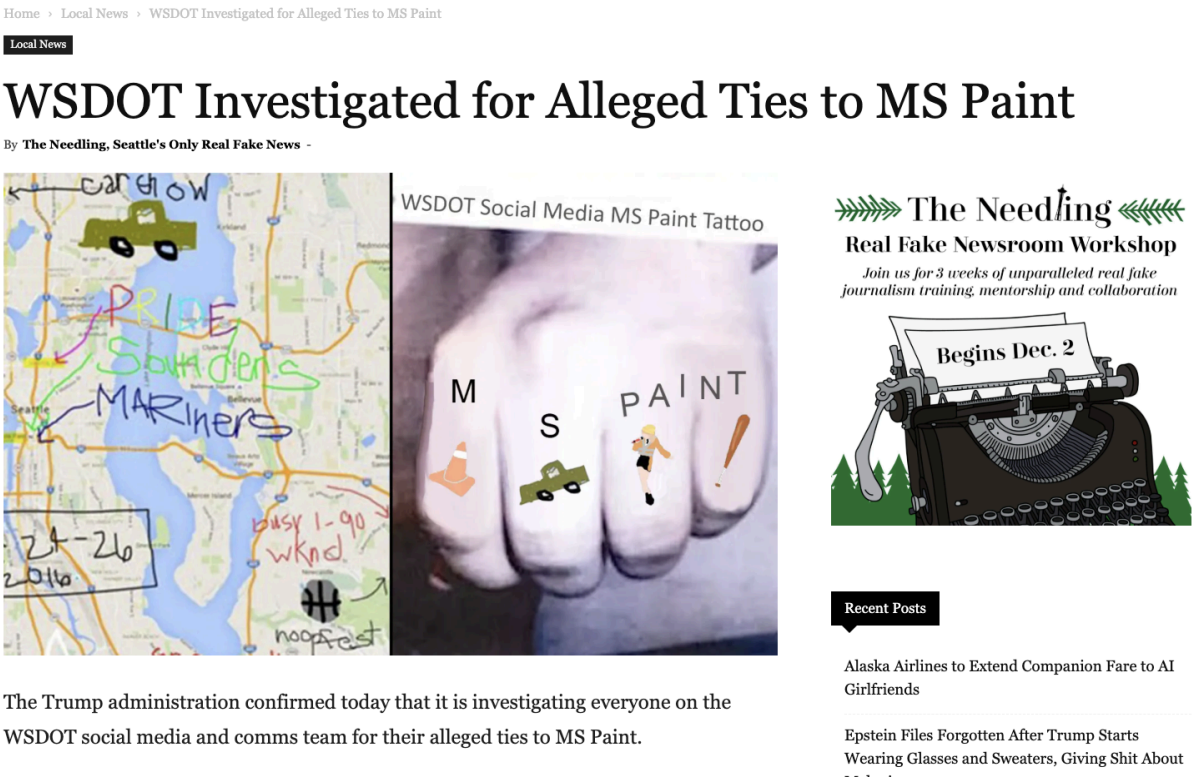

Fig 10. (The Needling, 2025)

B. Collectivist Case Study: UDOT Strategy

The Utah DOT is the most followed DOT Instagram account across all 50 states. Interestingly, the state ended its use of humorous VMS in 2022, ahead of the FHWA recommendation to cease the practice, citing that the idea was becoming stale (Axios, 2024). Utah, at 3.5 million people, has less than half the population of Washington, at nearly 8 million. Yet, the UDOT Instagram account has 16% more followers (226K vs. 194k) as of November 2025 (Instagram, 2025). The Virginia DOT, despite its endorsement of VMS humor, posts significantly fewer memes on Instagram than either of the aforementioned agencies, and has significantly fewer followers (18.4K) despite having the largest population of the three states and the highest number of posts (ibid.).

Fig 11. An informative shitpost from UDOT (@UDOT Instagram, 2024)

The WSDOT and UDOT accounts were launched in July 2015 and January 2016, respectively, and have nearly the same post count, with UDOT featuring only 2% fewer posts. The accounts also match in post frequency rate (although Utah posts slightly more frequently, as it has existed for 4% less time than WSDOT). Neither account's follower total corresponds 1:1 to individual humans or state residents; that data is not publicly available, but assuming the percentages of real individual human followers are similar, UDOT is heavily outperforming WSDOT in engagement per capita. So what has caused this discrepancy? A few possible explanations:

1. Utah is the youngest state in the country, with a median age of 31.7 to Washington's 15th youngest in the country 38.2, much closer to the national median age of 38.8 (World Population Review, 2023)

2. WSDOT's automated traffic alerts have more than 6.5x the followers of UDOT's on Twitter, and double the number of followers on Facebook. All accounts were created within 1 year of each other (Twitter, 2025).
3. The WSDOT app has five times as many downloads on the Google Play store as the UDOT app; Apple no longer discloses download counts on its app store (Google Play, 2025).

UDOT's most popular post across all platforms is as follows in Figure 12:

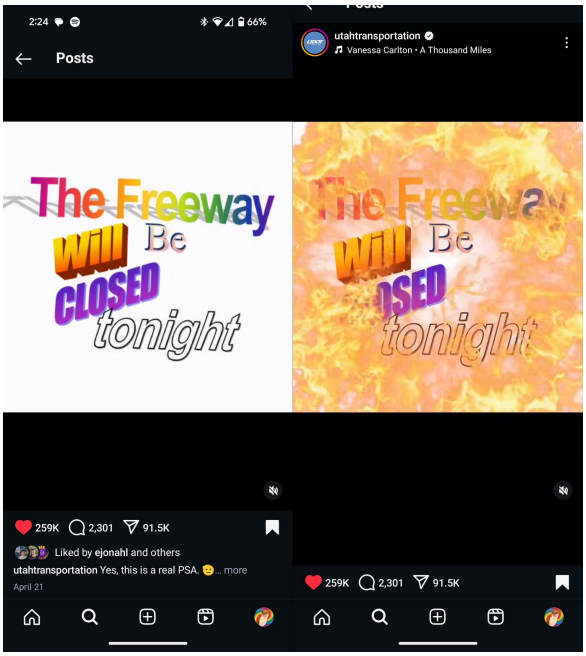

Fig 12. (@UDOT Instagram, 2025)

A freeway closure announcement in April, 2025 far exceeded the like count of any of UDOT's posts in its 9 year account history. The text of the meme itself only displays useful, factual information; the freeway will be closed. However, the humor lies in multiple absurdities; the use of early 2000s wordart, playing an early 2000s hit song, Vanessa Carlton's 1000 Miles, using cheesy visual effects reminiscent of the aforementioned era, as well as the employment of

the contemporarily trending ‘flaming circle’ effect found on highly popular contemporary nonsense memes such as “Italian Brainrot.” Here, the absurdity is unrelated to the content of the message itself; it is the irreverent effects surrounding the message allowed it to be promoted by the Instagram algorithm, spreading it globally and garnering mass attention. The post received 259,000 likes, 2,301 comments, and 91,500 shares as of May 20, 2025, one month since the initial post (Instagram, 2025). The number of likes on the post exceeds the account's number of followers, showing that appreciation for the post stretched beyond its typical fanbase.

As of December 2025, the post has garnered 380,000 likes and 3,777 comments. 46% of the posts’ appreciation came 1-7 months after the single-night road closure occurred. Notably, this content is in video format, which is more likely to be promoted by the Instagram algorithm. Multiple comments indicate a national and international reach for the announcement of this regional road closure.

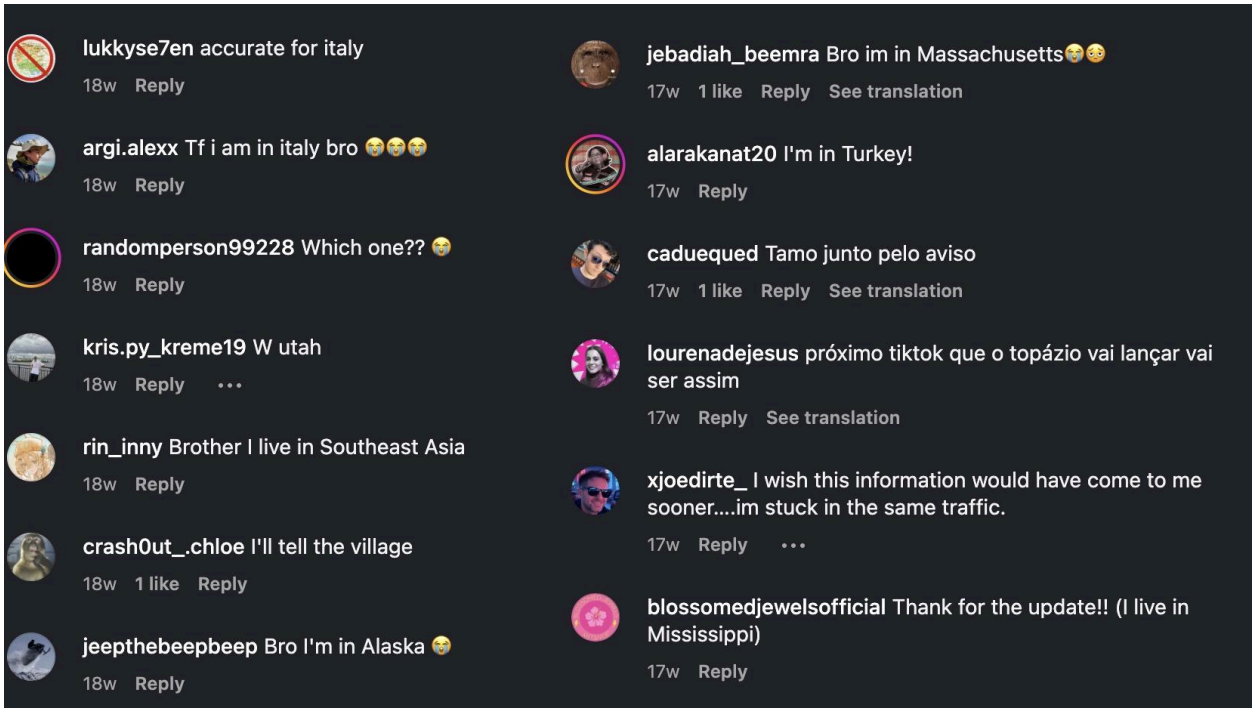

Fig 13. International reach does not imply effective reach for the target audience (@UDOT Instagram, 2025)

This post utilizes a high level of absurdity for attention and humor. While UDOT frequently uses humor on its Instagram account, most contemporary posts feature live actors and videos of real construction sites. By framing a highway closure in an absurd format, it garnered mass attention while informing the public.

Utah also presents a unique case study in America. Estimates of the states' population identifying as Latter-day Saints or Mormons range from 42-60% (Cragun et al., 2023; Pew Research, 2022). Even using the lowest estimate, Utah has the highest percentage of a single religious denomination in the population in the entire country (Pew Research, 2025). Vandello and Cohen (1990) found Utah to be the 6th most collectivist state in the U.S. A study at Brigham Young University found Mormons to exhibit collectivist tendencies, with an IDV score of 28 (0-100 scale, higher is more individualist), similar to that of Portugal or Malaysia (Lee, 2015;

Hofstede, 2025). The United States as a whole exhibits an IDV score of 91 (Hofstede, 2025). These factors result in the Utah audience representing a collectivist bubble within the United States, uniting an overwhelming plurality of state residents.

UDOT's messaging strategy does not purely appeal to collectivist preferences. The agency's consistent use of brainrotted shitposts targeting the youth demographic is likely confusing and controversial to older and more conservative members of the population. However, UDOT is subtly more conservative than its Washington counterparts, with an aversion to more "edgy" humor such as sexual references. The highest individualist aspect of UDOT's strategy is its low uncertainty avoidance; it is highly experimental, which correlates with individualist appeal. The type of humor UDOT employs is evidently sentimental and incongruity-resolution-oriented, most effective in collectivist societies. UDOT's most repeated meme format is the use of Cats With Hard Hats, which came about as early as 2021, and prominently features cute kittens. Various UDOT posts can simply be described as silly, which is an incongruity appeal.

Content Analysis

1. Pre-existing characteristics

Demographics (FHWA Registered Drivers, 2022; FRED, 2024):

Sex		**Higher Education**	
Male	Female	Yes	No
50.46%	49.54%	39.1%	60.9%

Cultural Demographic (Vandello & Cohen, 1990): Collectivist Society, 61/100 collectivist, #6/50 nationally.

2. Message Characteristics using VDOT typologies

Intended Behavior	**Emotional Response**	**Message Theme**
General Safe driving	Humor	Pop culture

Discounting Risk Factor	**Impact Level**	**Assessment**
Miscomprehension	High 3	Highly specific in-group messages and frequent incorporation of literal nonsense
Cultural offense	High 3	Confusing and disorienting to out-groups
Credibility Rejection	High 3	Overload shutdown
Authority Undermining	High 3	Discounting effect - heavy use of humor
Processing overload	Low 1	Non-urgent
Literacy barriers	Low 1	Visual Medium
Overall	High 2.3334	

Media Effects	Collectivist Characteristics	Individualist Characteristics
Message Orientation	Community-aimed	
Risk		High
Humor Types	High sentimentality, Incongruity without resolution	Pleasure maximization
Emotional Appeal	Contradictory	
Humor Prevalence	High	

Message Cultural Appeals: Lean Collectivist

Public Response/ Media Coverage: High/Positive

UDOT was dubbed Social Media Team of the Year 2025 in the Golden Post Awards by the Government Social Media Association, a trade association for government social media teams across the U.S. Two of the fourteen Golden Post Awards for 2025 were given to Washington State-based agencies (LinkedIn, 2025). The page's popularity and global reach has UDOT reaching influencer status, boosting interest in the state of Utah and interest in departments of transportation.

C. Individualist Case study: WSDOT's Greg the Geoduck

Fig 14. (@WSDOT Instagram, 2025)

Achieving nearly 60,000 likes, this is WSDOT's most popular post of September - November 2025. Another cross-promotion from UDOT can be found. Of the case studies analyzed, this post contains the most individualized and disparaging messaging.

Unlike "Use Yah Blinkah," which addresses a shared culture across the state of Massachusetts, WSDOT's messages of "CAR DOES **NOT** GO THERE" and a crossed-out vehicle driver stating "*But I'm different*" is a specific callout towards individual drivers for their inability to judge their driving abilities, which essentially criticizes an individual's flawed nature.

There are five impacted counties highlighted via MS Paint on WSDOT's map, all of which sum to less than 3% of the state's total population (USA.com, 2025). Including estimated weekend tourists for King Tide season that are targeted by these flood warnings, less than 3.2% percent of the states' population is being directly addressed (Olympic Peninsula Visitor Bureau, 2022).

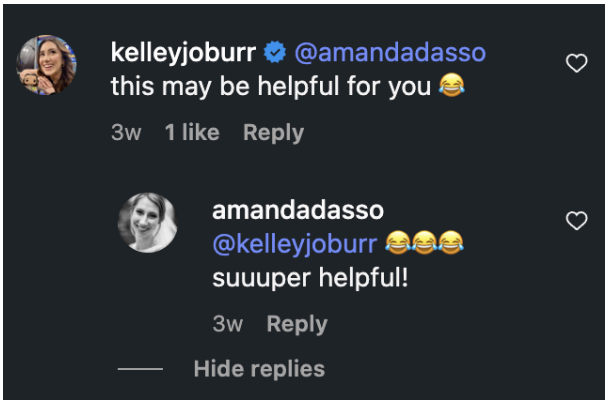

Fig 15. Commenters amused by the posts' specificity (@WSDOT Instagram, 2025).

The meme contains controversy as well. The Geoduck, a sea creature found on the Pacific Coast of North America, is a notably phallic creature; a plausibly-deniable sexual reference that did not go unnoticed by the audience. A government-sponsored penis joke is both controversial and risky, which leans towards acceptance in individualist populations. The meme employs fear arousal and strong humor, which would appeal to collectivists; however, the humor resolves in a non-contradictory instruction, which ultimately makes this meme lean towards an individualist appeal aligned with an individualist society.

Public Response/Media Coverage: High/Positive

Fig 16. Audience reactions to Greg the Geoduck (@WSDOT Facebook, Instagram, 2025)

1. Content Analysis

Pre-existing characteristics

Demographics (FHWA Registered Drivers, 2022; FRED, 2024):

Sex		**Higher Education**	
Male	Female	Yes	No
50.97%	49.03%	41%	49%

Cultural Demographic (Vandello and Cohen, 1990): Individualist Society, 37/100 Collectivist, #43 out of 50 states.

2. Message Characteristics

Intended Behavior	Emotional Response	Message Theme
General Safe driving	Humor	Holiday/Seasonal

Message Cultural Appeals: Lean Individualist

Discounting Risk Factor	Impact Level	Assessment
Miscomprehension	Low 1	Direct command
Cultural offense	High 3	Targeted fear appeal, perceived sexual innuendo
Credibility Rejection	Medium 2	Use of fear appeal, sleeper effect mitigation possible
Authority Undermining	High 3	Warranting event - audience use of sexual references
Processing overload	Low 1	Potential for sleeper effect
Literacy barriers	Low 1	Visual medium
Overall	Medium 2.166	-

Media Effects	Collectivist Characteristics	Individualist Characteristics
Audience Orientation	-	Individual-action aimed
Risk	-	Medium
Humor Types	Fear-arousal	Incongruity with resolution
Emotional Appeal	-	Non-contradictory
Humor Prevalence	High	-

D. Comparative Case Study: Collaborative Actions in Social Media

By definition, memes are meant to be shared. Traditional marketers are constantly adjusting their strategies to match trends, including utilizing contemporary memes. Traditional advertisers will comment on trending memes, even those of competitors, in order to attract attention in a viral moment. While copying memes and trend-hopping is fair in social media campaigns and often mutually beneficial, campaign strategy duplication can cause legal issues for competitors.

Unlike traditional marketers, DOTs are not only not competitors; the agencies have a shared common goal of increased traffic safety. Across social media platforms, state DOTs have liked, commented on, and boosted each other's content, even when that content is a direct copy of another DOT's campaign. Occasionally, UDOT employs MS Paint maps based on the WSDOT account, with WSDOT's blessing in the form of a like.

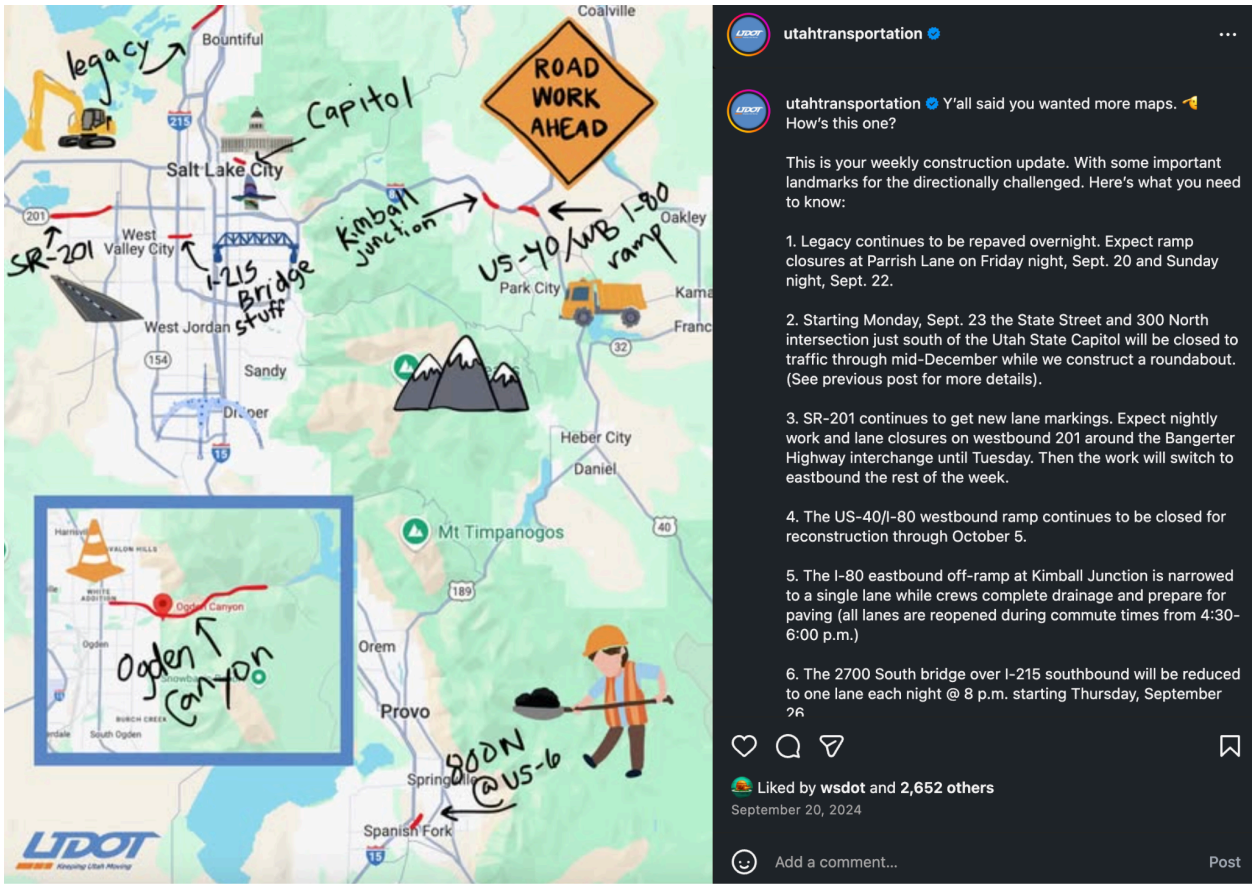

Fig 17. (@UDOT Instagram, 2024)

UDOT has also employed similar, but unique content to WSDOT when announcing heavy traffic.

Fig 18. (@UDOT Instagram, 2024)

While the MS Paint maps are an established series with a continuous format and following, this meme is in a novel format, with higher risk and the unresolved incongruity humor of having no logical relation between the image and message. WSDOT has utilized the visual crowding on MS Paint maps to convey the anxiety of congestion as a fear-arousal warning, which this meme does not attempt to do. Rather, this meme uses a random and irrelevant, visually interesting image to attract attention, offering both positive humor and a warning message simultaneously. The meme follows a contemporary format, the 'frutiger aero aesthetic' meme, nostalgically finding amusement in prevalent computer graphic styles from the mid-2000s.

Fig 19. (@UDOT Instagram, 2024)

The Arizona DOT has mimicked the humor strategy of UDOT, but missed the viral moment that UDOT achieved. UDOT's initial post garnered nearly 260K likes, while the AZDOT follow-up 4 months later received a paltry 8.5K likes, despite Arizona's greater than double population. One aspect to the lowered response is the lack of risk or novelty, another is the loss of contemporaneous humor. While the Arizona post still emits incongruous humor in a vacuum, the Italian brainrot trend was no longer in the vernacular, thus the flaming circle lost some of its trendy aspect.

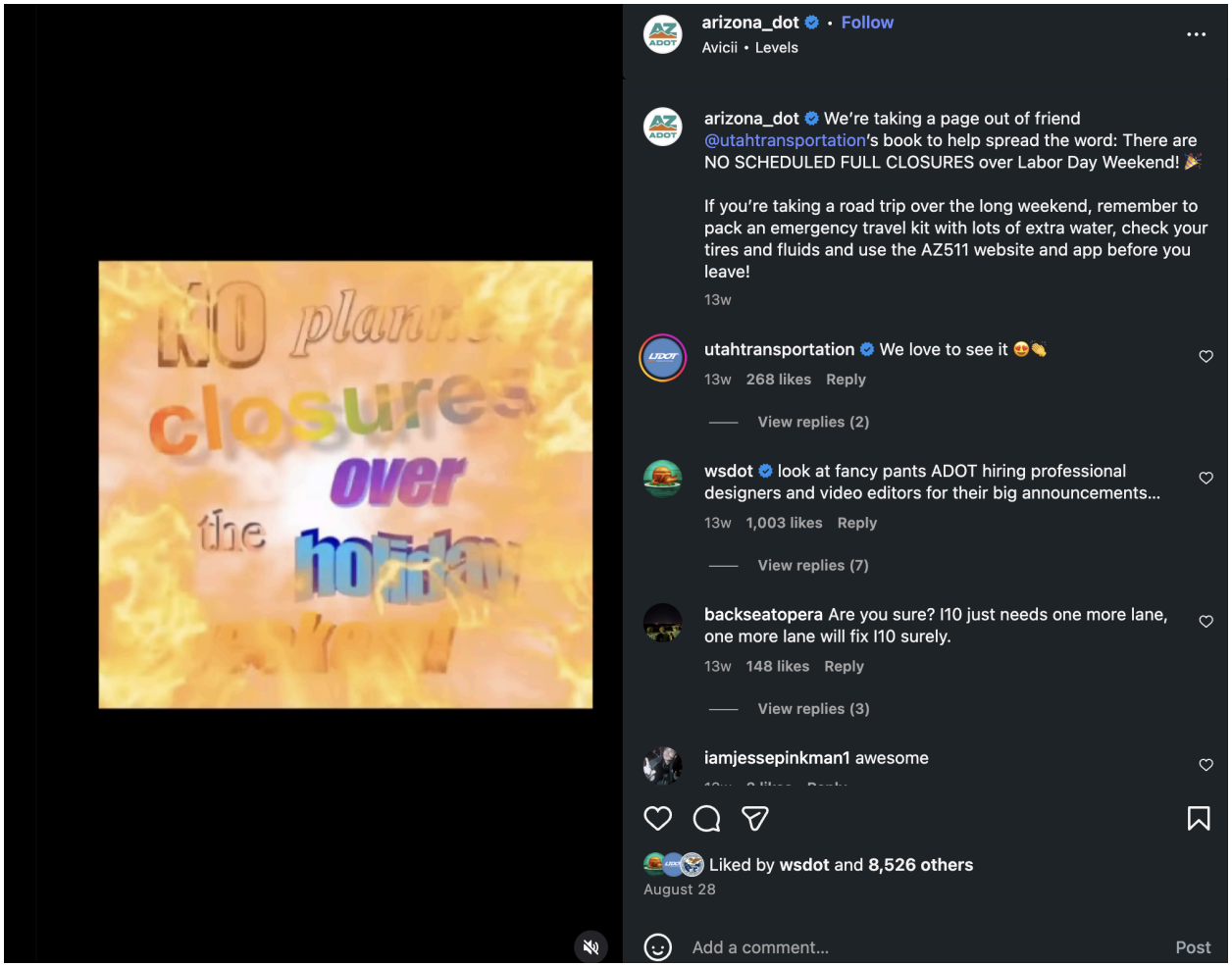

Fig 20. (@Arizona_DOT Instagram, 2025)

As WSDOT handed a like to UDOT's copycat MS Paint Map, UDOT offered a like and a comment of approval. WSDOT provided a like as well, and became the most liked comment on AZDOT's post by contributing a self-referential deprecation: "look at fancy pants ADOT hiring professional designers and video editors for their big announcements…" boosting its own MS Paint map strategy, known for its 'unprofessional' design.

There's an additional like, from the Washington State Department of Natural Resources, @WashDNR. Not only does this represent non-DOT state agencies getting in on the fun and attention, but shows a thread of collaboration across many agencies involved in the meme space.

A week earlier, WashDNR credited UDOT (in reference to its Cats in Hard Hats campaign) for inspiring a Washington-localized meme format: a Geoduck in a hard hat.

Fig 21. The Genesis of a Meme (@WashDNR Instagram, 2025)

Discussion

IX. What the Data Shows

The case studies above demonstrate how SatMDT can be used to find alignment between message characteristics and audience characteristics, and how that alignment is present across the most prevalent and famous DOT humor campaigns. What is ultimately missing is individual

survey responses for social media campaigns, and above all standardized and repeated behavioral outcome testing for pre-vetted cognitive-egonomic compliant VMS messages and any social media campaigns. Completing the framework in its entirety will allow DOTs to craft messages that are both likely to be well received and begin testing for behavioral impacts. The more data a DOT has to work with, the more these messages can be fully evaluated.

The only additional costs for a DOT come from new surveys and behavioral studies of which collection is imperative. Existing data can inform much of Steps 1 and 2, and standardized deployments of these methods can result in cost-savings which can be better distributed for Steps 3 and 4.

A. For Safety, The Jury is Out in the Court of the Jester

At present without those key components of SatMDT steps 3 and 4, arguments for and against humor's impacts on driver safety and behavioral change are moot; it has essentially not been studied yet. Agencies and researchers argue safety based on alternatives measures: attention, comprehension, engagement, brand loyalty, and public sentiment.

The studies making negative safety behavioral conclusions about humorous BTS, from Ullman et al. and Hall & Madsen, draw the same conclusions for all non-traditional messaging, blending the results of humor and fear appeals despite the science showing wildly different responses to fear and humor across gender, education, age, and cultural contexts.

Ullman et al. (henceforth BTSCRP)'s methodology raises external validity issues in various ways. BTSCRP studied messages that are double the length of the majority of VMS messages used by DOTs and drew conclusions for single-phase messages. The BTSCRP put forth that the cognitive loads of the messages in its experiment be considered equal to messages

that are physically half the size. In writing this research, it is evident that using more words does not increase information gained by the reader; it can often reduce the poignance of the overall message.

The use of CTT is questionable as an analog for driving. It has been used in the automotive industry, but to test distractions from non-driving instruments, rather than to test driving impacts while in motion. Across the science of messaging and driving, from the evolution of WSDOT's MS Paint maps to the defensive state of mind triggered when engaging a vehicle, the human brain is shown to respond to pattern recognition and familiarity with different automatic responses. The CTT is an unfamiliar program with a unique control system, which does not induce the driving response. The simulations used in Harms et al., Zhai & Ouyang, and Kondyli et al. are much more likely to stimulate the natural driving cognitive response and should be employed in future studies.

Harms et al.'s speed dip phenomenon for the control group alerted the researchers that there may be an internal validity threat to the research, as the experimental group spent prior time in testing familiarizing themselves with VMS before the simulation, leading to enhanced awareness of VMS and lower processing required than the control group. The experimental group exhibited reduced memory of the detour instruction despite equal compliance to adhere to the detour, indicating an automatic response.

> "Hence, the main difference between both groups is that the advertisements group had been repeatedly exposed to a variety of messages displayed on the VMS. In other words, the advertisements group received repeated practice with reading the sign. We believe that as a result of this repeated practice, drivers came to expect that the VMS

texts could change (in contrast to the control group). Correctly expecting a message's presence reduces response time for it." (Harms et al., 2019)

Once again, pattern recognition and automatic responses interfere with experimental design. This limitation calls for further research on repeated exposure to humor and its impacts on authority undermining and message discounting. It does not rule out humorous VMS as a useful tool nor does it make results inconclusive, as real drivers will encounter VMS repeatedly over years of driving.

VDOT's selection of single-phase messaging and careful mix of message typologies lead to very specific findings for cognitive and demographic responses for different types of messages, rather than the generalizations put forth by the BTSCRP, Hall & Madsen, and Harms et al.

Perhaps Kondyli et al. (henceforth KDOT) and Zhai & Ouyang (henceforth IDOT) have the strongest evidence for non-traditional VMS behavioral effects, each finding very specific impacts to behaviors like speeding, texting, honking, and tailgating during proper driving-experience simulations and 1-phase VMS messages.

IDOT's findings include the following conclusions:

- Use humorous messages when encouraging drivers to reduce frequency of texting and calling when driving speed is 60–90 mph.
- Avoid humorous messages when discouraging drivers from honking at another driver when driving speed is 60–90 mph.

These conclusions, while implying safety behavioral response can be triggered via humor, require significantly larger and repeated studies, and have findings with limited applicability.

KDOT found “Get Your Head out of Your Apps,” to be among the 50% of effective anti-texting VMS messages which changed driver behavior. Shealy et al. found this same message to be the most offensive of all its messages tested, calling for more research.

Shealy et al. found strong evidence of humor’s effects on message memorability and comprehension, demographic differences, and driver attitudes; but did not demonstrate that this translates to real-world behavior.

Harms et al., Hall & Madsen, and BTSCRP raise an interesting issue, as a 2-phase experiment resulted in the control group’s drivers slowing down in anticipation of the second half of the message. While all FHWA guidelines and cognitive-ergonomic findings urge salience and brevity, why should 2-phase messages be employed at all, especially in the instance of BTS, which is generally extraneous information?

Hall & Madsen employed negative statistics, fear appeals, and 2-phase messages during their survey period. Hall & Madsen concluded that BTS messages as a whole increase danger. Working from the data alone and not the authors’ conclusions, the three aforementioned studies are all in agreement: 2-phase messages appear to cause un-conditioned drivers to slow in traffic. Harms et al.’s control group, Texas’s real population, and the BTSCRP experimental group all suffered worse driving performance when encountering 2-phase messages.

The cases put forward represent five nominal successes and one subset of failures in the VMS messages that were used to create the guidelines on how to avoid repeating those mistakes. The success that started it all, ‘USE YA BLINKAH,’ has not been followed up with a behavioral study testing turn signal compliance across Massachusetts in the decade plus that has followed the continued use of the campaign. Nor is there evidence tying WSDOT’s paint maps to driving pattern shifts, or Greg the Geoduck’s warning preventing any low-risk-averse drivers from

testing their vehicle's seaworthiness (upshot: there are no news articles reporting any car wash-aways on the Olympic coast the week of November 4th, 2025).

There is only one behavioral trend that is measurably tied to DOT humor strategies across the existing studies; increased awareness, source-liking, and appreciation for the DOT. From boomer-humor one-liners on VMS to esoteric Gen-Z memes online, there has been a measurable increase in the public's opinion on and engagement with the DOT. These behaviors are critical for a government organization, as it ultimately works for the public.

As the purveyors of construction and the blame-takers for all traffic backups, DOT employees are likely to have a negative interaction when encountering a member of the public. DOT employees across the country even face death threats (Baruchman & Beekman, 2018). Boosting public sentiment and fostering collaborative engagement has emerged as a conclusive result of the use of humor, and its longitudinal impacts have yet to be studied.

The frameworks that have emerged to study message acceptance, retention, and appreciation can now be utilized to inform robust behavioral studies on real-world safety implications for humor.

B. Limitations and Safety Implications

Most behavioral studies agreed that the presence of an unfamiliar 2-phase VMS causes a temporary slowing in driving speed. Shealy et al. provides neurocognitive data showing enhanced brain activation with humorous messages, but brain activation does not equate to behavior change. Basso et al. provides rigorous behavioral tracking but only for specific actions (speed reduction, lane changes) in specific contexts, missing the broader effects on driver alertness and long-term safety behavior patterns, especially from alternative messaging.

1. Driver Distraction

As far as humor's direct impact on distraction, that falls under behavioral response, which is still not studied in a vacuum that mitigates external risk factors including message overload from text length, miscomprehension from cognitive-ergonomic issues unrelated to the humor, and dual-phasing's attention overload.

2. Message Discounting and Institutional Authority Concerns

Harms et al. is the closest to finding data on potential adverse effects from message discounting due to repeated exposure to humor, and found none. Following, Profitt & Wade, and Oliver et al. would concur with Harms' finding that repeated exposure correlated with a positive effect. However, the increased performance of the advertisements group can only readily show that those repeatedly exposed to 2-phase messages can anticipate a second message when encountering a 2-phase VMS and reduce the slowing effect, not that humor increased or decreased behavioral compliance. More research is needed to find the longitudinal impacts on repeated exposure to humor and message discounting from authority undermining.

C. Equity Issues

Fear appeals, rather than humor, appear to have more conclusive behavior and safety implications than humor. While fear has been found time and again to be effective for female persuasion, it is also dangerous to be exposed to fear appeals while driving. Fear appeals could therefore be used exclusively on social media, but that leads to ethical considerations.

Shealy et al. found multiple conclusions related to race, gender, and locality. Classical marketing studies reviewed in Oliver et al. and Weinberger & Gulas find specific effects when targeting demographics. Utilizing this data for any campaigns must be ethically vetted, especially

social media campaigns that can be hyper-targeted. In the most straightforward example, DOTs should not immediately begin bombarding women on social media with ads containing fear appeals for targeted driving behaviors. There are no longitudinal studies on repeated fear appeals impact on behavior, just as there are no studies showing repeated exposure to humor's long-term impacts on driving behavior or long-term and repeated impacts on undermining authority and message discounting.

The evidence suggesting humor works best for specific demographics (young, male, educated) raises equity concerns for a safety infrastructure that must serve all road users. Humor creates in-groups and out-groups, which in part forms its persuasive ability, but it can just as easily be dissuasive and create inequitable outcomes. While targeting the correct audience using social media's enhanced ability can mitigate these factors, nothing is perfect. VMS humor and social media humor alike can still offend and injure, and humor appeals should be carefully tested through SatMDT and vetted to maintain equitable outcomes.

X. Recommendations

A. Maintaining Equity

1. VMS: When and How Humor Can Be Appropriate

While incongruity is the inherent starting point for all humor, it can be expressed in vastly different ways. Multiple studies comparing various countries found clear cultural differences in types of effective humor, from sentimental humor to disparaging humor, with cultural dimensions such as uncertainty avoidance, individualism/collectivism, and masculinity/femininity, and race influencing both humor preferences and efficacy. The evidence

strongly supports the need for culturally-informed humor strategies in international advertising, with particular attention to local cultural values, communication styles, and humor preferences, which leads to the need for a framework for effective messaging.

Oliver et al. consistently shows that humor is highly effective at attracting attention. Advertising practitioners widely believe humor is a superior way to gain attention, and empirical studies support this finding across various media, including magazines, television, and radio.

The literature on humor in advertising shows that humor does not consistently offer an advantage over non-humorous appeals for increasing persuasion. Some studies indicate positive effects on persuasion, but these are often qualified by factors such as the audience's gender, their prior brand attitude, and the intensity of the message. Stefanidis et al. concludes that humor "may be persuasive but probably no more so than non-humor."

For VMS, the primary goal is to modify problem behaviors or maintain safety-conscious behaviors, which directly relies on clear comprehension and persuasive power. If humor distracts, confuses, or increases cognitive load, it undermines the core persuasive objective in a safety-critical context, even if it succeeds in grabbing attention. Excessively humorous messages might entertain without effectively conveying the safety message. The bottom line for practitioners is that VMS messages should stick to cognitive-ergonomic guidelines whether humorous or not. VMS messages should always convey information as simply and short as possible.

2. Avoiding potentially offensive or exclusionary humor

DOTs should implement a multi-stage review process involving community representatives, particularly when serving linguistically diverse populations, and consider the intersectionality of humor, ensuring that jokes don't inadvertently target or exclude based on age,

gender, race, socioeconomic status, or disability. Additionally, agencies should distinguish between humor that builds community (such as shared experiences of traffic frustration) versus humor that excludes, favoring universal themes like holiday travel chaos or construction delays that resonate across demographic lines.

3. **Audience Testing**

Pre-testing with representative audience samples, following the SatMDT approach, can identify potentially problematic content before public deployment, while establishing clear escalation procedures for addressing community complaints ensures responsive adjustments to campaign strategies. The research points toward several principles for developing humor that serves equity goals rather than undermining them:

- Maximize Universal Incongruity: Humor based on unexpected juxtapositions or absurdity that don't require specific cultural knowledge may reach broader audiences than reference-based humor. The Utah DOT meme's success derived partly from visual absurdity comprehensible without detailed knowledge of internet culture.
- Test with Representative Samples: The SatMDT framework's emphasis on pilot testing with actual target audiences before deployment becomes critical for avoiding inadvertent exclusion. Multi-stage review processes involving community representatives from diverse demographic groups can identify problematic content before public deployment.
- Distinguish Community-Building from In-group Creation: Some humor fosters community around shared experiences (traffic frustration, construction delays, holiday travel chaos) that transcend demographic lines, while other humor creates in-groups defined by cultural knowledge, language fluency, or subcultural participation. DOTs should favor the former.

- Employ Platform-Specific Approaches: VMS humor should prioritize accessibility and broad comprehension due to its safety-critical, time-constrained context. Social media platforms allow more demographic targeting, niche content, and experimental approaches since users control their engagement and messages aren't processed while driving.

B. A Multi-Tier Communication Strategy

Rather than ~~ban dancing~~ eliminating humor, DOTs should develop integrated communication ecosystems that deploy different approaches for different audiences and purposes:

Tier 1 - Critical Safety Information

Serious, direct, standardized messaging for immediate hazards, emergencies, and high-stakes safety warnings. No humor. Maximum clarity and urgency.

Tier 2 - Behavioral Safety Campaigns

Strategic humor deployment for BTS messaging about seatbelts, impaired driving, distracted driving, aggressive driving. Use evidence-based approaches tailored to target demographics. Maintain serious alternatives for audiences less responsive to humor.

Tier 3 - Traffic Information and Event Planning

Moderate humor acceptable to soften bad news (closures, delays) and increase information spread. WSDOT's MS Paint maps exemplify this tier—useful information delivered in mildly entertaining format.

Tier 4 - Community Building and Brand Development

Social media humor that doesn't directly communicate safety or traffic information but builds relationships, demonstrates agency personality, and maintains follower engagement between information-critical messages. This tier creates the foundation for Tier 2-3 messages to reach engaged audiences.

C. Summary of Recommendations for Successful Humor Implementation in Comprehensive Safety Campaigns

VMS and Social Media are different platforms with different purposes. A shortlist of message design priorities maximizes each platform's strength while minimizing weaknesses. Below is a list of best practices that apply universally, and those that are platform specific.

Universal Message Design Priorities:

- Optimize for both attention and comprehension
- Pre-testing approaches for equitable outcomes
- Utilize contextual factors and tiered approaches for platform selection
- Audience segmentation approaches for message targeting
- Behavior outcome measurement and continuous improvement

VMS Design Priorities:

- Immediate comprehension (8-second window)
- Broad accessibility (weak readers, diverse populations)

- Minimal distraction from driving
- Clear behavioral directive
- Memory aids (rhyme, simple repetition)
- Avoid abbreviations, scrolling, animation
- Center text, new thoughts on new lines
- Each phase must be understandable independently

Social Media Design Priorities:

- Attention capture to break scrolling inertia
- Shareability and viral potential
- Community building and participation
- Brand personality consistency
- Algorithm awareness (platform-specific mechanics)
- Multimedia integration where effective
- Engagement invitation (comments, shares, responses)
- Posting consistency and rhythm

Conclusion

The evidence examined throughout this research defies reductive conclusions about humor's efficacy in traffic safety communication. Humor is neither universally effective nor categorically inappropriate; rather, its value depends critically on implementation quality, platform selection, audience characteristics, message design, and institutional context.

Behavioral studies are greatly lacking, and instead existing research points towards efficacy for audience engagement and reception.

The unprecedented engagement achieved by UDOT, WSDOT, and other agencies using humor strategically suggests these approaches can build relationships between transportation agencies and publics that enhance information spread and civic participation beyond what traditional serious messaging accomplishes.

Future research requires moving past binary debates about whether humor should be "allowed," toward evidence-based strategies that deploy humor selectively where research suggests it works, maintain traditional approaches where they remain effective, and continuously evaluate outcomes to refine practices. Transportation agencies should view humor as an additional tool in comprehensive strategies that serve diverse audiences through multiple approaches.

Ultimately, the question is not whether humor can be effective at the DOT, rather when, how, and for whom. The research provides substantial guidance for answering these questions, even as critical gaps remain. DOTs willing to invest in systematic audience research, rigorous message testing, ongoing behavioral evaluation, and sophisticated communications expertise can develop humor strategies that enhance safety communication efficacy. Those implementing humor without this foundation risk undermining institutional credibility while failing to achieve meaningful safety improvements, capturing attention without accomplishing the behavioral change that justifies transportation safety communication investments.

XI. Future Research Directions

A. Methodological Improvements

1. Imminent and Longitudinal Behavioral Studies

The largest gap in the research is the longitudinal impacts on repeated exposure to humor and its impacts on message discounting from authority undermining or attenuation through repetition. Immediate behavioral impact studies are limited in applicability. As humor appears to be here to stay for the moment, populations should be studied over months or years as agencies implement humor strategies in VMS and online. Compare regions using humorous VMS versus and/or memes and control regions using traditional messaging approaches examining crash rates, citation rates, and observed behavior changes at scale.

2. Optimal frequency and saturation

As demonstrated by UDOT's retirement of VMS humor due to 'staleness,' and the changing characteristics of WSDOT's MSPaint maps as they approach 10 years old, how does time and repetition change the efficacy of humor? At what point does humor become expected rather than surprising, reducing its efficacy? Can humor strategies wear out through overuse, or does a consistent humorous voice build efficacy over time as it loses risk factors and credibility undermining?

3. Multi-method triangulation

Combine neurocognitive measures, behavioral observations, self-report surveys, and engagement metrics to develop comprehensive pictures of humor efficacy across dimensions. No single method captures the full picture, but convergent findings across methods build confidence.

4. Natural experiments

When DOTs change communication strategies, treat these as opportunities for rigorous evaluation rather than merely implementing and moving on. The FHWA guidance against humor

created natural experiments as some agencies complied while others have brazenly continued previous practices. Analyzing outcomes across these different approaches could yield valuable insights.

5. 2-Phase Efficacy

The research has illuminated a common thread among studies that have negative conclusions on humor: the utilization of 2-phase messages. While 2-phase VMS may be necessary for non-traditional messages with instructions that cannot fit in only three lines, their impact on cognitive load for non-urgent BTS messages appears to increase danger to groups without repeated exposure, which should be studied.

B. Emerging Technologies and Platforms

1. Autonomous vehicles

The majority of this research has been shaped by the advent of the internet and proliferation of GPS. The transition to real-time traffic visual information available in every passenger vehicle over the last 25 years has changed the dynamic for what type of information transportation agencies focus on communicating. While certain hazards like immediate accidents and temporary lane changes still require VMS messaging, drivers have other sources to learn about delays along their route, as well as road closures and detours that are submitted to GPS providers by transit agencies or learned by the GPS provider through location data or user reporting.

Looking to 2050, the next paradigm in driving dynamics is clearly the rise of autonomous vehicles, which are operating on the roads today. While current autonomous vehicles are programmed to recognize human-oriented road signs, there may be a tipping point where a much

simpler computer-recognized visual system becomes more efficient to implement. Alternatively, traffic data could become a fully invisible layer communicated between vehicles or from DOTs to vehicles wirelessly. DOT communications could change in a number of ways: from VMS becoming obsolete and solely used for BTS campaigns and humor, to traffic communications to the public becoming somewhat irrelevant.

2. New social media formats

Social media is continuously becoming more video-centric as processing power increases. Computing power continues to rapidly improve as AI demands push chips further than ever. While changes in vehicle technology will certainly be the driving force behind shifts in road dynamics, social media is also rapidly evolving. In 2014, Facebook was the dominant social media platform, with Twitter rapidly on the rise. Today, Instagram is the universal platform for images, while TikTok dominates engagement. Smartphone technology has plateaued for the moment, but the way we communicate, and therefore DOT communications, will continue to change with time.

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Appendix

Theoretical Frameworks Reviewed

Theoretical Framework / Model	Core Focus	Key Mechanism	Application to VMS	Application to Social Media
I. Foundational Mass Media & Effects Theories				
Social learning theory (SLT) and the Attention Economy	Explains media effects through observational learning, self-efficacy, and outcome expectations, especially regarding imitation (inhibitory/disinhibitory) and behavior change (e.g., aggression, health).	Attention → learning	Initial attention must be captured to begin comprehension	Enables behavioral modeling through attention-gathering messages, attention economy competition
Limited Capacity Model of Mediated Message Processing (LC4MP)	Explains how message features stimulate motivational systems, which then impact attention, encoding, storage, and retrieval of information, ultimately underlying media messages' effects on knowledge structures and decision-making.	Limited cognitive resources must be allocated	Critical, is the source of the 8 second constraint to comprehend messages at average driving speeds	Less critical - unlimited time
Elaboration Likelihood Model (ELM) and Heuristic-Systematic Model (HSM)	A dual-process model explaining attitude formation or change via two routes (central or peripheral), depending on motivation and ability to process mediated stimuli.	Central vs. peripheral routes	Risk of peripheral processing and message discounting	Allows central route engagement
Message Discounting	The multiple avenues by which a message, although perceived and processed, is discarded	Attention ≠ persuasion	Major concern for VMS being ineffective	Mitigated by sleeper effect

II. Basic Persuasion and Attitude Change				
Protection Motivation Theory (PMT) and Extended Parallel Process Model (EPPM)	A framework used to explain why people are motivated to protect themselves from danger and how danger control leads to message acceptance and a fear appeal model that expands on the PMT to include assessing message threat (severity, susceptibility) and efficacy (response, self-efficacy) in predicting behavioral responses.	If severity + susceptibility > response + self efficacy = message is discounted	Major concern for VMS fear appeals creating real danger	Mitigated by lack of risk involved in social media but draws ethical concerns
III. Narrative, Entertainment, and Identity Impacts on Behavioral Change				
Entertainment Overcoming Resistance Model (EORM)	Suggests that narrative entertainment can reduce resistance to persuasive messages by promoting immersion and reducing counter-arguments.	Masking persuasive intent	Reduces reactance	Fosters parasocial relationships
Affective Disposition Theory (ADT)	Explains enjoyment based on viewers taking emotional sides with characters and anticipating narrative outcomes (e.g., desiring pleasure and avoiding pain).	Affective dispositions to characters	Low due to limited character development in VMS	Full character/personality building
Warranting Theory	Authenticity of a message is verified and reinforced through the social dynamic of likes and shares by likeminded individuals	Authenticity = social appreciation	N/A	Important for overcoming message discounting
IV. Cross-Cultural Audience Paradigms				

Empirical Demographic Impacts	Gender, race, age, education, wealth, and other factors have measurable impacts on an audience's humor preference	Humor appreciation is shaped by life experiences	Local audience must be understood when crafting messages	Social media metrics can greatly inform audience targeting
Individualism vs. Collectivism	A widely used cultural dimension explaining differences in goal emphasis (personal vs. group) and communication effects, such as in advertising.	Cultural contexts shape humor preferences	Directly impacts message efficacy through humor appeal used	Directly impacts message efficacy through humor appeal used
V. Philosophical Models				
Governmentality (Foucault)	A macro-level theoretical tradition used to analyze how governing occurs through communication techniques, such as public hygiene posters and non-imposing text.	Perceived power dynamics between the government and citizens shape message acceptance	Impacts audience perceptions of voice	Impacts audience perceptions of voice
Labor Theory of Value	A Marxist economic theory central to critical analysis of capitalist forms (often rejected or revised by post-Marxist and Foucauldian discourse in the sources).	Humor alleviates mental labor at risk of message discounting	Directly impacts message efficacy through humor appeal used	Directly impacts message efficacy through humor appeal used
VI. Applied Frameworks				
Epidemiological Models (for Memes)	Used to classify and analyze memetic engagement in influence campaigns through a construct of message intent to **inoculate, infect, or treat**, its underlying concept, drawing on the pseudo-biological concept of memes.	Memetic engagement spreads in a traceable, viral manner	N/A	Informs message crafting and spread

Step approach to Message Design and Testing (SatMDT)	A conceptual framework devised to aid the development and evaluation of persuasive health messages, incorporating social psychological theories.	Four-step framework applying the theories above into a system to design and test message efficacy	Directly impacts message efficacy through tested methodology	Directly impacts message efficacy through tested methodology

Glossary

Brainrot: Oxford University defines "brainrot" as the following: 'Brain rot' is defined as "the supposed deterioration of a person's mental or intellectual state, especially viewed as the result of overconsumption of material (now particularly online content) considered to be trivial or unchallenging. Also: something characterized as likely to lead to such deterioration". In 2024, brainrot was Oxford University's word of the year, due to its newfound cultural prominence and 230% surge in use year over year, specifically referring to online content.

> The first recorded use of 'brain rot' was found in 1854 in Henry David Thoreau's book Walden, which reports his experiences of living a simple lifestyle in the natural world. As part of his conclusions, Thoreau criticizes society's tendency to devalue complex ideas, or those that can be interpreted in multiple ways, in favour of simple ones, and sees this as indicative of a general decline in mental and intellectual effort: "While England endeavours to cure the potato rot, will not any endeavour to cure the brain-rot – which prevails so much more widely and fatally (Heaton, 2024)?"

Shitpost: Merriam-Webster defines "shitpost" as: to post something online (such as a comment, video, or meme) that is deliberately absurd, provocative, or offensive

Meme: Merriam-Webster defines “meme” as an idea, behavior, style, or usage that spreads from person to person within a culture. In modern contexts, memes refer to such concepts as they spread through the internet, often in the form of image or video content.

Twitter: The text-based social media platform now known as “X.” For the purposes of reducing confusion surrounding the use of a single letter and also not sounding stupid, this paper will hereby only refer to the platform as Twitter.

Trolling: (Slang) posting deliberately offensive or provocative messages online

VMS: The term this paper will standardize to refer to Variable Messaging Signs, alternatively known as Changeable Messaging Signs (CMS), or Dynamic Messaging Signs (DMS) or messaging boards or matrix signs. All of the above names refer to programmable electronic traffic signs designed to give travelers information controlled by the transportation authority.