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Information sharing in government: How public organizations can use technological and communication advancements to protect citizens

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Abstract

This paper examines how governments can maximize their communication outreach to offer the most protective layers to citizens in a crisis. Utilizing available literature and data on existing government communication methods and citizen participation, this paper investigates the relationship between government communication and informed citizens. The research uncovered a weak correlation between citizen participation and the strength of an e-government. Additionally, an increase was found between traffic to e-government models such as websites and social media during times of crisis. The results of the research determined there was significant importance in developing these communication systems to be accessible in a crisis, despite general low citizen engagement. This research presented an innovative approach to the collection of data on government communication development and citizen outreach in a crisis, bringing the two subjects together into one framework. Future research could be conducted to study the application of crisis information by citizens when access barriers are removed. Practical implications. This paper provides governments with a clearer understanding of how to protect the maximum number of citizens in a crisis with strong communication systems. With this knowledge, governments can further investigate this research to determine the best communication methods to protect citizens in a crisis. This research posits a theory of connection between government communications, and the number of crises informed citizens.

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1. Introduction

In recent years, the number of public safety crises has steadily risen. Public safety has become a top priority for government agencies, from public health emergencies to weather-related disasters. In a crisis, it is

imperative that government agencies can disseminate information to their citizens in a timely and effective manner. Citizens increasingly depend on this communication from their government agencies. As technology has advanced, government agencies have been presented with new ways to help communicate with their citizens. As citizens have created a more online lifestyle, governments must find ways to adapt their civil service models to meet these needs. With the invention of social media, government communication has never been easier or more open, but governments must determine how to best use modern technology to their own individual advantage. However, it is imperative for public organizations to determine how to use these rising technologies to best engage their citizens.

1.1. Problem Statement

With the evolution of technology, government agencies are provided with a multitude of options to connect with their citizens and spread information. However, not all the communication methods are equally effective when it comes to connecting with citizens. Public organizations must determine which method of communication is the most effective in disseminating this life-saving information to their citizens. This research aims to determine how governments can establish these communication channels between governments and their citizens. Additionally, it will explore the challenges faced in implementing effective communication strategies and identify the best practices for overcoming these obstacles. Understanding citizen behavior and preferences will also be a key focus to ensure the development of tailored and responsive communication methods. Ultimately, the goal is to enhance government-citizen engagement during critical times.

1.2. Purpose of Study

The purpose of this research is to understand the relationship between public organization communication and its connection to citizens. This research will examine this data to determine the best way to connect public organizations to citizens in emergencies. The data collected will come from survey questionnaires as well as from researched literature. Additionally, the study will explore how communication strategies impact citizen trust and response during critical situations. By identifying effective communication methods, this research aims to provide recommendations for improving emergency management practices. Ultimately, the findings will contribute to strengthening the relationship between public organizations and the communities they serve.

1.3. Significance of Study

Reaching citizens in these moments of crisis can help to save lives and protect citizens. When citizens can be effectively notified in time to evacuate, take precautions or change their plans, they can save valuable moments in times of need. This research can help public organizations understand how they can best reach citizens in these times of crisis to deliver the important information they need. By breaking down where the communication barrier lies, public organizations can develop better communication infrastructure to communicate with their citizens more easily.

2. Literature Review

2.1. Creation of Information Platforms

The purpose of government communication is to create a better understanding of government ideas, policies, and institutions. Government communication, in essence, works to create a harmonious relationship between public agencies and citizens. As citizen approval of policies being pursued is crucial to their success, agencies must win over public favor (Minaeva, 2019). It is important to utilize existing information platforms to create this relationship between the government and its citizens. Some of these existing platforms include social media, government websites, and public service announcements, which can all serve as vital tools for engaging and informing the public effectively (Mengzhong Zhang & Bhattacharjee, 2024). By leveraging these platforms, governments can build trust and foster active citizen participation.

Social media has created an easy and low barrier for individuals to connect online. Social media platforms have made it extremely challenging for Public Information Officers to adapt their communication methods (Graham, 2014). Graham (2014) also explains that social media has created a way for governments to be more open in their communication with citizens, creating an open dialogue with their citizens. Chun, Shulman, Sandoval, and Hovy (2010) also discusses what the relationship would look like between a government and its citizens using social media.

Social media also presents unique factors when it comes to government policies and protections. As it is new and uncharted territory, many government policies are not yet up to standard to ensure the creation of social media policies that are relevant and up to date (Bertot, Jaeger, & McClure, 2008). Some of the issues around social media policies include security, especially as government agencies are often dealing with security and private concerns. As more citizens move towards online, there are many platforms available for government agencies to use. Governments can exercise more creativity and innovation when it comes to

trying to create more of an open relationship with citizens online (Criado, Sandoval-Almazan, & Gil-Garcia, 2013).

The research also leads to e-government. E-government is a form of online government model where government agencies can connect with their citizens online and provide them with information. Chun et al. (2010) described a government 2.0 stage of e-government using social media platforms. Minaeva (2019) notes that one of the most effective ways to win this public favor is transparency in the decision-making process, when forming policies. The research then uncovers that government communication is carried out on a multitude of levels. These levels include face to face, through television communication, billboards, and the Internet (Minaeva, 2019).

There are various methods and tools used by the government to construct information platforms. The elastic scalability of cloud technology allows government agencies to quickly adjust computing resources based on need. On a similar level, big data technology provides accurate and comprehensive data support for government agencies (Yao, 2024). Big data technology promotes intelligent and personalized government services by allowing agencies to analyze trends and citizen behavior patterns effectively. By analyzing the data provided, government agencies can adjust their methods to improve citizens' experiences, ensuring that services are more responsive and tailored to individual needs. The application of artificial intelligence and machine learning can also prove to be a valuable tool in the development of government information platforms (Yao, 2024). Additionally, these tools can help in creating more interactive and user-friendly platforms for citizens, improving overall accessibility and engagement.

Wentz et al. (2014) specifically targets the accessibility of emergency alert sign-ups in the northeastern United States and is its own standalone piece of research. The information in these alerts is crucial for citizens to receive, and often the most popular way for citizens to sign up to receive said alerts is through an online registration link. It has been noted that many of these websites are inaccessible for those with disabilities to use. There are various types of accessibility models that are available for people with disabilities to be able to access websites, such as screen readers. Wentz et al. (2014) found several violations across websites.

2.2. Creation of M-Governments and E-Governments

Information and communication technology in government is a new concept according to the research conducted. Some of the research provided finds varying degrees in the effectiveness of ICT. Some researchers assert that ICT can create more open, effective and efficient delivery of public services through the m and e government (Ingrams, 2015). Some research finds that ICT can raise civic engagement and behaviors. Combining ICT with e-government and m-government can create successful citizen engagement (Ingrams, 2015). When used properly, e-government can help to create more public value at the local level. Citizens become more involved with the decision making and deliberation processes (Lee-Geiller & Lee, 2019). ICT can be used to form successful e-governments. E-government is the government's use of technology to exchange information and services with its citizens (Kumar & Sinha, 2007). These authors also explain that e-government can extend to non-internet related services between government and citizens, including pagers, fax and cell phones. Kumar and Sinha (2007) explain that there are several subcategories of e-government.

There are several subcategories of e-government including m-government, or mobile government, u-government or ubiquitous government, and g-government or GIS/GPS applications for government (Kumar & Sinha, 2007). The authors then explain the difference between e-government and m-government. The article explains that m-government is a subset of e-government, utilizing ICTs limited to mobile and/or wireless technologies such as cellphones. M-government can make government services and public information available anywhere and anytime. M-government also provides convenience to citizens by allowing them to save time and energy by accessing the internet and government networks through personal devices (Kumar & Sinha, 2007). E-government provides citizens with ways to access the government in a low barrier way. Citizens can use e-government to pay their bills, apply for fines and permits in one quick go (Mensah & Mi, 2018).

There are a few critical issues in m-government that emerged from the research conducted. These issues include privacy and security concerns, as well as accessibility challenges (Kumar & Sinha, 2007). Ensuring the security of personal data on mobile platforms is crucial, as citizens need to trust that their information is protected. Accessibility remains a challenge, especially in ensuring that mobile applications and services are inclusive and accessible to people with disabilities. However, Mensah and Mi (2018) note that factors such as gender and age do not have a great impact on citizen involvement with e-government. Additionally, there are issues related to content and presentation management, as not all applications are compatible with wireless or mobile platforms (Kumar & Sinha, 2007). Agencies must carefully design and optimize online content for mobile use, considering diverse devices, screen sizes, and user interfaces to provide a seamless experience for all users. Furthermore, ongoing maintenance and updates are necessary to ensure these applications remain secure and accessible as technology evolves.

Some of the ways m-government can connect with citizens is by sending mobile emergency alerts and using mobile technology with police to report information back in real time (Almarashdeh & Alsmadi, 2017). Joseph and Lee (2015) discuss the use of mobile devices for the delivery of emergency notifications to end

users from a mobile government perspective. The fourth phase, and the phase this research will discuss most heavily, is establishing an effective communications method (Joseph & Lee, 2015). There are various methods of emergency communication and response being used by government agencies. The first method is ENS, or emergency notification systems. This is a first level emergency response reporting system. Information shared with a 911 dispatcher then triggers various steps to emergency response and in turn, citizen notification. Governments often use short messaging systems or SMS to deliver messages to citizens (Joseph & Lee, 2015). M and e-government also becomes helpful in times of crisis.

Following the COVID-19 pandemic, ICT usage has grown rapidly. This is especially true in cases where it can help citizens in ways beyond providing information. When finding ways to encourage citizen usage, there are a few key takeaways citizens look for in their e-government delivery. It has been seen that e-government can even replace in person government when it comes to finding a place of community. Offering citizens a virtual community to connect and build relationships (El Hajj, Karadas, & Zargar, 2023). When e-government is optimized, it can provide high end experiences for citizens, helping to connect them further with their government to receive more information. Citizens are likely to trust e-government services and utilize their services if they feel the ability to deliver services, solve problems and safeguard information is being met (Güler & Büyüközkan, 2023). Creating trust in citizens creates a higher likelihood of them adopting new technology.

E and m-government are not without their own obstacles. While adoption of e and m-government can help increase citizen engagement, it can lead to further issues as well. One of these issues is the permanence of the internet. Citizens also must perceive themselves as ready to utilize e-government services for them to be effective (Mensah & Mi, 2019). When citizens perceive themselves as able to utilize these services, they are more likely to adopt and utilize these services. Once something has been published on a government website or social media page, it is there forever, even if deleted (Lee-Geiller & Lee, 2019). By creating a lower barrier to citizens and government agencies, e-government can be used to create citizen engagement on all levels (Mncwango & Mncwango, 2024).

2.3. Existing Mobile Alerting Methods

As discussed above, there are several existing mobile alert methods. Joseph and Lee (2015) outline criteria necessary for these alert systems, highlighting some current methods used for emergency alerts and communication. One of these systems is SMS messaging, where the government sends emergency notifications directly to the public. Mowbray, Mills, Symons, Amlot, and James Rubin (2024) expand on the importance of mobile alerts, emphasizing that several factors, such as message content, length, and timing, are critical to ensuring effective communication during emergencies. The message must be clear and concise so that it is properly received and understood by citizens. The research notes that mobile alerts can reduce the amount of harm to citizens in a disaster. For example, mobile alerts sent before a flash flood can reduce the amount of car accidents by 15.9% (Ferris & Newburn, 2017). As mobile phones have spread wildly since their inception, they provided the ability for governments to offer new ways to contact citizens in a crisis.

However, Mowbray et al. (2024) highlights limitations of emergency communication systems and the behaviors exhibited by citizens. One concern is that citizens often do not respond immediately; instead, they may experience a period of "milling around" before acting. This phenomenon is influenced by various factors, including age, and understanding these patterns is essential for designing more effective alert systems. Further research into citizen demographics, as well as behavioral responses, could enhance the effectiveness of emergency communication strategies, ensuring more immediate and appropriate public responses.

Wong, Jones, and Rubin (2018) is reviewed as a standalone article that explores ways of effectively communicating emergency alerts to 12–18-year-olds. One of the advantages of mobile phone networks is the ability to target all phones in a specific location. The authors then discussed their method of research, which was seven focus groups of 12–18-year-old participants. The participants were shown a series of messages and asked to share their responses to said messages. The data was broken down into intentions to comply, trust and authenticity, information needs, style of message, emotional reaction, typical text message behaviors, and criticisms, concerns and compliments. Mowbray et al. (2024) that the demographic is willing to accept and comply with emergency texts, but it depends on the aforementioned criteria.

In addition to other forms of emergency communication. Wireless Emergency Alerts (WEAs) are pushed out through FEMA's Integrated Public Alert and Warning System (IPAWS) (Cain, Sutton, & Olson, 2024). WEAs dispense instructing information, such as protective guidance, and adjusting information, such as organizational responses and mental health resources. Cain et al. (2024) review the information dispensed in these WEAs and note a limited presence of adjusting information. It is important to note that while instructing information is important in a crisis, adjusting information is an important piece of protection for citizens after the fact, by mitigating psychological stress. Governments can utilize both sets of information to provide more overall protection to citizens.

Social media is another way to promote citizen engagement through a crisis. During COVID-19, citizens heavily utilized government social media to engage with the government as well as receive information (Chen et al., 2020). In times of crisis, it is important to encourage citizen engagement to ensure citizens are receiving

the information they need. While governments often use Government social media (GSM) as a tool to disseminate information, it is important to use it as a tool to also encourage citizen involvement. Media Richness Theory can be utilized to understand that communication has different capacities to facilitate understanding. Dialogic Communication Theory can also be used by governments to review their communication on their websites to promote the most information received by citizens (Chen et al., 2020).

2.4. Social Media and Government Engagement

Social media operates as an extension of m-government. Social media engagement with citizens can lead to more trust and transparency, leading citizens to be more likely to adopt m-government (Hebbar & Kiran, 2019). When working on a long-term model that will help in times of crisis, this can help ensure the foundation is ready for citizens to be engaged with m-government strategies. When it is not done properly, government social media can have little to no change in the interaction between citizens and their government. As addressed by Sharif, Troshani, and Davidson (2016) this is especially evident in local government agencies. Many local government agencies display reluctance to shift to social media models, as they see little perceived benefit, with worries of benefits versus risk for their organization (Sharif et al., 2016). However, in small government models, there is a distinct relationship between perceived benefit and willingness to adopt social media in an organization. As noted by Sharif et al. (2016) as social media continues to expand and become more widespread, organizations may view it less as an adoption and more as something necessary. This mindset can help organizations see the benefits that social media adoption can offer them.

Social media also presents unique factors when it comes to government policies and protections. As it is new and uncharted territory, many government policies are not yet up to standard to ensure the creation of social media policies that are relevant and up to date (Bertot, Jaeger, & Hansen, 2012). Some of the issues around social media policies include security, especially as government agencies are often dealing with security and private concerns. The authors discuss an open government model where social media opens the dialogue up for citizens and their government, described as a government 2.0. Social media also presents an interesting section of innovation for many government agencies. As more citizens move towards online, there are many platforms available for government agencies to use. Governments can exercise more creativity and innovation when it comes to trying to create more of an open relationship with citizens online (Criado et al., 2013). To create a better relationship with citizens online, government entities must look outward when developing social media accounts (Ruiz Soto, 2023). Utilizing systems that make social media engagement easier, such as AI and other tools can help create an easy communication system between the government and its citizens.

Social media has created an easy and low barrier for individuals to connect online with their government (Tagoe & Zhang, 2024). However, social media platforms have also made it extremely challenging for Public Information Officers to adapt their communication methods (Graham, 2014). Graham (2014) also explains that social media has created a way for governments to be more open in their communication with citizens, creating an open dialogue with their citizens. Social media creates a two-way street of communication between citizens and their government, without the intervention of editors and third-party media. Chun et al. (2010) also discuss what the relationship would look like between a government and its citizens using social media. Governments can use social media to promote engagement and ideas in their citizens. During the COVID-19 pandemic, governments could use their social media to quickly disseminate information, communicate with the public, and get public opinion (Wu, Li, Qi, Shi, & Zhu, 2022). As addressed in this research, social media can be especially helpful in times of crisis. However, response to government outreach can depend on a long list of variables that can determine the level of engagement and outreach.

When trying to increase citizen engagement or disseminate information, citizen engagement is necessary. These variables matter down to the choice of platform to use. Twitter or X is more often viewed as a more 'formal' news platform that encourages more two-way communication throughout the platform. Instagram, however, was a more 'informal' narrative, and not as conducive to spreading immediate messaging to citizens (Gruzd, Haythornthwaite, Paulin, Gilbert, & Del Valle, 2018). The content posted can also significantly impact the engagement your post is receiving. Multimodal content, or content containing images, text, illustrations, and videos, is typically more engaging to consumers. During the COVID-19 pandemic, multimodal content was seen in several countries to dispense information to their citizens (Xu & Löffelholz, 2024). The type of government account also has a large impact on the amount of engagement seen in times. While social media usage in general increased significantly during the pandemic, health agency websites showed a tremendous increase in their usage (Badr, Mohamed, Osman, & Mikhaylov, 2022). Organizations need to see the need for different types of social media usage depending on the needs of their citizens.

As social media is a tool used to enhance transparency and government relationships, understanding public opinion is necessary (Hebbar & Kiran, 2022). This is especially true for governments that may be viewed as further behind developmentally to other countries. This is especially helpful to government agencies when trying to gather information and data about an emergency such as an extreme weather event. Social media websites such as Twitter see citizens live posting updates about storms from their location. This data is crucial for meteorologists to mitigate crisis impact in the future (Styve, Navarra, Petersen, Neset, & Vrotsou,

2022). Social media can also be used in other government communication methods to disseminate information in a crisis (M. Zhang & Sahli, 2024).

2.5. Citizen Usage and Involvement of E-Government Models

Almarashdeh and Alsmadi (2017) use two models to determine whether citizens are using m-government technology or not: the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). According to the research, there are two main influences on whether individuals use m-government technology or not. The first influence is social influence, and whether others use it or not. The second reason is perceived helpfulness to citizens. Another way to measure the impact of government websites is the Balanced Scorecard (BSC). This is an evaluation system to measure performance and therefore citizen engagement (Hu & Yang, 2020).

Citizen engagement is the goal of e-government models, including social media and other ICT systems. Citizen engagement helps ensure citizens are seeing the information that a government entity wants to share with them (Mengzhong Zhang & Kaur, 2024). The City and County of Honolulu implemented a social network service or SNS to increase citizen engagement with their online models. This model created a space for citizens to become engaged in the policy-making process. Their model allowed them to receive and respond to public comments, creating an engagement between themselves and citizens online (Harris & Winter, 2013). In another example, Arab governments utilized Facebook to rebuild relations with their citizens in their countries. Before the adoption of social media, relationships between citizens and their governments were fragile. The adoption of social media allowed citizens to finally have a way to engage in the diplomatic processes of their government (Mishaal & Abu-Shanab, 2017).

The important part of this research is how citizens can become more engaged online. When government organizations are more able to engage their citizens online, they are more able to establish relationships with their citizens. For example, in Saudi Arabia, only 30% of citizens use e-government sites (Al-Maliki, 2014). It is important to overcome these numbers to improve relations with citizens. Some of the barriers that may be contributing to why citizens are not engaging include lack of understanding, lack of resources, and computer literacy. One of the ways that governments can combat this is by working to bridge the gap in education of online resources in citizens (Al-Maliki, 2014). By creating more citizen-focused e-government, Saudi Arabia can shift more of its citizens to their online services, helping needs to be met faster (Chatfield & AlAnazi, 2015). This is known as a citizen-centric integrated interoperable e-government.

Other factors can contribute to why a citizen may not be utilizing e-government services. Younger citizens seem to utilize e-government services a lot more and with a lot faster adoption rate. Even political engagement can impact how much someone interacts with e-government models (Fudge & Van Ryzin, 2012). Additionally, a large factor that can impact the adoption of e-governments by citizens is citizen trust. When citizens have higher trust in their government, they are more likely to adopt methods such as e-government (Mensah & Mi, 2017). Governments must increase the trust citizens have in them to ensure they are adopting the methods of e-government that are being put out.

2.6. New ICT Suggestions

With the importance of ICT and e-government models in citizen communication, there have been several proposals for better models to keep citizens more engaged and connected. While the development of new information technology models has made it easier to connect with citizens, it can leave citizens confused about where to properly access information. If governments are pushing information out online, through social media, and on an app, citizens may be unsure of where to check first. One proposition to address this concern is an integrated system that uses mobile alerts (Repanovici, Nedelcu, Tarbă, & Busuioceanu, 2022). This would be a mobile app for citizens and a web app for dispatchers. Repanovici et al. (2022) propose this would help to reduce response time and make it easier for all parties involved to use. With a system specially designed to create better engagement with citizens, this model can save valuable time.

Another way to improve ICT systems to improve response time in crisis is through the Internet of Things concept. The Internet of Things is a network of devices that can communicate across the Internet (Khorov, Lyakhov, Nasedkin, & Yusupov, 2019). According to research, by 2030, more than 500 billion Internet of things (IoT) devices will be in use. This rapid expansion of IoT devices shares that they are becoming a prominent part of citizens' day-to-day lives and are a crucial aspect of communication. The authors of this article in particular address the idea of a heterogenous Wi-Fi network. In a heterogenous Wi-Fi network, a system would convey a message across the entire network, in this case, an emergency alert notification. The notification would subdue other usage on the network to get the message across to more citizens.

Following the 173 deaths of the 2009 bushfires, Australia implemented a sweeping emergency system across the continent (Aloudat, Michael, Abbas, & Al-Debei, 2011). Under this system, one of the main roles is to disseminate warnings and safety information to the public in case of a widespread emergency. Utilizing location-based services with this program helps to ensure emergency response times are faster for first

responders. Additionally, location-based services can ensure that citizens are in danger of a specific type of emergency. This system will ensure a citizen is notified of impending emergencies in their area.

Artificial intelligence is another way that governments can help their citizens and reach them faster. Artificial intelligence can help governments to interact more with citizens by utilizing virtual assistance. These assistants can chat with citizens, measure feedback, and access information that may take traditional civil servants longer to do (Pislaru, Vlad, Ivascu, & Mircea, 2024). The implementation of artificial intelligence can ultimately make government communication models smoother and connect with citizens at a faster rate. Finally, public diplomacy can help to improve ICT systems. By creating a model where private and public actors have a say in government policy creation, it can help citizens feel more engaged and responsible with the government (Yun, 2022).

Increasing accessibility is another improvement government agencies can make to their online engagement model. Often, government websites and social media are not accessible to all citizens. A survey of local government websites in Poland measured each site for general accessibility. The scores were underwhelming, with almost 60% of the websites being deemed "inaccessible for individuals with disabilities" (Król & Zdonek, 2020). In addition to physical disability, accessibility to those who are disadvantaged is another way to improve e-government reach. This includes the digital divide that has become more apparent as IoT technologies become a daily aspect of life. The digital divide represents those who do not have the skills and training to work with online or e-technology (Sipior, Ward, & Connolly, 2010). Overcoming this divide can make all government ICT more accessible, regardless of education level.

2.7. Implementations for Public Health as Seen in Covid-19

There are a few ways that governments can use mobile technology to stop the spread of COVID-19 by information sharing. One of these ways is public warning and m-health. The rise of technology has occurred at a pace that has greatly outweighed the ability to test and measure for effectiveness. M-health is known as mobile health communication (Bean, Grevstad, Meyer, & Koutsoukos, 2022). The WEA is designed to enhance public safety by allowing the government to send out 90-character SMS to citizens regarding emergencies (Bean et al., 2022). It is designed to warn citizens about imminent safety threats, weather, and missing children. Unfortunately, WEA and other emergency alerts are filled with limitations in the inequalities that occur in information sharing through mobile methods.

One thing that has emphasized these various inequalities stemming is the COVID-19 pandemic. The COVID-19 pandemic was unprecedented, and many public organizations were unsure of how to handle it. Due to the nature of the pandemic, most government services were shifted to be fully online and remote (Beaunoyer, Dupéré, & Guitton, 2020). As such, citizens needed to have online access to be able to see important information regarding the pandemic. There are various ways online access has become crucial since the pandemic, from social connection to learning to information sharing. The COVID-19 pandemic exacerbates a hidden inequality (Beaunoyer et al., 2020). The authors then discuss how COVID-19 inequalities potentiate vulnerability to COVID-19. These include vulnerabilities to the crisis itself as well as repercussions of the pandemic. One of the ways that this gap can be slightly lessened is by using wireless emergency alerts.

Yeon, Kwak, and Chung (2022) examine the effectiveness of wireless emergency alerts for social distancing against COVID-19 in Korea. In this article, the steps the Korean government took towards mitigating COVID-19 cases were examined to see whether they helped slow the spread or not. As such, it was shown that WEAs had an impact on the level of foot traffic in each city. It was shown that foot traffic was reduced in cities where the WEAs were disseminated. COVID-19 also taught us a lot about the influence government communication can have as well as the various influences that can occur on government communication (Yeon et al., 2022).

As seen in Madrid, the way the government frames a crisis can completely impact the way its citizens respond. Crespo-Martínez, Mora-Rodríguez, and Rojo-Martínez (2022) address the response citizens had to the COVID-19 pandemic after government officials in Madrid referred to COVID-19 as "influenzaisation" or influenza. This was to lessen the way citizens panicked over the disease but ultimately mitigated their fear almost entirely (Crespo-Martínez et al., 2022). COVID-19 also exacerbated the gap that existed within government communications. As a result, in addition to determining how to handle COVID-19 from all other aspects, government agencies also had to reestablish communication channels with citizens (Savoia, Piltch-Loeb, Stanton, & Koh, 2023). In addition to these difficult communication channels, governments had to compete with media framing of their messages. As COVID-19 saw a return to old-fashioned communication of government press conferences, governments had to rely on whether the media would reframe their message when delivered to citizens or not (Hayek, 2024). In using the middleman for their communication, governments can lose control of their messaging to citizens.

2.8. Implementations for Weather Related Events

Weather related events can have various and severe impacts on citizens of the United States. As the National Weather Service (NWS) collects this data, it conducts research and proposes ways to help mitigate these costs and turn the United States into a weather-ready nation. The NWS simulates economic growth and can tie economic growth to weather-related events by using the data collected. The United States experiences more weather events annually than most if not all countries (Uccellini & Ten Hoeve, 2019). The NWS has made strides to reduce deaths and catastrophic impacts of these weather-related events, however the number of events causing more than $1 billion in damage has increased by 400% since 1980. With economic disparities making it difficult for certain populations to prepare for these events and aging infrastructure, the NWS must provide ways to mitigate the loss in these increasing weather disasters.

Weinberger, Zanobetti, Schwartz, and Wellenius (2018) notes that in the United States, approximately 3642 heat-related deaths occur each year. NWS sends out heat alerts to local communities to help mitigate the risk of heat related deaths. These may trigger several local responses from community officials, such as cool systems being implemented. The exact criteria for heat alerts vary depending on locality but are all rooted in forecasts. Often, they are sent out based on personal judgment rather than a set level of criteria. As such, the heat alerts may go out ahead of days that are not significant as far as temperature or are not administered for days that do end up being above the recommended heat index. Weinberger et al. (2018) used a natural experiment to determine whether NWS heat alerts were related to lower mortality rates in various areas. In their research they were unable to find data that supports that NWS heat alerts were related to lower mortality rates in the cities they studied. This research can help ensure thorough planning for other weather-related emergency alerts.

3. Research Design

3.1. Research Questions

The research will help to answer the following research questions regarding government communication.

1. Does the strength of an e-government system improve citizen engagement?
2. Do strong e-government systems make it easier to share information and connect with citizens in a crisis?
3. Are citizens more likely to engage with e-government if a government uses social media platforms?
4. Has new technology made it easier to communicate with citizens in a crisis?

3.2. Research Methods

Data measuring e-government and citizen participation will be collected. Utilizing existing studies and data, we are seeking connections between e-government and citizen communication. The study will first look at data regarding strong e-government models. Then, data regarding e-government and crisis communications will be collected. Utilizing this data, we will measure the correlation between strong government and citizen communication. we will also be using this data to measure the relationship between e-government and emergency crisis factors such as COVID-19.

4. Data Collection and Analysis

4.1. Data Collection

For this study, we will be using the United Nations' E-Government Development Index (EDGI) scores for 2024. The E-Government Development Index (EGDI) evaluates the state of e-government progress among United Nations Member States. It assesses website development trends within a country while also considering factors such as infrastructure and educational levels. EGDI is a composite measure encompassing three key dimensions of e-government: online service provision, telecommunication connectivity, and human capacity (United Nations, 2024b). This data will serve as a measurement of the strength of a country's e-government. We will also be using the United Nations' E-Participation Index. The E-Participation Index (EPI), part of the UN E-Government Survey, measures how governments engage citizens. It progresses through three stages: providing basic information, enabling two-way input from citizens, and fostering partnerships where citizens lead policymaking. This aligns with the UN's three-tiered e-participation framework (United Nations, 2024a). Finally, to expand upon the gaps left in the research from the literature review, we will be reviewing various case studies and research on e-participation, government social media, and citizen participation.

4.2. Data Analysis

4.2.1. E-Government Participation and Strength

Table 1 shows the top five scoring countries for the UN's EDGI, as well as EPI. The chart shows their respective scores for both EDGI as well as EPI. Per the United Nations (2024b) website, the average EDGI score for 2024 was 0.6382. The average EPI score was 0.4893. As seen in Table 1 there are crossovers between the top five scoring countries for both EDGI and EPI in 2024. Denmark ranks first in the EDGI scores with a score of 0.9847 and is tied for second in EPI with a score of .09863. Since 2018, Denmark has

ranked as the highest-scoring country in EDGI. Similarly, the Republic of Korea comes in fourth on both EDGI and EPI. However, Estonia, Singapore, Iceland, Japan, and Germany are all only on one of the lists. Before COVID-19, the 2018 EDGI average score was 0.5491, the 2020 average score was 0.5988. Following COVID-19 the score in 2022 jumps to 0.6102. Conversely, a drop is seen in the EPI scores with a score of 0.5654 in 2018 and an average score of 0.4450 (United Nations, 2024a).

Table 1. Top Scoring countries in UN EDGI and EPI 2024 rankings.

Top 5 EDGI scoring countries	EDGI score	EPI score	Top 5 EPI scoring countries	EPI score	EDGI score
Denmark	0.9847	0.9863	Ukraine	1.0	0.8841
Estonia	0.9727	0.9589	Japan	0.9863	0.9351
Singapore	0.9691	0.9589	Denmark	0.9863	0.9847
ROK	0.09679	0.09726	ROK	0.9726	0.9679
Iceland	0.9671	0.9589	Germany	0.9726	0.9382

Source: United Nations (2024a).

4.2.2. Social Media and Government Engagement

A study by Shi and Medina (2021) assessed the social media content output during Hurricane Matthew by firsthand interviewing county employees from Florida counties across the state. Their research studied the number of posts, types of posts, and citizens' reactions. In post-survey interviews, most county employees noted they could improve their social media processes, and that their citizens wanted more involvement in the process (Shi & Medina, 2021).

Khan, Umer, Uddin, Muhammad, and Ahmed (2023) examine citizens' behaviors and the correlation to e-government adoption. Their research found that citizens' beliefs in government effectiveness will have an impact on their willingness to adopt e-government services. The authors also note that trust and fear are other reasons why citizens may choose not to adopt e-government services. The authors also note that social media behavior plays a role in citizen's adoption of e-government, with the idea that citizens perceive government online information as trustworthy.

The authors in the last study surveyed 529 individuals in Vietnam on their relationship with e-government and social media (Nguyen, Van Nguyen, Huynh, Truong, & Do, 2024). This survey was designed to measure citizens' perceptions of perceived usefulness (PUF) and perceived ease of use (PEU) in their adoption of e-governance models in Vietnam. The survey determined that citizens view PEU and PUF as determining factors in their adoption of e-government systems. Their study also found that PEU increased PUF. Additionally, the study found correlations between social media and e-government were weak and unsubstantial.

4.3. Findings

Based on the data provided in the United Nations ranking lists, there is a weak correlation between the strength of an e-government and citizen participation. As seen in the data, there is little overlap between the top five countries in each category. There are countries in both categories that are only on one list. The research does show that there is a positive increase in e-government strength following the COVID-19 pandemic. This correlates with governments being forced to have more reliance on online platforms to reach their citizens in times of crisis. It is important to note that citizen participation declined in the years following the pandemic. Citizens seem to be less engaged with e-government models. This data covers research question 1, "Does the strength of an e-government system improve citizen engagement?" and the data does not indicate there is a relationship there.

It is also worth noting that when surveyed, government employees feel their crisis outreach could be improved. As seen with the Hurricane Matthew interviews, government employees feel there is room to better serve their citizens in a crisis but are unsure of how to do so. The government employees in this survey did note that there are now dedicated employees focused on communicating with citizens in a crisis via social media. Research question 2 asked "Do strong e-government systems make it easier to share information and connect with citizens in a crisis?". Based on the data collected in this section as well as the literature review, government organizations seem to have a better method of communicating with citizens due to social media. Additionally, research question number 4, "Has new technology made it easier to communicate with citizens in a crisis?" has been covered in this section.

5. Discussion

The data collected in the literature review and research helped to answer questions about e-government and citizen communication. The literature presented in this research has connected e-governance to social media in times of crisis. The influx of new technologies has created opportunities for governments to continue to expand their work with citizens to an online model. In the research collected, it was not possible to conclude that stronger e-governance equates to more citizen participation. This is important for government

organizations to note that strong e-governance cannot benefit your citizens if your citizens are not actively engaged in your work. Literature provided several rising technologies and methods for getting citizens engaged. Additionally, the literature provided more insight into the gap of e-governance which is accessibility for all citizens.

The research also covered citizen engagement and e-governance. In the literature, it was found that social media was an opportunity for governments to further engage their citizens in e-government models. Based on research and literature, governments seem to be moving towards stronger e-government models. It is important to note that social media is a tool that can help take e-government to a new level with citizen engagement.

There were limitations to the research and literature collected. The research did not provide a strong correlation between social media and e-government participation. While this is something that is implied in the literature, the data presented in Nguyen et al. (2024) noted that a correlation could not be found when surveying citizens. Additionally, the research provided did not offer conclusive answers on how to better engage citizens in online processes, and this must be researched more in-depth in future studies.

6. Policy Implications

The research conducted provides room for several policy accommodations to be made. As the paper has noted, there are already policies in place that cover the topic of government communication and citizen outreach. By adjusting the policies in place and creating room for new policies, governments are given the ability to directly influence the number of citizens that are reached in a crisis. Based on the research, there are three major areas where policy recommendations can be made to directly address the gaps where governments can increase their reach to citizens. These three policy accommodations include the accessibility of communication systems, the adoption of new technology systems and the adoption of government wide communication models.

6.1. Policy Recommendation 1: Mandatory Accessibility Requirements for Government Communication

The first policy recommendation that can be met to increase the likelihood of citizens receiving important crisis communication is to increase the accessibility of communication systems. Governments must adopt policies that mandate the accessibility of their existing communication systems. While policies around the accessibility of television and radio broadcasting have existed since their inception, policies must also be created to make other communication systems more accessible for citizens. This includes increasing the accessibility of their e-government systems. As communication systems evolve, it is imperative that governments increase the accessibility of their systems. This looks like ensuring systems are accessible to citizens with various disabilities including vision and hearing loss. Examples of creating systems that are accessible are creating high contrast websites, using text to speech options and captioning services for citizens. Ensuring citizens can access these systems will help ensure they are receiving the vital information they need.

6.2. Policy Recommendation 2: Mandatory Updating of Government Technology Systems

Another policy recommendation that needs to be met to ensure that citizen accessibility is being met is mandating the upgrades of technology services. By ensuring governments utilize the most up to date and new technologies, governments can ensure that citizens have the best options for receiving important information. This is especially pertinent as the development of newer technologies can lead to the obsoleting of older technologies. As these new technologies are developed, the older technologies become less invested in, and less reliable. By ensuring governments are using the most up to date and accessible technologies, governments can ensure they are removing as many potential failures in communication as possible. Additionally, by mandating the upgrading of government technology systems, governments increase the likelihood of more successful and wider reaching communication in times of crisis.

6.3. Policy Recommendation 3: Adoption of Government Wide Communication Systems

The final policy recommendation that can be met is the adoption of government wide communication systems. These systems can eliminate virtually any barriers to all citizens receiving communication in times of crisis. Some examples of this from the research is Australia's adoption of a nationwide emergency communication system, and Wi-Fi HaLow. Governments that mandate government wide communication systems ensure all citizens are receiving the communication and information that they need in times of crisis. By eliminating barriers such as whether a citizen happens to be by their television to receive information or not, government wide communication systems ensure all citizens receive vital information they need in an emergency.

7. Theoretical Implications

7.1. Defining a Theory

The definition of a theory is hotly debated in academia. Some researchers believe that a theory is only abstract and does not require application. Other researchers argue that theory is found through trial and error

rather than measured research. While other researchers argue that a theory is not a theory unless it expressly states how it is found (Wacker, 1998). A theory is a construct of ideas linked together by underlying logic and assumptions (Corley & Gioia, 2011). A theory is made up of several parts including constructs, propositions that link those constructs together, logical arguments that explain the underlying theoretical rationale for the propositions, and assumptions that define the scope of the theory (Dankasa, 2015).

7.2. Theories Used in Research

One of the first, and most important theories used in this research was the Unified Theory of Acceptance and Use of Technology (UTAUT). This theory is a model that predicts the likelihood of someone adopting and using technology and is important in predicting whether someone will adopt e-government models or not. Another important theory of this research was Government 2.0. Government 2.0 is a new type of theorized government that relies on social media and e-government to build relationships with citizens through online platforms. Other theories used in this research were Media Richness Theory, which is the ability of a platform to convey a message and Dialogic Communication Theory, which covers how a two-way communication can be formed.

7.3. Theory Synthesis

All these theories have their importance in the development of research regarding e-government and government communication. Based on the data collected, we propose a new theory that can offer valuable insight into the relationship between government communication and citizen protection. This theory posits that stronger government communication models lead to a higher number of crises informed citizens. The dependent variable in this theory is the number of crisis-informed citizens (Y) and based on crisis information sharing (F) by the government. Citizens having access to important information in a crisis such as a weather-related emergency provide them with an extra layer of protection. In a crisis, citizens rely on governments to share vital information with them such as the next steps they need to take to protect themselves. When citizens have higher access to this information, they are more likely to be able to make an informed decision regarding the best course of action they need to take for their safety. When governments utilize additional layers of communication, they provide protection factors that help ensure more citizens can receive the information they need. As governments are not often able to mandate citizens take the necessary steps to protect themselves, ensuring that as many citizens as possible have access to critical information helps protect more citizens. The dependent variable (Y), relies on the independent variables of (F), also known as crisis information sharing, including social media outreach (X_1), crisis communication systems (X_2), and e-government usage (X_3).

Each of the variables directly impacts the way citizens receive information from the government and therefore the number of crises informed citizens. Variable (X_1), or social media outreach, describes the way governments share pertinent information on social media. As the research in the paper has shown, citizens are increasingly relying on government social media in times of crisis. Utilizing social media to share instructions and information in a crisis can increase the amount of informed decisions citizens make. Variable (X_2) describes the use of crisis communication systems. Existing crisis communication systems such as EAS, or radio and television broadcasts can increase the number of citizens that receive important information in a crisis, therefore directly influencing the number of citizens that can be protected. Variable (X_3) describes e-government usage in a crisis. The research in the paper showed a clear increase in citizen usage of government websites and e-government options during COVID-19. Utilizing these e-government methods can increase the number of citizens reached in a crisis and therefore increase the likelihood of making informed decisions. These variables work to protect citizens more by providing more information to citizens to follow in a crisis.

Figure 1 shows the hypothetical impact of these variables on the amount of crisis informed citizens. The theory proposed relates the number of crisis-informed citizens (Y) to the crisis information sharing (F), impacted by the independent variables of X_1, social media usage, X_2, crisis communications, and X_3, e-government usage. Figure 1 shows the way these communication variables feed into the crisis informed citizens population. By using these factors, governments are able to increase the number of crises informed citizens.

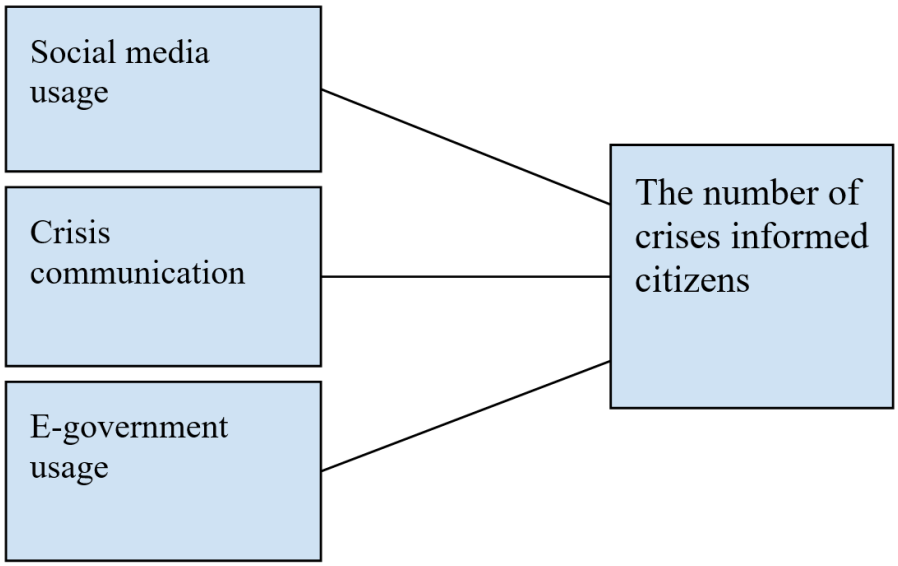

Figure 1. Crisis information sharing and number of informed citizens.

This theory assumes there is a positive relationship between F(X) and Y, that the more government communication systems are in place, the more citizens will make an informed decision based on the access to vital information they have. A formula for this theory would look like $Y=F(X_1, X_2, X_3)$, where the informed decisions made, (Y), is a function of the independent variables previously outlined. In this formula, the independent variables all have different influences on (Y). A government that only utilizes radio broadcasts for a communication model limits the number of citizens it can protect because it limits the range of messages being shared. This theory provides further implications into the world of developing e-government and m-government models as it provides evidentiary support to government agencies showing the importance of e-government development in their quest to increase citizen communication outreach. This theory asserts that improved government communications can improve the number of citizens who are protected in a crisis by providing more opportunity for important information to be shared.

8. Conclusion

8.1. Brief Summary

This paper sought to find ways to better connect governments to citizens in a crisis. In times of emergency, it is imperative that governments have ways to connect with citizens to provide them with the information that they need to make the best decision for themselves regarding their personal safety. The goal of this communication is that citizens will comply with the crisis information governments are sharing, such as taking immediate shelter or evacuating, and protecting themselves in an emergency. The first part of this communication is connecting with citizens to ensure they are receiving the information they need. This research analyzed the information around government communications, specifically in crisis.

The data collected provided valuable insight into how governments can maximize their outreach to citizens. One of the most important pieces of data findings is that citizen participation in e-government and government communication models before an emergency does not impact citizen usage of these systems during an emergency. Additionally, the research found significant issues with the accessibility of these government communication systems as technology has continued to grow. Using the data collected, the research finds a relationship between the amount of government communication methods used, and the number of crises informed citizens. This research helps us to better understand how governments can use their communication systems to protect citizens in times of crisis by providing pertinent and timely information.

8.2. Future Prospect

This research provides a new look at how government communication and citizen protection are related. Future research should be conducted to dive deeper into the research presented in this paper. Future research should examine the gaps in the research provided. This could include research to examine the impact of the accessibility of government communication systems and citizen outreach. As the research in this paper uncovered, there is a gap in accessibility of government communication models, making the barriers to access higher for citizens in times of crisis. Future research may examine this barrier deeper to assess any potential concerns this may have around ensuring citizens receive the information they need in a crisis if the information has not been presented in accessible ways. Additionally, further research may be conducted to fill the limitations of research relating to the application of crisis information by citizens in times of crisis. This

could examine more deeply how citizens adopt the information given to them, as well as what factors may cause them to comply or not to comply with the instructions and information shared with them. Future research should examine the aspects of the data provided to find ways to maximize the outreach to citizens to ensure citizen protection in times of crisis.

8.3. Limitations of Research

There are several limitations present in the research of this paper. The first limitation of this paper is the data around the adoption of information by citizens. The theory provided offers how governments can ensure citizens receive the information they need in a crisis to make an informed decision regarding their personal safety. The idea of governments providing this information is that citizens will follow the instructions or information shared with them, in order to best protect themselves from the crisis they are facing. However, this paper does not further examine what citizens do with the information they receive in a crisis once it is received. Further research around how and why citizens follow the instructions given can help governments to understand what steps they need to take to ensure the maximum number of citizens are protected in a crisis.

Additionally, while the literature provides information regarding the accessibility of government communication systems and websites, there is little information regarding how citizens are impacted by the lack of accessibility of these platforms. Further information regarding how citizens are impacted by these barriers can ensure the application of crisis communication is more well received by citizens. These limitations offer the ability for future research to be conducted to enhance our understanding of connecting with citizens in a crisis. When the information displayed in this paper is received, it can be utilized to ensure the maximum protection is given to citizens in times of crisis, saving lives and mitigating the effects of disaster.

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