

SHAKEALERT IN OREGON: APPLYING THE SITUATIONAL THEORY OF PUBLICS
TO UNDERSTAND EARTHQUAKE-RELATED BELIEFS, COMMUNICATION
BEHAVIORS, AND THE FORMATION OF STAKEHOLDERS

by

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DISSERTATION ABSTRACT

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Common regional hazards in Oregon include wildfires and earthquakes. These hazards vary in severity and have the potential to cause damage to persons or communities in the state. Earthquakes range from small to significant in size and consequence. When ground shaking from an earthquake occurs, safety recommendations encourage individuals to take protective actions like drop, cover, and hold on. ShakeAlert is an earthquake early warning system that delivers notifications to publics and stakeholders affected by possible ground shaking. In March 2021, ShakeAlert became available in Oregon. Using conceptual underpinnings from risk communication and public relations, the purpose of this dissertation was twofold. It first examined Oregon residents' beliefs and attitudes toward earthquake risks, safety behaviors, and ShakeAlert. Then, it analyzed how Oregon publics formed and performed communication behaviors according to the situational theory of publics. An online Qualtrics survey of a representative sample of Oregonians gathered a total of 1,041 responses. Survey respondents perceived a moderate-to-high earthquake risk in Oregon. Research results confirm theoretical groupings of publics and suggest an individual's group membership, earthquake experience, and perceived level of organizational trust may impact the breadth of communication behaviors (i.e., information seeking, processing, engaging, and

gaining) an individual engages in. This project proposes an applied segmented risk communication messaging approach targeting groups with various attributes such as barriers for earthquake safety, low awareness of ShakeAlert, or recommended protective action behaviors. Additionally, research results propose an avenue for risk and hazard scholars to employ the situational theory of publics in the contexts of earthquake risk.

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DEDICATION

This dissertation is dedicated to my daughter, parents, partner, and anyone in the world who thinks they are not smart enough. Never, never, never, give up.

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CHAPTER I

INTRODUCTION

Regional natural hazards are commonly known, anticipated, and discussed in the local media. For individuals who live along the US Gulf Coast, natural phenomena like hurricanes are expected and considered seasonal; individuals residing in the Central US are accustomed to hazardous events like tornadoes. Similarly, individuals living along the West Coast of the US are more familiar with natural hazards like earthquakes. To some extent, experiencing such hazardous events are expected and accepted as a norm of living in specific regions. Nonetheless, regardless of their location, all populations need to be aware of the particular hazards common in their area and the risk communication associated with such regional threats (Cole & Fellows, 2008).

The unique communication environment surrounding earthquakes, which this dissertation addresses, is characterized by complexity, uncertainty, and time sensitivity, which poses distinct communication challenges for communities and organizations communicating earthquake risks to publics and stakeholders. Therefore, communicating effectively before an earthquake hazard is essential for creating risk awareness and encouraging behavioral preparedness for all possibly impacted publics and stakeholders. The complexities of communicating risks are multifaceted, navigating explanations of emergent technical or scientific material about the hazard into standard terms while encouraging the public to acknowledge the severity of the potential consequences an event may affect their lives (Cole & Fellows, 2008; Jederberg, 2005). Accordingly, this project resides at the intersection of risk communication and public relations related to natural hazard stakeholder formations, communication behaviors, and beliefs.

Before discussing the complexities of communicating earthquake risks and safety behaviors, however, it is necessary to place this research in the correct context by understanding the unique nature of earthquakes, first as natural hazards rather than natural disasters, and second as uniquely occurring natural hazards.

Certainly natural hazards and natural disasters are alike because populations at-risk for a natural hazard or disaster should be familiar with risk-related information and ready to prepare for the possibility of a hazardous or disastrous event (Cole & Fellow, 2008). Additionally, both events have the qualifier “natural” (i.e., natural hazard, natural disaster), which implies removing human or manmade effects from causing the event. Human activity is not removed from the processes that create natural hazards or disasters (Nelson, 2018). Human effects like war, pollution, oil drilling, or chemical contamination might exacerbate naturally occurring phenomena like earthquakes, which could cause other hazardous events or disasters.

That said, there are key distinctions between natural hazards and natural disasters that are important to understand. A natural hazard is broadly defined as a threat of a naturally occurring event that will have a negative effect on humans (Nelson, 2018). Researchers have determined different categories of natural hazards: atmospheric, hydrologic, geologic, and other (Burton, Kates, & White, 1978). Atmospheric natural hazards occur mainly from atmospheric processes, including lightning, hailstorms, tropical storms, and hurricanes (Nelson, 2018). Hydrologic natural hazards are associated with water distribution, occurrence, or movement, including circumstances like drought, coastal or river flooding, erosion or sedimentation, and desertification (National Research Council., 1999). Geologic natural hazards events are triggered by activities or processes that transpire beneath the earth's surface (ESKP, 2018). Some natural geological hazards include events like landslides and earthquakes. Lastly, natural hazards included in the "Other" category are naturally

occurring events that do not precisely fit into one previously mentioned category such as insect infestation, disease epidemics, and wildfires (Nelson, 2018).

In contrast, a natural disaster is broadly defined as the adverse effects or consequences caused by a natural hazard. This concept of disasters implies that disasters do not cause effects. This definition of a disaster is a shift from perceiving disasters as agents to events; instead, disasters result from hazardous events impacting humans and communities (Dombrowsky, 1998). Simply put, the impact the hazard causes to humans creates the actual disaster. An earthquake, for example, is a hazard threat (natural hazard). When an earthquake occurs and devastates human life or property, a natural disaster has occurred (the hazardous event resulted in a disaster).

Humans influence natural hazards and disasters (Nelson, 2018). Oil drilling, for example, might induce an earthquake in a hazardous location, however. In some cases, oil spills, such as pollution, train wrecks, and airplane crashes, are considered technological disasters and might be a secondary result of a hazard. If an earthquake occurs in a major city and an electricity and power infrastructure system cannot withstand the event, a technological disaster of a vehicle accident might occur because of the hazard (Mulargia & Geller, 2003). In conclusion, given these definitions of natural hazards and disasters, this dissertation will position earthquakes as natural hazards because they are naturally occurring hazardous events that have the potential to harm humans and become disastrous situations.

Natural hazards vary in severity, complexity, and predictability. Meteorologists and scientists might forecast and predict the landfall of an anticipated storm or hazardous event. Forecasting an event might allow publics and stakeholders possibly impacted by the hazard to prepare. For example, in the event of a hurricane, recommendations may be made for community members to stockpile water and food or prepare to evacuate. Tornado warnings usually include recommendations that residents seek shelter. Floods are accompanied by

advice that residents drink bottled water or boil water to avoid waterborne pathogens. An earthquake is different from other hazardous events because earthquakes are recurring hazards that cannot be prevented, even if foreseen (Mulargia & Geller, 2003). This variability in a hazard event might cause a community anticipating an earthquake to prepare for the hazard differently from a community preparing for a hurricane (Sellnow, Seeger, & Ulmer, 2002). Without knowing when an earthquake will occur, potentially affected communities are encouraged to prepare for the possibility of the absence of food, water, and natural resources and are told to anticipate being without services (power, water) and assistance (transportation, telecommunications) for at least two weeks (Oregon Emergency Management, n.d.). That said, because there are so many intangibles with earthquake hazards, it is challenging to get communities to comply with earthquake preparedness behaviors because communities may not understand the severity and uncertainty of an earthquake and the importance of taking proper precautions before the event happens (Becker, Paton, Johnston, Ronan, & McClure, 2017).

In addition to their unique status as hazards, rather than disasters, how earthquakes occur is also unique compared to other natural hazards. An earthquake occurs when parts of the earth (tectonic plates) slip past one another (Wald, 2014). More specifically, the earth's tectonic plates accumulate geological stress that might cause the plates to interact with one another, mainly occurring in regions with known earthquake zones or fault lines. Over 143 million people live in areas at-risk for ground shaking from an earthquake in the continental US (Jaiswal & Fitzpatrick, 2015). There are multiple areas known for high seismic activity and earthquake risks. In California, over 38 million people live in areas where possible ground shaking can occur from an earthquake (Jaiswal & Fitzpatrick, 2015). In fact, California has a complex earthquake fault system because the state rests on two tectonic plates (the Pacific and the North American plates). One of California's most infamous fault

lines is within this complex fault system, the San Andreas, which has a 75% chance of producing a significant earthquake within the next 30 years (USGS, 2015).

The Pacific Northwest (PNW) is also known for seismic activity. This area has over 10 million people living in areas with possible seismic activity. The PNW's system of fault lines are located in Oregon and Washington, and the Cascadia Subduction Zone (CSZ), starting near Mendocino, California, and ending around Vancouver Island, Canada, and have a history of producing small-to-significant sized earthquakes (USGS, 2018). The CSZ has not produced an earthquake since 1700, causing seismologists to estimate a 30 to 40 percent chance of a major earthquake along the CSZ in the next 50 years (Oregon Emergency Management, n.d.). This event would be felt throughout the Pacific Northwest and might threaten three major metropolitan hubs: Portland, Seattle, and Vancouver. Two significant earthquakes have occurred in the PNW within the last 30 years. One earthquake was in southern Oregon, Klamath Falls, and the second considerable earthquake occurred outside Seattle, Washington (Pontbriand & Krezel, 2015).

Located in the Central US is the New Madrid earthquake zone. Over 6 million people live near the New Madrid zone, where possible ground shaking from an earthquake might be felt (Pontbriand & Krezel, 2015). Seismic activity in this zone has the potential for a significant earthquake to occur as the last major earthquake was over 100 years ago (Pontbriand & Krezel, 2015). The previously reviewed areas (California, PNW, New Madrid) include zones where the seismic activity occurs naturally from geological stress trapped underneath the earth's surface, for example. In contrast, other areas in the continental US are known to have human-induced earthquakes. Places in the Central and Eastern US, like Oklahoma, Kansas, Texas, and Arkansas, with stable continental plate placement, have seen an increase in seismic events due to human activity like drilling for oil, which could influence a shift in the tectonic plates and led to an earthquake (Pontbriand & Krezel, 2017).

As mentioned, certainly the extent of seismic activity can vary, with significant earthquake potentially causing more economical and bodily consequences to a community compared to moderately-sized earthquakes. Large earthquakes, however, happen much less than small-to-moderate-sized earthquakes (Nelson, 2018). For example, a moderately-sized earthquake might occur once a year, and a significant-sized earthquake might occur once every three years (Keller & DeVecchio, 2016). In contrast, smaller-sized earthquakes might occur several hundred times a day in different locations (IRIS, n.d.).

Given the frequency and the various locations of hazardous events, like earthquakes, for some, the risk from natural hazards cannot necessarily be eliminated. To that end, in order to inform publics on the possibility of ground shaking, the United States Geological Survey (USGS) for the west coast developed an early earthquake warning message system: ShakeAlert. Earthquake early warning is not the same as earthquake prediction. The focus of the early earthquake warning system is to detect earthquakes the moment they begin, assess the relative location, determine the amount of shaking, and send warning messages to populations likely affected (Sellnow, Jones, Sellnow, Spence, Lane, & Haarstad, 2019). ShakeAlert can potentially provide seconds of notice before an earthquake is felt. Once the seismic activity is detected, a ShakeAlert-powered WEA alert will notify publics and stakeholders about the possible ground shaking from an earthquake.

ShakeAlert has been publicly available in California since 2019 and Washington and Oregon since spring 2021. The current ShakeAlert message system delivers earthquake and earthquake safety information to users and is intended to be understood and acted upon quickly. A population's ability to respond depends on their access, understanding, and interpretation of the information they receive in warning communication from systems like ShakeAlert (Reddy, 2016). When an individual gets a warning message, it is not guaranteed that they will act on the news as the sender intends or even fully understand the message. The

risk needs to be communicated to and understood by affected populations to minimize the hazard to humans and thus minimize the impacts or consequences of the risk (Cole & Fellows, 2007).

To date, no research has been conducted on Oregon's population awareness of and attitude toward ShakeAlert and its public messaging and whether populations distinguish other regional hazards from earthquake risks. As such, ShakeAlert provides a key jumping off point for this dissertation, which examines the unique communication challenges associated with earthquake early warning systems. By employing the situational theory of publics (STP), this study examines the extent to which Oregon residents recognize earthquake early warning systems, earthquake safety behaviors, and earthquakes as a regional hazard as an important social issue. Applying the STP, specifically tests the extent to which potentially affected residents are personally involved with these issues, and how their perceptions of constraints and recognitions of the risk affect their communication habits and behavioral intentions to perform acts before or during an earthquake.

Applying STP in this context also provides insights regarding the profile of distinct public segments, groups, or types based on their problem recognition of and constrain recognition with earthquake early warning systems, safety, and Oregon earthquakes. In so doing, the study explores the relationship between the situational theory's distinct populations and variables like previous earthquake experience and demographics. Exploring this relationship helps identify the key characteristics of these publics, such as their media consumption habits, the trust they place in various information sources (i.e., organizational trust), and their behavioral intentions to perform various communication behaviors (i.e., information seeking, processing, engaging, gaining), and protective behaviors before or during after an earthquake. Ultimately, the purpose of this study is two-fold. First, this study is interested in learning Oregonian's awareness and perception of earthquake risks, protective action behaviors,

ShakeAlert, and their public relations material (i.e., utility bill insert). Second, this study is interested in learning how Oregon publics form and perform communication behaviors according to the STP.

CHAPTER II

LITERATURE REVIEW

This literature review discusses the intricacies of earthquakes while focusing on the West Coast of the United States of America (US) and a governmental public alerting earthquake early warning system available in some states. Next, the literature reviews the field of risk communication as it relates to an individual's demographic, social, and attitudinal influence on hazard messaging. The foundation of risk communication and effective strategic messaging is public relations. Therefore, this project finds theoretical underpinnings from public relations scholarship. Within public relations literature, this project specifically examines the STP and its utility for accessing the formulation of publics in situations of earthquake risks. This literature review chapter concludes by pinpointing the gaps and limitations in risk communication literature and public relations theoretical scholarship.

Earthquakes

This section on earthquakes will tease out the uniqueness of earthquakes as hazards that was outlined in the introduction. Then, it will discuss the historical and current tools and technologies used to measure, record, report, and alert publics and stakeholders of a possible earthquake. A section on earthquake early warning systems on the international and national levels is reviewed to understand the usefulness of such systems for public alerting populations and infrastructure systems at-risk for an earthquake. To conclude, this section presents literature on strategies to publicly promote and educate publics on outreach earthquake warning systems and protective actions.

The introduction offered a broad definition of earthquakes. Specifically, according to the USGS, an earthquake is a hazard where there is a slip-on a tectonic plate fault causing minor-to-major "ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth" (USGS, n.d.). For

millions of years, plate tectonics have shaped the earth. With time, these huge plates have slowly moved over, under, and past each other. Sometimes the movement is gradual. Other times, the movement is not gradual and more intense. During plate movement, plates may lock together, making them unable to release the accumulating energy or geological stress, which causes two plates boundaries to interact with one another. This plate interaction is followed by the groundbreaking free, which causes ground shaking and an earthquake. Movement in earth-shaping plate tectonics can cause seismic activity in zones and regions known for earthquakes. These earthquake-prone areas are familiar with the significant destruction and expenses an earthquake may cause an individual, community, or region.

Not everyone is at risk for an earthquake. Earthquakes mainly occur in regions with known earthquake fault lines or hot zones. Some well-known earthquake zones in the United States of America (US) include the San Andreas fault zone (located in California), Cascadia fault zone (located in the Pacific Northwest), and the New Madrid fault zone (located in the US mid-South region) as previously reviewed in the introduction. Most earthquakes occur at boundaries where the earth's plate tectonics meet. Scientists have defined four types of plate boundaries where interactions that produce earthquakes are likely: divergent boundaries (spreading zones), convergent boundaries (subduction zones), transform boundaries (transform zones), and plate boundary zones (USGS, 2014; 2016). A divergent boundary earthquake occurs in a spreading zone where two plates push or spread apart (USGS, 2016). These types of earthquakes may be located in oceans. The North American and Eurasian plates, for example, are spreading apart in the mid-Atlantic ridge in the Arctic Ocean (USGS, 2014). The transform boundary earthquakes are found where two plates that rest horizontally to each other slip or slide past or under one another. These earthquakes tend to occur at shallow depths and form relatively straight linear patterns (USGS, 2016). Transform faults tend to be located on the ocean floors, however. There are some transform faults on land too.

The San Andreas fault, for example, is located along the coast of California and northwestern Mexico. Convergent boundary earthquakes occur in subduction zones where one plate overrides another plate causing a downward plate sink (or be subducted) into the earth's mantle (USGS, 2014). An example of a subduction-zone plate boundary is the Cascadia Subduction Zone (CSZ), which starts near Mendocino, California, extending beyond Oregon and Washington, and ending around Vancouver Island, Canada. The least common type of earthquake occurs in plate-boundary zones where boundaries are not accurately defined because of a formation of a broad belt of microplates, which are smaller fragments of larger plates (USGS, 2014). Plate-boundary earthquakes make up less than 10 percent of all earthquakes (USGS, 2016). This project will primarily focus on residents living in the CSZ earthquake region. Therefore, the next section will provide more information on earthquake risks populations in Oregon may face.

Earthquakes in Oregon. Oregon is located on the West Coast of the United States in a region known as the Cascadia. The Cascadia region of Oregon stretches from a high above sea level in a mountainous area known as the Cascadia Mountain Range to below sea level in a regional hazardous area known as the Cascadia Subduction Zone. The CSZ is where two tectonic plates — the North America plate and the Juan de Fuca plate — come together to form an 800-mile-long earthquake fault (Wirth & Frankel, 2019). This subduction zone has a rich earthquake history and includes parts of northern California, Oregon, Washington, Alaska, and British Columbia.

Within the CSZ, Oregon is situated between California and Washington. California and Washington have high amounts of seismic activity and histories of violent earthquakes (Von Hake, 1976). In contrast, Oregon's history shows less active seismic activity in its neighboring states. The first recorded earthquake in Oregon occurred outside of Fort Vancouver along the Oregon-Washington border in 1841 (Berg & Baker, 1963). Since 1841,

Oregon has experienced more than 6,000 earthquakes on Oregon land or near its borders. From 1843 to 1993, 40 recorded Oregon earthquakes had magnitudes of 4.5 or higher (Wong & Bott, 1995).

There are four areas of seismic risks in Oregon, including the Portland region, Mount Hood, Pine Valley Graben-Cuddy Mountain, and the CSZ. These areas span from the most Western part of the state, the CSZ, and coastal region, to the most eastern part of the state, Pine Valley, which lies near the Oregon-Idaho border. The Portland region has been recognized as one of the most seismic active regions in the state because it has recorded at least 17 magnitudes 4.0 and larger earthquakes and six earthquakes recorded at a magnitude of 5.0 and larger (Bott & Wong, 1993; Wong & Bott, 1995). Researchers claim that Portland's basin and gorge-like geological structure are to blame for the seismic activity because the basin is bounded by two fault zones, the Portland Hills fault zone, and the Frontal fault zone (Wong & Bott, 1995; Yelin & Patton, 1991). The Mount Hood region is east of Portland and has seismic activity occur at the Mount Hood Cascade volcano and around the Mount Hood fault. The seismic zone beneath Mount Hood is like the zone beneath Mount St. Helen in Washington, one of the most seismically active areas of the Pacific Northwest (Wong & Bott, 1995). The Pine Valley region is the most seismic active area of eastern Oregon. The area witnessed a significant earthquake in 1913 and numerous small earthquakes (Mann, 1989).

The CSZ has not produced an earthquake since 1700. Scientists believe that this long lapse is causing the tectonic plates to build pressure and geological stress furthering the possibility of an earthquake hazard (Oregon Emergency Management, n.d.). To that end, some scientists have recently predicted a nearly 40 percent chance in a megathrust earthquake of the magnitude of 9.0 or 10.0, lasting at least four minutes and possibly creating a tsunami in the wake of its destruction, to occur along the CSZ within the next 50 years (Oregon

Emergency Management, n.d.). This event will be felt throughout the Pacific Northwest, and it will directly threaten three major metropolitan hubs, Portland, Seattle, Vancouver. Even though a major earthquake is a known threat of the region, the area surrounding the CSZ experiences hundreds of small earthquakes each year (Mann 1989; Wirth & Frankel, 2019).

Since the 1970s, nearly 17,000 earthquakes with magnitudes ranging from 1 to 6 have been recorded in Oregon and Washington (Brocher & Sherrod, 2018; Moran, 2010; Yelin, Tarr, Michael, & Weaver, 1994). Researchers determined that populations in the Pacific Northwest experience roughly 15 to 20 moderate-to-significant earthquakes each year (Brocher & Sherrod, 2018; McGurie, 2021). Oregon, in particular, has a history of and is at risk earthquakes that vary from small to significant in size and consequence. Nearly hundreds of small offshore earthquakes occur in Oregon every year, mostly unfelt by populations (Nisqually, 2001). Oregon also experiences a moderate number of inner-ocean earthquakes each year. In December 2021, for example, the coast of Oregon witnessed nearly 100 inner-ocean earthquakes (Byrd, 2021).

Measuring and observing earthquakes. Earthquakes are measured by magnitude and intensity. The Richter Scale measures the magnitude of most modern earthquakes, whereas the Modified Mercalli (MMI) Scale measures an earthquake's intensity to a location. With magnitude, earthquake measurements are recorded by the vibrations produced at the event. These vibrations are recorded and analyzed with seismographs. Seismographs produce zigzag lines that reflect the changing intensity of vibrations of seismic waves caused by an earthquake. Therefore, a zigzag with long narrow vertical lines or zigzags sitting closely together instead of a zigzag with short and wide-like vertical lines sitting further apart is a recording and measurement of a relatively strong earthquake with intense vibrations. The data produced by the seismograph can determine the time, the epicenter, the focal depth, and the type of faulting of an earthquake and can estimate how much energy was released. The

information produced by the seismic waves can also be used to gauge an earthquake's magnitude. The earthquake's magnitude information is used to determine an earthquake's position on the Richter Scale. The Richter Scale measures earthquakes from a 2.0 to a 10.0 by analyzing the geological energy released during the event (Stover & Coffman, 1993; USGS, 2013). An earthquake that has a magnitude of 2.0, for example, is a minor earthquake usually felt by people in the surrounding areas. Earthquakes with a Richter value of 6.0 or more are commonly considered significant, and great earthquakes have a magnitude of 8.0 or more on the Richter scale. The largest earthquake on the Richter Scale is a 10.0 – an earthquake of this size has never been recorded. Even though the Richter scale provides the most scientific method to record and analyze destruction from an earthquake, a different approach to measuring earthquakes is available for researchers and practitioners.

The second way to measure an earthquake is by describing an earthquake's intensity. An earthquake's intensity is assessed via its observable earthquake damage and accessed with the MMI scale. In short, the MMI describes the intensity of an earthquake, whereas the Richter Scale describes the magnitude of an earthquake. Instead of using seismographs as an earthquake measurement tool to measure earthquakes, the MMI uses observations data quantified from the aftereffects of the earth's surface, populations, and structures (Wood & Neumann, 1931; USGS, 2016). The MMI records and measures earthquakes using a scale that ranges from one (not felt) to ten (total destruction; USGS, n.d.). The MMI scale as an earthquake measurement tool is beneficial for use in inhabited areas and to compare the damage caused by earthquakes in different areas. However, the scale's limitations have hindered its appeal in the scientific community for two primary reasons (Stover & Coffman, 1993). One limitation is that the observations derived from eyewitness accounts and the experiences of individuals may vary with inaccuracies. Another limitation is that the damage caused may not accurately reflect an earthquake's strength. Therefore, the Richter scale is

considered more scientific and accurate than the MMI because it allows scientists to accurately compare the strength of earthquakes at different times and locations in a more objective manner (Stover & Coffman, 1993; USGS, 2016).

New tools and technologies have been developed that monitor seismic activity and use earthquake measurement scales like the Richter and MMI to gauge earthquake magnitude and intensity rates occurring in near real-time. The earthquake information derived from these new tools and technologies may be used to develop earthquake early warning information or alerts to proper agencies and organizations so populations and automated systems may be notified about the geolocated ground shaking. This process is similar to how a developed earthquake early warning system operates.

Earthquake Early Warning Systems

Early warning is defined as “the provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response” (ISDR, 2004). Early warning systems have been implemented to publicly alert populations of hazard prevention techniques and hazard forecasts for events like floods, tornadoes, and hurricanes. Scholars have determined that the number of lives an early warning can save exceed significantly when weighed against the development and maintenance costs of early warning systems (Rogers and Tsirkunov, 2011, Teisberg and Weiher, 2009).

Similarly, earthquake early warning (EEW) systems are designed to detect earthquakes rapidly and submit alerts notifying and encouraging societies and infrastructure systems to take protective actions and mitigate losses and injuries from the hazard or its aftereffects (Cochran et al., 2018; Strauss and Allen, 2016). Currently, EEW systems are active in Mexico, Japan, Turkey, China, Taiwan, Italy, and Romania and now in the US (Lee & Espinosa-Aranda, 2003; Hoshiya, Kamigaichi, Saito, Tsukada, & Hamada, 2008; Allen,

Gasparini, Kamigaichi, & Bose, 2009). Most EEW systems vary in alert availability, production, and distribution due to the system services' size and area. Some EEW systems, like those based in Mexico City, Japan, and the US, produce a form of public alerting where the greater public directly affected by an earthquake hazard is warned about possible risks in their area. Like those in Turkey, China, and Romania, other EEW systems deliver a limited number of alerts to specific users – those with specific phone operating systems, for example (i.e., Android operating system phones can receive alerts; McBride et al., 2021; Strauss & Allen, 2016). It should be noted that the alerts powered by EEW systems can provide seconds of warning time for populations likely to experience ground shaking. Furthermore, with EEWs, it is not always guaranteed that enough warning time will be provided due to the variability in locations of earthquakes, the intensity of ground shaking and population relational distance to the earthquake's epicenter (Minson, Baltay, Cochran, Hanks, Page, McBride, & Meier, 2019).

The goal for alerts produced by EEW systems is to provide helpful earthquake and protective action information to affected populations so individuals may become more mentally and physically prepared for a possible hazard, and infrastructure and electromechanical operating systems may take automatic actions to reduce damage and injuries on a macro level (Cochran, Aagaard, Allen, Andrews, Baltay, Barbour, & Toomey, 2018). A system that can deliver earthquake early warning alerts to publics directly impacted by an earthquake risk is a tool and technology needed for areas with known earthquake risks in the US.

EEW in the US. An EEW system, ShakeAlert, has been developed for the US west coast. ShakeAlert is powered by the USGS and is modeled after techniques employed in Japan, Taiwan, Mexico, Turkey, and Romania (Neith, 2013). In 2006, ShakeAlert started the developmental process for an EEW system in areas known for high-seismic-risk activity

along the US West Coast – California, Oregon, and Washington (Burkett, Given, & Jones, 2014) by adapting the earthquake-monitoring infrastructure of seismic networks coordinated by the USGS (Given et al., 2014). A well-fashioned technical system of USGS seismic networks bolsters the ability to provide the rapid and dense ground-motion annotations necessary for issuing earthquake alerts like those within the ShakeAlert EEW system. The communication and information generated by the coordinates of the seismic networks are sent from field stations (i.e., areas near the closest ground shaking) to central processing sites (area to help transmit EEW alerts). With current tools and technologies, seismic activity and information processed via the seismic networks can send continuous real-time data back to processing centers by some combination of radio, government-owned microwave, commercial cellular, commercial Internet, commercial frame-relay, satellite, and partner-owned telemetry systems (Given et al., 2014).

Fast forward to 2019, ShakeAlert went live and started delivering public earthquake warning alerts to users in California. In 2019, ShakeAlert began delivering public earthquake warning alerts to users in California likely impacted by an earthquake or possible ground shaking from an earthquake. In 2021, ShakeAlert expanded its EEW alert delivery mechanisms to reach Oregon and Washington populations (Jenkins et al., 2022). Between October 2019 and January 2021, ShakeAlert powered a total of 30 alerts via smartphone apps and eight alerts via the Integrated Public Alert and Warning System (IPAWS) portal through partnered agencies and organizations (McBride et al., 2021). Google, for example, delivers ShakeAlert-powered alerts as a service within the Android operating system.

An earthquake warning system, like ShakeAlert, will not predict when and where an earthquake will occur. Instead, ShakeAlert can provide nearby impacted populations with seconds of notice before an earthquake is felt. Through ShakeAlert, the USGS manages and publishes information on sensor-detected earthquakes and ground shaking at accessed

locations to the publics and stakeholders likely affected by the earthquake hazard (Sellnow, Jones, Sellnow, Spence, Lane, & Haarstad, 2019). A ShakeAlert-powered warning may be issued for a region when the expected ground shaking intensity is above a minimum magnitude of 4.5 or slightly larger (McBride et al., 2020). The system can detect large offshore earthquakes with a magnitude of 7.5 or higher, similar to a CSZ event.

ShakeAlert has four alerts: correct alert, correct no alert, missed alert, and false alert (Festa, Picozzi, Caruso, Colombelli, Cattaneo, Chiaraluce, & Zollo, 2018; Minson et al., 2019). A "correct alert" is when the earthquake's magnitude and expected ground shaking will be felt in a user's territory, and an alert is correctly triggered to the correct populations affected by the ground shaking. A "correct no alert" occurs when no alert is issued because the earthquake's magnitude and expected ground shaking will be less than the threshold to trigger an alert. In its opposite case, a "missed alert" occurs when the earthquake's magnitude and expected ground shaking will be more than the threshold to trigger an alert, and no alert is triggered; therefore, it is a missed opportunity to alert. Lastly, a "false alert" occurs when ground shaking produced by the earthquake falls short of the threshold to trigger an alert, but an alert is triggered to the public that would have been affected by ground shaking if the alert was not false. False alerts could prevent stakeholders from trusting the newly established EEW system and its published earthquake information (McBride et al., 2020).

ShakeAlert messages notifying populations of possible ground shaking from an earthquake and recommending protective actions to take during a hazard is essential because not all people may be familiar with regional earthquake risks, EEW systems, or guidelines on protective actions. Public acknowledgment and understanding of safety and protective actions for impending risks and hazards is critical when discussing earthquakes due to the reduced warning time a population may receive before a hazardous event. With seismic activity, even the most advanced EEW systems offer only seconds of warning time, in contrast to

hurricanes or tornados, for example, where advanced forecasting systems give more warning time and allow individuals days or hours to prepare (Goltz and Bourque, 2017; McBride et al., 2021). In light of these complexities, stakeholders and publics who receive EEW alerts must understand the message content and acknowledge the recommended protective actions during an earthquake. A population's ability to understand and respond to public relations material communicating regional hazards, risk mitigation tools, and protective actions depend on their access and interpretation of the information they receive from systems like ShakeAlert (Jenkins et al., 2022; McBride et al., 2021).

EEW promotional and educational outreach. When a population receives a warning message from an EEW like ShakeAlert, they might not understand the information or act on it as the sender intends (Major, 1993). Therefore, encouraging stakeholder hazard awareness and preparedness through educational and promotional material is essential because it informs stakeholders on how to use the system and what protective actions to take during a hazard (Fraser, 2004; Liu, Seate, Iles, & Herovic, 2020). Scholars, for example, analyzing the importance of community education with a newly implemented alert system in Iran, found a community that received proper alert system education but had an inadequate system were more able to understand the alert information and how to use the system injunction with already learned protective actions compared to a community that received inadequate system education but had a newer system (Zaboli, Seyedin, & Malmoon, 2013).

A messaging toolkit with educational and promotional public relations materials was created to raise awareness of ShakeAlert and earthquake protective actions. Public relations material such as frequently asked questions, key talking points, informative flyers, multimedia products, and social media sample posts are included in the ShakeAlert toolkit. This toolkit was designed to be used by the general public, media outlets, educational institutions, and various infrastructure systems or sectors like the transportation sector. The

variation in messages from targeted group-to-group is low as a similar message is used to target all publics.

The literature on earthquake hazards highlights seismic activity's unique geological and environmental features and how it is monitored, measured, recorded, and reported to various stakeholder groups. The arrival of the EEW system, ShakeAlert, will allow the delivery of public alerts notifying populations of possible ground shaking from an earthquake in regions with known seismic activity along the US west coast. As of 2021, ShakeAlert is activated in three states and has delivered dozens of ShakeAlert-powered messages warning impacted populations of nearby seismic activity. This section also touched on the opportunities for EEW system and protective action educational outreach while considering public relations and risk communication practices. To promote and educate the public on ShakeAlert and protective actions, a messaging toolkit was created with public relations and risk communication material to be used as a promotional and educational tool targeted at a variety of stakeholder groups and industry-related sectors such as the media, governmental agencies, non-governmental entities, educational institutions, and the transportation sector. Because elements of risk communication play a vital role in the creation of public relations material intended to promote and educate publics of the earthquake early warning system, ShakeAlert, and protective actions, the following section reviews the comprehensive research on the field of risk communication before the literature review explores the public relations theoretical underpinnings of this project.

Risk Communication

This section on risk communication will first review the start of the field of risk communication and the vast amount of risk communication definitions offered to scholars. The literature will also discuss how risk communication serves as a function of public relations. Next, this section will elaborate on the demographic, social, and attitudinal factors

that may affect the transmission of risk communication. Lastly, this section reviews selected limitations of risk communication research and how public relations theory can aid in risk communication's conceptual shortcomings.

In its simplest form, risk communication is two activities: alerting and reassuring people (Sandman, 1988). More specifically, risk communication can be defined as “an iterative exchange of information among individuals, groups, and institutions related to the assessment, characterization, and management of risk” (McCommas, 2006, p.76). This definition highlights the importance of exchanging information in risk control or management. Another, more prominent definition of risk communication acknowledges the stakeholder instead of concentrating on risk control or management. The National Research Council defines risk communication as:

“An interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management” (NRC, 1989, p. 21).

The NRC definition stresses the importance of stakeholder involvement and targeted risk communication messaging to all, directly and indirectly, impacted stakeholder groups. Other scholars have noted the importance of stakeholder recognition in risk communication. One study, examining the effects of chemical terrorism risk messaging, argued that “risk communication provides the opportunity to understand and appreciate stakeholders' concerns related to risks generated by organizations to engage in dialogue to address differences and concerns, carry out appropriate actions that can reduce perceived risks, and create a climate of participatory and effective discourse to increase harmony and mutuality” (Palenchar, Heath, & Orberton, 2005, p. 752). This concept of risk communication focuses on the

stakeholders and how they come to risk communication with a set of individual and collective beliefs that influence the impact of risk mitigation. Understanding the background of preexisting demographic and social factors stakeholders have about risks is undoubtedly valuable when developing risk messaging targeted at-risk mitigation or protective action behaviors. In a similar sense, a study on Hurricane Katrina and risk messaging found “Stakeholder involvement is pivotal in the development of a dialogue intended to result in a risk management or mitigation consensus” (Cole & Fellow, 2008, p. 214). Altogether, these scholars echo the NRC risk communication model, incorporating and valuing stakeholder preexisting risk perceptions and attitudes when developing risk communication messaging or communication risks to the public.

The current project looks to the NRC risk communication definition as a guiding conceptual light because this definition values stakeholder contribution in the practice of risk communication. Drawing attention to the stakeholder is slightly different from previously mentioned definitions that focused more on organizational risk management (i.e., Covello, 1992; McCommas, 2006).

Risk Messaging

Research has found that stakeholders' buy-in of risk communication is essential because it helps to encourage a responsive public (Gilk, 2007). Stakeholder obtainment and acceptance of risk communication are essential because those possibly impacted by a risk need to be familiar with the facts to understand the issue better and act upon the information. Stakeholder acceptance of risk communication messages relies on two components. The message "must communicate the probabilities and consequences of known risks to affected audiences" (Cole & Fellows, 2008, p. 213). Risk recognition is a critical part of risk communication because the information must instill an act of urgency in the public. For example, one study found an increase in perceived severity of a risk influences individuals to

perform risk mitigation behaviors (McCommas, 2006). Additionally, the risk communication message should seek agreement among the affected audiences regarding a specific course of response and mitigation (Cole & Fellows, 2008). Therefore, if the public perceives the risk messaging to be clearly communicated with certainty, they will be encouraged to perform the recommended behaviors of the risk message.

Risk communication scholars have found that individuals must comprehend the content of that message in order to act on it (Albarracin & Vargas, 2010). Certain message characteristics help motivate stakeholders to take preparedness or mitigation action. Characteristics of the threat, how the warnings are communicated, and how the recipients process the information, for example, are all key determinants as to whether the public takes specific mitigation behaviors or proactive actions (Mileti, Farhar, Fitzpatrick, & Helmericks, 1991). Scholars believe that recipients of risk messaging must a) receive the information, b) understand the information, c) understand that the messages apply to them, d) understand that they are at risk if they do not take proactive actions, e) decide that they need to act on the information, f) understand what actions need to be taken, and g) be able to take action (Mileti & Sorensen, 1990). Any interferences with this cognitive and behavioral sequence of risk processing, such as ambiguity about message meaning, disagreements regarding message validity, or urgency of warning, could result in individuals not taking recommended risk mitigation actions (Tierney, 2000).

Processing and comprehending risk messaging are important, as the previously mentioned, however, other factors, like demographic and social features, play an essential role in risk communication understanding and motivation to act (Sorensen, 2000). More specifically, factors like household income, caregiver status, social experiences, and perceived trustworthiness in risk messaging significantly relate to stakeholders' ability and feasibility to receive, cognitively process, and act upon risk information (Tierney, 2000).

Demographic differences with socioeconomic status. Research on the demographic difference in risk communication messaging comes primarily from disaster studies. As mentioned, this dissertation reviews earthquakes as hazards, however. Because most scholarship is disaster-orientated, this literature review will discuss what disaster studies scholars have found regarding various demographic differences with risk communication messaging.

Hazards do not affect all people equally. Research has found that susceptibility is closely related to socioeconomic conditions that vary from individual to individual, group to group, and community (Mallick, Khan Rubayet, & Vogt, 2011). Specific communities with a narrow economic base may become particularly vulnerable to the onset of a hazard. One study, analyzing the health effects of hazards on the poor, found that vulnerable socioeconomic groups tend to be exposed to more natural hazards and extreme weather events due to the hazardous communities they inhabit, which are areas predisposed to hazardous events that might turn into disasters (i.e., communities below sea level, along coastal lines; McMahan, 2007). The vulnerable groups occupying these communities have preexisting problems amplified once a risk threatens their neighborhoods. These individuals are focused on day-to-day survival, living paycheck-to-paycheck, with limited resources reserved for emergencies. Therefore, having extra cash for resources such as gas, food, or medical supplies may be unrealistic for most families living near or below the poverty line. This economic hardship causes tension when they are asked to act upon hazard preparedness information like purchasing extra food (McMahan, 2007). Underprivileged and vulnerable groups may receive an evacuation message, but they may not have the means to leave their residence. For example, in New Orleans, during Hurricane Katrina, a study found that more than 50% of the households in the 9th Ward did not have a vehicle to evacuate, money for a hotel, or nearby family for lodging requests (Sherman & Shaprio, 2005). These individuals

could not evacuate because of a lack of resources, so they decided to stay home for the arrival of Hurricane Katrina.

Vulnerability categorized in terms of demographic information such as income, education, and ethnicity can influence risk perceptions and preparedness behaviors (Schmidlin, 2006). Research on risk perception, for example, found that low-income individuals had a greater risk sensitivity because they had a perceived lack of power and little control over their lives (Fothergill & Peek, 2003). Another study discovered lower socioeconomic groups worry more about losing their homes to an earthquake than other SES groups (Palm, 1998). Individuals living near or below the poverty line understand risk messaging differently because they lack adequate resources to act upon the information.

Hazards can also cause havoc to low SES groups because they can affect an individual's ability to gain an income due to injuries or death. A hazard could cause an individual an immediate loss of income due to destroying a worksite, personal injury, or death. A study of Vietnamese households found that being injured was a significant contributor to poverty after a hazard (Thanh, Hang, Chuc, Rudholm, Emmelin, & Lindholm, 2006). Additionally, research on the effects of hurricanes, tropical storms, and tornados found that low-income communities suffer disproportionately in fatalities and injuries compared to non-poor communities (Zahran, Brody, Peacock, Vedlitz, & Grover, 2008).

Social differences with previous hazard experience. Different variables play a role in risk perception, and experience is one of those variables (Gilk, 2007). Research has argued that previous hazard experience factors into whether individuals respond to risk communication mitigation and preparedness messages. One study, investigating the effects of flood experience on mitigation behavior, found that people who had not been affected by a flood underestimated the impact of the hazard in terms of severity of and susceptibility to loss (Siegrist & Gutscher, 2008). A study on wildfires concluded that personal experience had a

powerful impact on risk perception and the willingness to protect oneself from a current risk against wildfires (Martin, Bender, & Raish, 2007).

Other studies have found experience does not drive future risk mitigation or preparedness attitudes or behaviors. One study, examining the role of household preparedness, determined that individuals with previous experience were less likely to prepare for future events because participants estimated their chances of experiencing a negative outcome was less likely due to their previous experience with the hazard (Kapucu, 2008). Additionally, another study found that if an individual has survived a prior risk or warning, they are less likely to take action for a current hazard despite warning messages (Tierney, 2000). The difference in research findings for experience moderating natural hazard risks preparedness behaviors and attitudes qualifies the need for scholars to investigate this matter further.

Message factor differences with trust and credibility. As previously reviewed, demographic and social differences can indeed impact the effectiveness of a risk message. Message factors like differences like how stakeholders perceive trust from the message source can affect the acceptance and responsiveness of risk communication (Paton, 2008). Trust can be defined as a person or organization that is competent, objective, fair, consistent, has no hidden agenda, and being genuinely concerned about the vulnerability of its stakeholders (Heath, Seshadri & Lee, 1998). People tend to be less afraid of risks when risk communication comes from places, people, corporations, or other organizations that they trust. Similarly, people are more frightened of hazards if the risk communication comes from a source they do not trust (Ropeik & Gray, 2002).

Research on risk perceptions and risk messaging effectiveness found that the more trust a stakeholder has in the message sender, the more likely they will proactively follow the message sender's recommendations (Palenchar & Heath, 2003). One study found, for

example, that trust has a positive influence on hazard preparedness behavioral intentions for an individual with varying levels of hazard knowledge or experience (Paton, 2008). Another study determined that trust in risk message sources was a motivating factor for flood and landslide hazard preparedness behavioral intentions (Lin et al., 2008). Trust plays a critical role in the interrelationship between risk information acquired from various sources and protective hazard actions.

One of the most prominent examples of source trustworthiness comes from Hurricane Katrina research (Cole & Fellows, 2008). Scholars found that a segment of the population of New Orleans did not trust officials disseminating the evacuation messages because of the inconsistent federal, state, and local risk evacuation messaging. Unfortunately, the distrust in risk communication messages swayed some people not to evacuate, thus causing a segment of the population to lose their belongings, homes, and lives (Spence, Lachlan, & Griffin, 2007). Risk communication is tasked with warning stakeholders about the possibility of a hazard or crisis. Trust or lack of trust should not complicate the risk communication mission. Stakeholders must trust the message source to be motivated to take some form of preparedness action. In the Hurricane Katrina example, risk communication failed. Distrust was found in the source of risk messaging, which ultimately caused message failure.

Risk communication is essential for public relations programs designed to educate people on earthquake safety or protective actions for those in communities at risk for seismic activity; however, people comprehend and act upon risk communication differently. As for demographic factors, research has found that when an individual is faced with a risk or warning about an impending hazard, they may use existing knowledge shaped by previous beliefs and attitudes, life experience, personal psychology, and prior encounters with similar risks or warnings to interpret the risk information (Riley, 2014). To that end, an individual's beliefs and attitudes will guide their acceptance and comprehension of a warning or a risk and

influence their inclination to notice a warning message and determine the information to be relevant or credible.

The previously mentioned research points to the importance of audience segmentation and more personalized risk communication messaging because people interpret risks in the "context of their experience, beliefs, and expectations" (Connelly & Knuth, 1998, p. 80). Sociocultural and personal norms and experiences can result in different ideologies about risk decision-making (Vaughan, 1995). Public relations theory provides a perspective for examining public response to the earthquake risk and protective actions as an earthquake safety tool through the use of a restructured version of Grunig's (1997) situational theory of publics. Public relations theory, more specifically, the STP in risks, provides a framework for examining two sets of variables in a given risk-assessment process that have been found to influence public response to hazard warnings (Grunig & Ipes, 1983; Major, 1998).

Public Relations

This literature review section will review public relations' theoretical contributions to scholarship and practices. First, the literature will review the excellence theory and discuss how public relations plays a vital managerial role in organizational operations. Then, it will discuss the historical conceptualization of communication "streets" while elaborating on the difference between one-way and two-way communication avenues. The literature review presents sections on relationship management theory and dialogic communication as other primary theoretical perspectives in public relations. In conclusion, the literature points to the final theoretical pillar in public relations scholarship, STP.

Academics have defined public relations multiple times over the years. In 1984, scholars defined *public relations* as the "management of communication between an organization and its publics" (Grunig & Hunt, 1984, p. 6). This definition highlights public relations as a role where information is disseminated to persuade stakeholders, promote

organizational positions, and manage the corporate image (Lee & Rodriguez, 2008). A couple of years later, the practice was redefined to focus on organizational flexibility, changing environments, and stakeholder needs. This definition stated that public relations was “a communication function of management through which organizations adapt to, alter or maintain their environment for the purpose of achieving organizational goals” (Hazleton & Long, 1988, p. 81). Both definitions echo the concepts of communication, management, organization, environment, and goals; however, the latter definition is more communication-focused and stakeholder-oriented, which lends itself to upholding the two-way, symmetrical communication model (Lee & Rodriguez, 2008). This dissertation assumes the definition of public relations that views it as a practice that focuses on interacting with and soliciting input from stakeholders to shape the organizational decisions that affect stakeholder groups; therefore, this dissertation adopts the latter definition of public relations.

Four primary theoretical perspectives make up the library of public relations scholarship. These perspectives include the excellence theory, relationship management theory, dialogic theory, and the STP. For the most part, each perspective draws attention to the organization and keeps stakeholder considerations as a secondary inquiry. The organizational slant to public relations theory is similar to the ecology of the public relations definition as early discoveries were rooted in the corporation, and later inquiries leaned toward stakeholder communication and acknowledgment. The review of public relations theory will string together excellence theory, relationship management, and dialogic theory. STP is the last public relations theory reviewed in this section. The situational theory will be described in more detail because it is the theoretical underpinning of this dissertation.

Excellence theory. The excellence theory contributed to the practice and scholarship of public relations by outlining the four models of public relations and theorizing a shift of public relations from a tactical practice to a managerial practice (Grunig & Grunig, 2000;

Grunig, Grunig, & Vercic, 1998). The excellence theory also created principles to help guide professionals as communication specialists. These principles include 1) public relations professionals wear dual hats of the strategic manager and the administrative manager; 2) public relations should not be preoccupied with marketing but more or less integrated with marketing; 3) when a company engages in symmetrical communication, employee satisfaction increases; 4) with a growing number of women were in the field, companies should value women as much as they value men; 5) there should be an inclusion of race and ethnicity within organizations; 6) public relations professionals should be the ethics counselor and supporters of the organization (Grunig, 2008; Grunig & Grunig, 2010; Grunig, Grunig, & Vercic, 1998).

Another important product of the excellence theory was the development of the four models of public relations (Grunig & Hunt 1984; Grunig, 2008; Grunig & Grunig, 2010). The four models of public relations include the press agency, public information, two-way asymmetrical, and the two-way symmetrical model. The first two models of public relations use a one-way approach to communication, whereas the last two models use a two-way communication approach. With the one-way communication models, organizations provide information to their stakeholders, but they do not seek out or utilize any stakeholder feedback (Grunig & Hunt 1984). The press agency model, for example, uses one-way communication and persuasion to influence stakeholder decision-making or behavior in the organization's favor. The public information model also uses one-way communication (i.e., press releases) to distribute organizational information. In this model, the public relations professional is often referred to as the in-house journalist or the organizational storyteller. The following two models apply a two-way approach to communication. With a two-way approach to communication, organizations provide and seek out information from their stakeholders (Grunig & Hunt 1984). The two-way asymmetrical model uses an imbalanced form of two-

way communication where persuasion and manipulation may be used to influence stakeholders to behave in a certain way (Grunig & Hunt 1984). The asymmetrical model does not utilize research to gauge stakeholders' temperature toward the organization. Lastly, the two-way symmetrical model uses communication to negotiate with stakeholders, resolve conflict, and reach a mutual understanding and respect between the organization and its stakeholders (Deatherage & Hazleton, 1998; Laskin, 2012; Kenny, 2007). These four models of public relations have been used to plan, describe, and evaluate public relations, as theoretical concepts have been developed due to a discussion on the four models of public relations or the excellence theory (Grunig, 2008; Grunig & Grunig, 2010).

Even though the excellence theory is one of the most dominant theoretical perspectives in public relations scholarship, it does have several limitations as current research using excellence theory is restricted due to its limited ability to predict and explain (Laskin, 2012; Kenny, 2007). Some argue that the theory is not equipped to withstand country lines; its asymmetrical worldview does not account for culture and power differences (Degtherage & Hazelton, 2009). One study found that the excellence theory cannot travel easily across country lines. The hegemonic, Western view that power is distributed equally is not realistic for countries with different political and economic systems, levels of development, media markets, and the ability for activism (Kenny, 2007). Another limitation of the theory lies with the testability of attributes. Researchers have found criticism in reliability, stating that the developed scales for the models of public relations fall well below minimum recommended reliability levels (Degtherage & Hazelton, 2009; Leichty & Springson, 1993). Another study suggested that excellence theory represents how to perform public relations in the early days of mass media without accounting for technological advancement (Kenny, 2016). Lastly, other scholars have argued that the theory is too

normative (Thurlow, Kushniryk, Yue, Blanchette, Murchland, & Simon, 2017) and merely describes how public relations should work in an ideal situation (Pompper, 2004).

All in all, the excellence theory is a foundational public relations theory because public relations was largely viewed as a tactical craft where professionals focused on publicity and media relations prior to this work. Throughout the years, public relations roles have advanced to managerial practice. Scholars have argued that the progression of public relations to decision-making is partially due to research highlighted in the excellence theory. Excellence theory has also been the foundation of other conceptual underpinnings in public relations. Scholars, for example, used excellence theory as a guide to help develop relationship management theory, as relationship management theory builds on the concept that public relations professional plays an organization's managerial role while going into more detail on maintaining relations.

Relationship management theory. Relationship management poses relationships should be the center focus of public relations work because these relationships forecast the public's attitudes and behaviors toward the organization (Ledingham, 2003; Ledingham & Bruning, 1998). The theory argues that if the organization has a positive relationship with the public, then the public should have a positive attitude toward the organization (Ledingham, 2003). Relationship management theory came into the discussion by offering a conceptual shift from public relations as a communication activity to a relationship management practice (Ledingham & Bruning, 1998).

There are five dimensions of an organization's relationship management: 1) trust (created when organizational behaviors align with mission, goals, objectives); 2) openness (cultivated when an organization shares plans and goals with the community); 3) involvement (when an organization is involved with community welfare); 4) investment (when an organization is "investing in the welfare of the community"); and 5) commitment (when an

organization is “committed to the welfare of the community,” Ledingham & Bruning, 1998, p. 62). These dimensions have been used to analyze and measure various organization-public relationships (Ledingham, 2006).

Current research has used relationship management to examine social media influencers and their relationships with their followers (Dhanesh & Duthler, 2019). This study found that the influencer-follower relationship was not affected by ad sponsorship as long as the influencer was trustworthy and honest about its relationship with the sponsoring organization. It also found that the influence-follower relationship correlated with behavioral intentions when the relations were positive. Another study found that relationship management can be utilized in hazard communication campaign designs. This study suggested that relationship management works in collaboration with muted group theory to help to identify mutual interests and values of the organization and diverse community groups, as many marginalized groups may feel disempowered to act on early warning messages or preparedness information (Jenkins et al., 2022; Lejano, Rahman, & Kabir, 2020).

Relationship management theory has captured the overall goal of public relations, to identify organization-public mutual interests and values and act accordingly to satisfy the organization and the public, however. Critics of RMT argue that relationship management fails to evolve with modern-day ideologies and practices of professionals because the focus is too much on relationship building and not enough on strategic management of mutually beneficial relationships (Welch, 2006). Even though critics argue the theory lack utility to stay current and grow the field, its theoretical dimensions have been proven to be foundational assets for building stronger relationships between entities and stakeholder in current times of digital relationships building and engagement.

Dialogic theory. In 1998, an article on the dialogic principle of the internet began the discussion of dialogic communication and dialogic theory. This article defined *dialogic*

communication as "any negotiated exchange of ideas and opinion" (Kent & Taylor, 1998, p. 325). Dialogue should not be seen as a process. Instead, dialogic needs to be conceptualized as a product an organization receives from disseminating information to stakeholders instead of simply talking to stakeholders (Kent & Taylor, 1998). Treating organizational-public communication as a give-and-take relationship is a shift from excellence theory's position of the dissimulation of information.

Aside from conceptualizing dialogic communication, the theory also introduced the five dialogic principles of the internet. These principles are 1) create a dialogic loop that allows for feedback from the audience; 2) organization websites should include useful information that is of value for a variety of stakeholders (i.e., the general public, journalists, investors, competitors); 3) websites should generate return visits by including features to make them appealing and valuable; 4) websites should have an ease of interface and be easy to navigate; and 5) websites should value their visitors show their effort for the conservation of visitors. These dialogic principles have been used to research social media, Fortune 500 companies, and colleges and universities (McAllister-Spooner, 2009).

In 2002, scholars proposed a move toward a dialogic communication theory in public relations as a means to use communication as a tool for relationship building (Kent & Taylor, 2002). Accordingly, the five features for dialogue communication theory were named. The dialogic theory features include that organizations recognize 1) mutuality (acknowledging an organization and its publics are tied together); 2) propinquity (organizations consulting with their publics about matters that influence stakeholders); 3) empathy (an organization must have an atmosphere of support and trust); 4) risk (organizational dialogue is not scripted or planned); and 5) commitment (dialogue is honest and forthright; Kent & Taylor, 2002).

Research using the dialogic principles or dialogue theory proposed by Kent and Taylor has been rich over the years. When applied to social media, scholars found that for-

profit and non-profit organizations use Twitter to disseminate useful information and conserve visitors, while for-profit organizations are notably better at using the platform to fortify the dialogic loop (Wang & Yang, 2020). Research on the use of dialogic communication and socioeconomic stakeholder groups differences found that face-to-face communication achieved better dialogic engagement for low-income publics than social or mobile media dialogue (Place, 2019). A ten-year literature review of the internet's dialogic principles exposed previous research poorly applied principles to digital media analyses, as they are only used at an introductory and surface-level for relationship building functions (McAllister-Spooner, 2009). This analysis tasked researchers to refine and validate the measurement of dialogic principles to extend the theory.

Dialogic communication theory has been rich; however, it has limitations. First, the pioneering researchers of the theory have been the main contributors to the theory. Another limitation to this research is that a large portion of dialogic-focus scholarship has lacked any substance on diversity or power (Wirtz & Zimbres, 2018). Dialogic communication of public relations completely ignores moderating factors that can help or hurt an organization's dialogue with stakeholders. Attempts at two-way communication, lack of diversity, and enforcement of power could influence and hinder an organization's ability to build mutually beneficial relationships with stakeholders or employees (Lane; 2019; Wirtz & Zimbres, 2018).

This public relations section of the literature review examined three dominant perspectives in public relationship scholarship – excellence theory, relationship management theory, and dialogic communication theory. The excellence theory is seen as superior because public relations was largely viewed as a tactical craft where professionals focused on publicity and media relations prior to this work. Throughout the years, public relations roles have advanced to managerial roles. Relationship management theory builds from the

conceptual roots of excellence theory as it attempts to determine the best routes of maintaining organizational-public relationships. However, relationship management theory gives a reasonable attempt to bring the stakeholder perspective into theoretical and practical public relations discussions. At the same time, relationship management is too organizational-heavy and holds many limitations as excellence theory. Dialogic communication theory mainly focuses on how the organization may create better communication and relationship-building opportunities with stakeholders. A benefit of the dialogic theory of communication is that it provides scholars and practitioners with a process to measure dialogic communication (Taylor & Kent, 2014).

These previously reviewed public relations scholarship is rich; however, there are still significant limitations with these theories on an individual and collective level. First, there is a disconnect between research and practice (Kenny, 2007). Research often does not reflect practice, and professionals have found that it takes too much time to incorporate research in their practice (Kenny, 2007). The excellence theory, for example, is idealistic and does not account for the daily demands of a public relations professional. Also, relationship management and dialogue theory paint a picture of how public relations professionals should behave or communicate in an ideal nonpolarizing world. These perspectives completely fail to acknowledge culture, diversity, and power. Lastly, the previously mentioned public relations theoretical perspectives exhibit the breadth of theories addressing the private sector, the dearth of theories dedicated to understanding the public sector of public relations, and communication-related roles instead of stakeholder-focused theoretical options (Horsley & Barker, 2002; Liu & Horsley, 2007). The excellence theory, for example, approaches public relations from a corporate standpoint. Relationship management and dialogic theories attempt to add stakeholder perspectives but fail to meet the mark because theoretical approaches

reinforce an organizational-oriented pattern and fail to acknowledge stakeholder attributes or unique public attributes.

The STP is the last public relations theoretical perspective offered in this literature review. The situational theory scholarship is similar to the previously reviewed theories as it tends to lean toward the organization. However, the theory holds multiple benefits particular for this research. Situational theory sets itself apart from other public relations theories because research has found that the situational theory is more predictive in nature (Aldoory & Sha, 2007). Additionally, STP of publics is well suited for this project because it has often been applied to hazard and risk-related situations or cases (Aldoory, 2001; Grunig & Ipes, 1983; Lee & Rodriguez, 2008; Marjor, 1998; Xifira, 2016).

Situational Theory of Publics

The STP is concerned with how publics form. According to the theory, *publics* are defined as groups connected through their involvement and identification with an issue, or issues, presented in the communal sphere (Guy, Williams, Aldridge, & Roggenkamp, 2007; Lee & Rodriguez, 2008). However, stakeholder groups may not be formally organized or aware that they are in a group or apart from a particular public. Research on communal health issues found that even though stakeholders are unaware of group membership, they can form or organize at any point because publics form depending on their attitudes surrounding issues that directly or indirectly affect them personally (Guy et al., 2007). Nonpersonal commonalities among group's members include having a similar problem, recognizing that problem, and organizing to do something about the problem, thus, the STP posits that specific issues and situations are critical in defining publics (Grunig 1983 1987, 1997)

For more than 30 years, the STP has been applied to a vast number of topics, including social issues related to health (Aldoory & Bonzo, 2005; Cameron & Yang, 1991; Vardeman, 2006), politics (Chen, 2019; Hamilton, 1992), the environment (Major, 1993;

Grunig, 1983), risks (Aldoory, Kim, Tindall, 2009; Grunig & Ipes, 1983; Lee & Rodriguez, 2008; Major, 1998), and cultural identity (Sha, 2006), to name a few. The situational theory is a well-tested theory to explain the relationship between public opinion and communication behaviors (Kim & Krishna, 2014; Major, 1993). In terms of risks, the theory has been found valuable in explaining how publics form on issues surrounding earthquake predictions (Major, 1998), risk communication and mediated messages (Aldoory, Kim, & Tindall, 2009; Lee & Rodriguez, 2008), and environmental concerns (Major, 1993; Xifra, 2016).

Theoretical independent and dependent variables

The STP is composed of three independent variables and two dependent variables. The STP defines publics by combining independent and dependent variables. The theory's independent variables include problem recognition, constraint recognition, and level of involvement, while the dependent variables are active communication (information seeking) and passive communication (information processing; Grunig, 1997). If a public, for example, has an independent variable combination of high problem recognition and low constraint recognition, then this public would most likely have communication behaviors that match an "active public" according to the theory. In this theory, the independent variables reflect a public's perceptions regarding a specific issue or organization, while the dependent variables reflect stakeholder communication behaviors (Grunig, 1997).

Independent variables. As previously mentioned, the theory has three independent variables: problem recognition, constraint recognition, and level of involvement (Grunig, 1997). Problem recognition is the extent to which an individual perceives whether a situation needs to be improved and if it has consequences for them (Grunig, 1997). Problem recognition is registered when a public detects an issue, thinks about the issue's impact, and believes something should be done to correct it (Grunig, 1989, 1997). Research has found that individuals may detect problems externally from a situation or internally from curiosity

or lack of understanding (Grunig, 1989, 1997; Grunig & Repper, 1992). An individual's external or internal problem recognition can be influenced through mediated messages, interpersonal communications, and organizational communication (Lee & Rodriguez, 2008).

Constraint recognition refers to the degree to which "people perceive ... obstacles in a situation that limit their ability to do anything about the situation" (Grunig, 1997, p. 10). Constraint recognition is commonly referred to as the publics' perceived barriers to taking action on a problem or issue, and constraint recognition may impede individuals from conducting a planned behavior (Grunig & Hunt, 1984). Constraints can be developed internally and externally. Internally, constraints may arise from a belief in or understanding the problem (Grunig, 1997). Among strategic communication and persuasive literature, low self-efficacy, for example, has frequently been a barrier that affects an individual's constraint perception (Grunig & Hunt, 1984). Perceived constraints could also derive externally from physical barriers, such as physical abilities to take protective actions or the lack of space to take safety measures (Grunig, 1997).

The level of involvement determines how a public feels connected to a problem or if a situation affects them personally (Grunig, 1989b, 1997; Grunig & Hunt, 1984). Involvement may arise externally from actual involvement in a situation or internally from ego involvement (Grunig, 1997). Scholars argue that the level of involvement is the most important independent variable of the theory because of its predictive powers compared to problem and constraint recognition (Aldoory & Sha, 2007). To that end, research has found that variable effectively determines if an individual's communication behavior will be active or passive. Some scholars have posited that the level of involvement cannot be manipulated through messages to publics, but instead is something which publics already possess (Aldoory & Sha, 2007).

Dependent variables. As previously mentioned, in this theory, the dependent variables reflect a public's communication behaviors and whether members of a public will engage in active or passive communication (Grunig, 1997). Passive communication behavior is a characteristic of information processing, which is described as the public's likelihood to process information received passively about an issue. When engaging in information passively, individuals do not actively seek out information on an issue or topic, but they will process the messages if they are randomly exposed (Grunig, 1997; Grunig & Hunt, 1984). Research has found that passive informative processing publics are most likely to receive and process topical information through the media instead of word of mouth (Aldoory & Sha, 2007). Inversely, active communication behavior is a characteristic of information seeking, which describes an individual that actively searches for information on a topic or issue. When one engages in information-seeking behaviors, they purposefully scan the environment for messages and make an effort to understand information on a specific topic (Grunig, 1997). Information-seeking individuals will actively search for information about an issue from various sources such as mass media, interpersonal communication, digital communication, and social media (Aldoory & Sha, 2007).

This theory naturally compares active communication behaviors to passive communication behaviors because "the distinction between information seeking and processing is important in choosing a medium and communication strategy" (Grunig, 1979, p. 742). Publics who use information passively, for example, do not perform communication behaviors like the publics who actively seek information as information seeking "try to understand the information they receive and then use the information to plan their behavior" (Grunig & Hunt, 1984, p. 149). If public relations professionals can segment their publics, they can become more effective with their communication by using specialized media to reach those who seek out information (Grunig, 1979).

Referent criterion. Grunig's (1978) early work on defining publics in public relations considered previous experience and knowledge (referent criterion) essential aspects of an individual's communication behavior and attitude toward an issue. Here, the referent criterion sat with the independent variables (problem recognition, constraint recognition, level of involvement). The referent criterion provided a measure of the extent to which individuals believed they had prior knowledge of the situation and thus could articulate a solution for the problem (Grunig, 1978). This scholarship suggested that previous experience reduced the need for additional information because the experience and existing knowledge on the situation indicated that individual's behavior (Carter, 1966; Grunig, 1978). One study, examining drunk driving risk messaging, found that attitudes levels toward a recommended health behavior were influenced by a participant's previous experience and knowledge of the risk. This study suggested that individuals with higher referent criteria were more likely to positively affect the recommended health behavior (Grunig & Ipes, 1983). Even though previous experience and knowledge seemed to like a reasonable explanation for communication outcomes, scholars argued that referent criterion failed to provide strong enough prediction levels, and suggested that referent criteria may be an outcome rather than a cause of communication behavior (Grunig, 1987a, 1987b).

Some situational theory research found usefulness in measuring an individual's knowledge toward an issue (Hallahan, 2000) or experience with an issue (Aldoory, 2001; Powell, 2006; Sha 1995; Sha & Lundy, 2005). One study, for example, determined that an individual's previous experience and familiarity with an issue positively affected their message attitude and source credibility compared to individuals without issue familiarity (Sha & Lundy, 2005). Additionally, multiple studies have found that cultural identity fortifies referent criteria (i.e., cultural experiences), which influences an individual's communication behaviors, problem recognition, or level of involvement in some way (Aldoory, 2001;

Powell, 2006; Sha, 1995). The situational theory research on referent criteria is unstable. At times, previous experience with the issue or knowledge on the problem is a predictive source to other theoretical variables. Other times, referent criterion falls flat in the area of predictability. Among the studies where knowledge or experience is an important theoretical variable, the issue or problem under investigation often has a personalized element to the population studied. Research inquiries on health risk, environmental risks, or political involvement, for example, are all topics where the studied population has an innately higher attachment to the issue or problem because it is personalized, or it personally impacted them. Therefore, this study is interested in reigniting the referent criterion discussion by focusing on how previous experience with earthquakes may influence how the opinion publics from STP form and respond to earthquake-related information.

Categorization of Publics

Combining aspects of the theory's independent variables, STP developed a categorization of opinion publics that predictably perform communication behaviors (i.e., dependent variables). A variety of categorizations of publics have been offered to scholars. Each categorization focuses on the theory's variables in slightly different manners.

Publics according to issues (all-issue, apathetic, single-issue, hot issue). Scholars classified stakeholders by their salience toward an issue(s) (Grunig, 1997). The issue-orientated stakeholder classification approach was meant to understand what topics stakeholders found the most salient and whether salience matters when thinking about communication behaviors (Kim, Ni, Kim, & Kim, 2012). A total of four types of publics can be formed depending on their recognition of an issue. These publics are defined as hot-issue, single-issue, all-issue, and apathetic publics. A “hot-issue” public refers to those who are “active only on a single problem that involves nearly everyone in the population and has received extensive media coverage” (Grunig, 1997, p. 13). A hot issue public forms mainly

because of the massive topical media coverage and attention given to the “hot issue.” An all-issue public is active on all the issues. All issue publics can be called activist publics because they frequently challenge organizations on many different issues and not just one hot or pressing issue. Single-issue publics are active on one issue or a small subset of issues that usually concern only a small part of the population. Generally speaking, single-issue publics promote and pursue solutions for one issue while ignoring other issues. Lastly, apathetic publics are inattentive to all of the issues. Apathetic publics are usually considered are non-publics (Grunig, 1997; Grunig & Hunt, 1984).

Research discussing this categorization has primarily focused on hot issue publics because hot-issue publics are unique and different from other publics (Kim et al., 2012). Hot issue publics tend to have higher problem recognition and constraint recognition but weigh on their level of involvement. These publics have been considered more actively in the intellectual form than behavioral (Grunig, 1997). Research has found that the media influences hot issue publics because these publics tend to pay more attention to negative media issues than to positive ones (Grunig, 1997; Aldoory & Grung, 2012). Because hot-issue publics are fluctuated by the media and not genuinely involved with the organization or issue, these publics may quickly disappear when the issue-related media coverage fades (Grunig, 1997).

Publics according to variables (nonpublic, latent, aware, active). According to the theory, each public has a unique level of involvement about a particular issue or organization; however, the perceived solution to the issue separates stakeholders into different categories. To that end, another way to categorize publics is by combining variables according to a publics’ solution differentiation; publics are categorized as either active, aware, latent, or nonpublic (Grunig, 1997; Aldoory & Sha, 2007).

Categorizing publics with the titles active, aware, latent, or nonpublic is a primary way STP research classifies groupings of stakeholders. To be classified as an active public, an individual has high problem recognition and low constraint recognition, and they may have a high or low level of involvement (Aldorrey & Sha, 2007). Because active publics have a perceived low constraint recognition, it encourages them to solve an issue or be more active in finding a solution to a problem. Active publics are likely to actively seek information about an issue instead of passively processing topical information. Some situational theory research found that active publics will not only actively consume information, but they will also share the topical information and encourage others to seek the information (Aldoory & Sha, 2007).

Aware publics are different from active publics due to their level of constraint recognition. Aware publics have a medium to high problem recognition, a medium to high constraint recognition, and may have a medium to a high level of involvement. However, the aware public's high constraint recognition prevents any action towards an issue. For an aware public, if constraints are lowered, this public will likely become involved with the active public categorization (Aldoory & Sha, 2007).

The latent public has medium to high involvement and low problem recognition simply because they are unaware of the issue. Because this public is unaware of the issue, it tends to have low constraint recognition. Research has found that latent publics will remain latent until these individuals recognize the problem and become aware of the issue (Aldoory & Sha, 2007). Once latent publics have a heightened problem recognition, they can become aware publics. Latent publics have the most passive communication behavior compared to aware and active publics (Schuch, 2007).

The last public is the nonpublic group. Nonpublics do not have involvement with an issue, and, therefore, they believe the issue does not affect them (Grunig 1997). These publics are unlikely to become a different type of public unless something in their lives gives them a

sense of involvement with the issue. Some scholars believe nonpublics should not be considered in campaign and message designs because this group typically does not receive or process campaign information due to their low level of involvement and problem recognition (Aldoory & Sha, 2007; Kim, Ni, & Sha, 2008).

The situational theory research has used the active, aware, latent, nonpublic categorization to analyze an array of occurrences. One study, for example, reviewed how public relations professionals segment publics according to organizational issues (Kim, Ni, & Sha, 2008). This study found that some organizational news and issues may arouse the active public and cause too much enthusiasm. Another study reviewed public segmentations in terms of a public health campaign. This study found that active publics tend to engage additional stakeholders and publics. To that end, an organization may strategically encourage active publics to become involved and active on an issue to persuade other, less active, publics to engage in solution management (Kim, Ni, & Sha, 2008).

Publics according to knowledge (active, aware, aroused, or inactive, non-public).

The situational theory of publics' segmentation was extended to account for people's knowledge and level of involvement. Here, only two independent variables (knowledge and level of involvement) make up the development of publics. In contrast, Grunig presented three independent variables (problem recognition, constraint recognition, level of involvement) to build the grouping of publics. Based on varying combinations of the variables of knowledge and involvement, five categories were created: the nonpublic, the inactive public, the aware public, the aroused, and the active public (Hallahan, 2000).

The nonpublic includes individuals who have no knowledge about and no level of involvement with the issue or problem. Researchers believe that if a nonpublic acquires knowledge or a level of involvement with a topic, then the nonpublic members are likely to become part of the inactive public (Hallahan, 2000). Inactive publics differ from nonpublic

because members of the inactive public have little knowledge and display low levels of involvement. Hallahan (2000) argues that the inactive public may display signs of inactivity. However, they may convert into an aroused, aware, or active public whenever specific social cues are activated or triggered by planned campaigns or mediated messages. These cues are likely to influence behaviors that increase knowledge acquisition and level of involvement with the issue (Lee & Rodriguez, 2008). Members of the aware public tend to have high levels of knowledge about a topic or issue but exhibit low levels of involvement in resolving or mitigating the problem. Research has found that members of the aware public are considered opinion leaders because of their high knowledge levels and attentiveness toward the problem. The aroused public is composed of individuals who demonstrate low knowledge levels but have high levels of involvement.

Scholars argue that these publics become involved with the topic by personal experience, media coverage about situations involving others they identify, or interpersonal interactions (Hallahan, 2000). Lastly, the active public comprises those who are highly knowledgeable about a topic and show a high level of involvement. One study found that the active public displayed higher levels of behavioral intentions and trust in media sources than the other groups defined by knowledge-based variables (Lee & Rodriguez, 2008).

Publics according to recognitions: (constrained, problem facer, routine, fatalistic). A portion of the early STP research focused on health, risks, or environmental (Grunig, 1987; Major, 1993; Major, 1998). These studies developed a common way to categorize stakeholder groups according to their recognitions. Researchers determined four opinion publics with a crosstabulation of the problem and constraint recognition independent variables: problem-facer, constrained, routine, and fatal publics (Grunig, 1987; Major, 1993).

Members of the problem-facer public have high problem recognition and low constraint recognition. This problem-facing public thinks about the problem and believes that

they can solve it. The constrained public has high problem recognition and high constraint recognition. This public thinks about the problem, but they perceive high barriers or constraints in solving the problem. Members of the routine public have low problem recognition and low constraint recognition. Routine publics do not think about the problem, but they believe that they could solve or mitigate the issues from the problem. Finally, the fatalistic public has low problem recognition and high constrained recognition. Fatalistic public members also do not think about the problem, and their perceived barriers prevent action in solving or mitigating issues from the problem (see Table 1).

Table 1. Situational Theory of Publics Categorization According to Recognitions

Public	Variables	Description
Constrained	H CR; H PR	Thinks about the problem, too constrained to act
Problem Facer	L CR; H PR	Thinks about the problem, not constrained to act
Routine	L CR; L PR	Does not think about problem, not constrained to act
Fatalistic	H CR; L PR	Does not think about problem, too constrained to act

Table 1: Table 1 details how situational theory of publics categorizes stakeholders according to the theory’s independent variables of problem recognition and constraint recognition.

Research using this categorization has often reviewed issues surrounding natural, health, or environmental risks or issues. One study, for example, found that when asked about a landfill issue, problem-facing and constrained publics stated they were more likely to participate in information-seeking behavior regardless of their level of involvement (Major, 1993). Another study reviewed the formation of a fifth public, the denial public, and how to craft climate change messaging targeted at those in denial or fatalistic with environmental or health concerns (Xifra, 2016). A study that reviewed how publics form in an earthquake zone also used this situational theory of publics’ categorization to understand how demographic features and communication behaviors influence publics living in at-risk areas (Major, 1998). Lastly, another study found that, for a public health risk campaign, the constrained population

had higher levels of behavioral intentions than the problem facer public and that members who made up the problem facer public had the most experience and knowledge with health risk under investigation (Grunig & Ipes, 1983).

Situational Theory of Publics in Contexts of Risk

Scholarship surveying the situation theory of publics has shown its usefulness in segmenting publics in contexts surrounding organizational issues and demands. The following literature will review how situational theory has been applied to cases of disasters, hazards, environmental concerns, and personal health risks.

One risk-related situational theory study, examining the formation of publics, their attitudes, and behavioral intentions of a public health risk campaign, found that individuals in the problem facing the public had higher levels of experience and knowledge on the issue than the constrained public (Grunig & Ipes, 1983). This study suggested that the independent variables of problem recognition and level of involvement were stronger predictors for communication behavior outcomes. In contrast, constraint recognition was a stronger predictor for attitudinal or behavioral outcomes. Moreover, this study showed that individuals with higher levels of problem recognition and active communication behaviors (i.e., information seeking) are more likely to have a positive attitude or behavior change to mitigate the problem. Lastly, researchers determined that members of the constrained public can transition to a problem facing public if levels of constraints (perceived or actual) are reduced or lower levels of constraint recognition (Grunig & Ipes, 1983).

The STP has been applied to a study of earthquake prediction systems (Major, 1998). This study reviewed how social and personal factors impacted the formation of publics and their attitudes and behaviors toward earthquake predictions systems and preparedness methods. This study found that an individual's perceived risk was highly associated with their constrained recognition, and that word of mouth and not news media was prioritized by

participants (Major, 1998). Altogether, this study suggests that in terms of risk communication, there is not just one general public because multiple publics emerge in response to an issue based on how the individuals perceive the impact, severity, and susceptibility of the risk (Major, 1998).

Additional scholarship has investigated situational theory related to mediated risk communication, perceived similarity with media spokesperson, and shared experience with media coverage, and found a relationship among shared experience or similarity with media and the motivation to perform a behavior change (Aldoory, Kim, & Tindall, 2009). This study determined that media could influence an individual's risk perceptions, more specifically, an individual's level of concern, sense of personal involvement, and desire to learn more (i.e., information-seeking behaviors). For the surveyed public, an individual's level of problem recognition and involvement, for example, increased when individuals had higher perceived similarity with the media. Survey participants who had higher levels of perceived risk also had high levels of problem recognition and were active in their communication behaviors (Aldoory et al., 2009). Likewise, this study found that the variable of shared experience with the media or media spokespersons also influenced an individual's communication behaviors (information seeking and information processing;). All in all, the conclusions from this work showed that media might do more than inform audiences on risks, as media coverage might have the potential to motivate audiences to be more aware of risks and active with their communication behaviors and behavioral intentions.

Another study, which examined the STP in relation to bioterrorism risk messaging, trust in media, media consumption habits, and behavioral intentions, found that problem recognition and level of involvement were positively related to communication behaviors. In contrast, constraint recognition was negatively related to such behaviors. As the theory suggests, this study confirmed that publics who recognized the risk as a severe problem and

perceived few barriers in their ability to solve the problem were more likely to have higher communication behaviors and were more likely to prepare for a risk (Lee & Rodriguez, 2008). Furthermore, this study found that publics who had higher levels of source trust were more likely to perform recommended behaviors than publics with lower levels of source trust (Lee & Rodriguez 2008).

In terms of environmental risks, various studies used the STP to understand the formation of publics and their uses of communication behaviors. One study analyzed how the STP may be used to determine public opinion awareness levels of environmental concerns (Major, 1993). This study found that problem recognition was the strongest predictor for environmental awareness and intending to perform communication behaviors, while constraint recognition and level of involvement acted as modest predictors for an individual's attitude toward environmental issues (Major, 1993). Another study used the STP to review climate change communication and mediated campaigns. This project found that mediate spokesperson credibility and similarity increased problem recognition and some level of involvement for a newly developed "denial" public (Xifra, 2016).

The STP research has focused on a range of matters, from organizational issues to issues concerning risks and stakeholders in the state of uncertainty. Often, research articles are organization-oriented where the focus of the problem recognition is an outside agent, that is the organization, which, most times, indirectly impacts the publics with its actions, while risk-related research often focuses on issues that directly impact the public. Risks of environmental and health issues, for example, tend to be under investigation.

In the contexts of risks, the previously reviewed situational theory literature fortifies its utility in explaining how publics form within a variety of risk contexts including earthquake predictions (Major, 1993), risk messaging in media (Aldoory, Kim, Tindall, 2009; Lee & Rodriguez, 2008), public health and risk campaign effectiveness (Grunig & Ipes,

1993), and environmental concerns (Major, 1998; Xifra, 2016). The theory has had success navigating the world of risk communication in various contexts because the theory can be situated nicely within risk by substituting the concept of an organizational issue with a risk or hazard (Aldoory & Van Dyke, 2004; Aldoory, Kim, Tindall, 2009).

Theoretical Limitations and Gaps in Literature

The STP is a highly regarded, well-tested theory in public relations scholarship (Grunig & Hunt, 1984; Grunig, 1997; Grunig & Dozier, 2002); however, the theory does come with some limitations and gaps in literature. The STP is one of few public relations theories that is more predictive than normative. This theory does not paint a picture of an ideal public relations situation like the excellence theory, relationship management theory, or, even, the dialogic principles. Instead, it describes how publics group together and how organizations can communicate to stakeholders according to their involvement toward issues.

Like other public relations theories, the situational theory does not account seek information from the stakeholder perspective. It uses an organization-centric approach instead of an audience-or stakeholder-centric model (Schuch, 2007; Vasquez, 1993). Some scholars have used a reclassification of STP grouping to mitigate the slanted organization lens of the theory. Hallahan (2000) and Major (1993, 1998), for example, reorientated the situational publics groupings to account for the stakeholder attributes and situational awareness, other scholars have focused on a particular independent variable (i.e., just problem recognition) to understand how the stakeholder perspective influences the theory (Aldoory, 2001).

The situational theory tends to ignore demographic and psychographic variables. The theory argues that stakeholder groups do not form according to demographic characteristics but due to shared concern for particular issues. Scholars have noted that some demographic and personal characteristics might influence the theory's public categorization (Chen, 2019;

Sha, 2006; Sriramesh, Moghan, Wei, 2007). Early scholarship, for example, found that low-income individuals had different communication behaviors compared to other income groups in the study (Grunig, 1978). Likewise, a recent study on politics and situational theory found that low-income individuals had significantly lower involvement levels than middle-class individuals who had the highest levels of involvement (Chen, 2019). Personal factors such as risk perceptions and previous experiences were also found to be predictive in public segmentation for a study on earthquake predictions (Turner, Nigg, Paz, & Young, 1981). Cultural identity has consistently shown impactful results. In terms of health risks, previous studies found that cultural identification was a factor in categorizing publics for women as both studies only analyzed the women's experience with health risks and mediated messages (Aldoory, 2001; Vardeman, 2006). One study found cultural identity to be a predictive variable in terms of a publics' perceived level of involvement and problem recognition (Sha, 2006). Additionally, a study using cultural factors as a variable found that these factors were vital in determining publics' constraint recognition (Sriramesh, Moghan, Wei, 2007).

The most recent robust theoretical extension to STP is the situational theory of problem solving (STOP; Kim & Grunig, 2011). STOP upholds the same conceptual model of situational theory of publics. However, it introduces a new dependent variable and theoretical concept of communicative action in problem solving, which explains more variety of communication behaviors such as information seeking, processing, and sharing. The STOP extension also points to the importance of adapting the previously used referent criterion variable. STOP posits that experience and knowledge are important predictive factors in communication actions (information seeking, process, sharing). STOP is a well-developed extension of STP; however, public relations literature needs more audience-centric, theoretically driven perspectives that highlight, understand, and reinforce members that make up those stakeholder groups. STOP is not a remedy in this arena because the STOP extension

adds to communication behaviors contexts and does not acknowledge differences of stakeholders or publics experiences, demographics, or cultures.

Given the gaps in the literature, the purpose of the current study is twofold. First, this study will gauge the awareness of and attitude toward earthquake-related information and ShakeAlert. To date, no research has been conducted on the Oregon populations' comprehension of and responses to ShakeAlert messaging, recommended earthquake protective actions, and whether they distinguish distinct risks from earthquakes compared to other regional hazards. Therefore, this project asks the follow research question:

RQ1: What are survey respondent's beliefs toward earthquake risks in Oregon, earthquake safety behaviors, and ShakeAlert?

The second purpose of this study is to learn how Oregon publics form according to the STP in the context of earthquake risks. Therefore, this study is interested in answering the following research question:

RQ2: How do Oregon publics form and perform communication behaviors according to the situational theory of publics?

The situation theory of publics argues that publics do not form due to demographic variables. Instead, the theory posits that publics form due to their shared opinion toward an issue or problem. Over the years, scholarship has found demographic characteristics are indeed an important variable to consider for situational theory scholars. Early scholarship, for example, found that low-income individuals had different communication behaviors compared to other income groups in the study (Grunig, 1978). Furthermore, recent research on political involvement and situational theory found that low-income individuals had significantly lower involvement levels than middle-class individuals who had the highest levels of involvement (Chen, 2019). Other scholars have confirmed demographic do matter when it comes to situation theory of publics audience formation. One study, for example,

found that gender and political affiliation can help predict audience membership for problem facers and fatal (Major, 1998). Multiple research articles have testified to the predictive notions of cultural identity when it comes to the situational theory of publics' problem recognition and level of involvement variables (Sha, 2006), while another study found cultural identity was a strong predictor of constraint recognition (Sriramesh, Moghan, Wei, 2007). Given that previous research found socioeconomic status, gender, and political affiliation may impacts the formation of situational publics, research question two is interested in learning how demographics influence the creation of Oregon's situational publics and poses the following research question:

RQ3: Do demographic variables of (a) gender (b) household income and (c) political identity influence how Oregon publics form according to the situational theory of publics?

Grunig's (1978) early work on defining publics in public relations considered previous experience a critical aspect of an individual's communication behavior and attitude toward an issue. This scholarship suggested that experience and prior knowledge (i.e., referent criterion) reduced the need for additional information, and thus decrease communication behaviors mean scores. Disaster studies scholars determined similar results as Kapuca (2008), and Millstein et al. (2001) found that individuals who have previous experience with a hazard tend to be less likely to participate in hazard preparedness or mitigation efforts. One study, focusing on personal injury earthquake experience for motivating preparedness behaviors, found that individuals who experienced injury in an earthquake were more likely to participate in preparedness behaviors compared to individuals with earthquake experience but with no earthquake injury experience (Becker, Paton, Johnston, Ronan, & McClure, 2017). Therefore, this study posits the following research question:

RQ4: Does previous experiences with earthquakes influence how Oregon public form and perform communication behaviors according to the situational theory of publics?

A portion of situational theory research has reviewed how message source credibility and trustworthiness influences the development of publics or theoretical independent variable. One study, for example, found publics with high problem recognition and low constraint recognition (i.e., active/high involved problem facers) had higher levels of source trust were more likely to perform recommended behaviors (Lee & Rodriguez, 2008). Similarly, in disaster studies, a study found that message source trust was a stronger predictor for hazard preparedness behavioral intentions compared to previous hazard experience (Paton, 2008). Another determined similar results as message source trust was motivating factor for flood and landslide preparedness behavioral intentions (Lin et al., 2008). Given the previously mentioned research has found a connection between risk-related communication and source trustworthiness and exploratory purposes for the situational theory in risks, the following research question was posed:

RQ5: Does organizational trust influence how Oregon publics form according to the situational theory of publics?

Level of involvement is the degree of personal connectedness or relevance to an issue. When a problem has high personal significance in an individual's life, an issue-related message will more likely resonate with or be more salient (Aldoory, 2001; Grunig, 1997; Grunig & Hunt, 1984). The theory predicts that higher levels of involvement lead to higher levels of communicative behaviors and may even forecast behavioral intentions (Grunig & Hunt, 1984; Xu & Chen, 2016). A study analyzing public health crises, for example, found individuals with higher levels of involvement also had higher levels of information-seeking behaviors and increased levels of behavioral intentions (Jin, 2007). Therefore, the following research question is asked:

RQ6: Does level of involvement influence how Oregon public form and perform communication behaviors according to the situational theory of publics?

To answer these questions this project employed a survey to Oregonians who are potentially affected by an earthquake. Accordingly, the next chapter walks through the details of that instrument, its design, implementation, and process of analysis.

CHAPTER III

METHOD

In outlining this study's method, first, a detailed explanation and mitigation technique of possible instrument error is presented in this section. Second, the instrument design and validation processes are discussed before this section reviews the setting of the online survey. After the survey instrument is thoroughly examined, this section reviews each independent and dependent variables as it plots the reliable scales used in data analyses. Lastly, the method section reviews the process of data collection and steps for data analyses.

An online quantitative survey was administered to a paid representative sample of Oregon residents to address the research questions proposed in this study. A survey is well-suited for this analysis for multiple reasons. First, surveys can be helpful when a researcher is attempting to measure everyone in a population, such as a census, because surveys are designed to quantifiably observed a large population in order to understand how a population thinks and behave and to test theories (Dillman, Smyth, & Christian, 2014; Groves, Presser, & Dipko, 2004; Wimmer & Dominick, 2013). Second, previous literature used a survey as a means to capture theoretical contributions and measure public relations messages and campaign outcomes (Aldoory et al., 2009; Grunig, 1983; Lee & Rodriguez, 2008; Major, 1993; Major, 1998), and this study was modeled after them. Lastly, concerning the setting of the US and Oregon in the year 2021, the only realistic way to gain an understanding of how residents of Oregon perceive and respond to information regarding earthquakes as risks, earthquake early warning systems, and protective actions during a global pandemic is with an online survey using census-based representative sampling.

Survey error. Several different types of errors occur with survey methods including coverage error, sampling error, construct validity, measurement error, and nonresponse error (Groves, 2004). Coverage error occurs when not all population members have a chance of

being a survey participant (Dillman et al., 2014), and when a difference between the target population and the sample population is present (Groves et al., 2004). Coverage error is the result of not including all possible elements of the population in the sample's grouping or panel (Dillman, 2000). Often times, coverage error exists with Internet surveys because not all people have stable Internet connections or access (Dillman, Smyth, & Christian, 2014). The researcher intended to reduce coverage error by using a census representative sample of Oregon residents based on three factors determined by Oregon census data, rather than using a random sample. The representative sample of Oregon residents based on demographic variables attempts to create a general population within the sample, which reflects the possibility of coverage error. A possible increase of coverage error could arise from using a paid panel of participants from a research firm, Qualtrics, instead of an authentic representative sample that is not recruited from an online research firm. Qualtrics' panel of survey participants contains thousands to hundreds of thousands of active panel members where panel members can self-select the surveys they would like to complete. Research has argued that Internet surveys that give participants the self-select option on survey topics can help circumvent issues with coverage errors (Dillman et al., 2014).

Sampling error is the extent the quality and precision of the survey are limited because not every person in the population is part of the study's sample (Dillman et al., 2014). With an Internet survey, accruing some sampling error may be inevitable. This study aimed to reduce sampling error by increasing the sample size, which in turn, increased confidence levels and decreased the sample's margin of error. A common goal in survey research is to achieve a confidence interval of 5% at a confidence level of 95% (Dillman et al., 2014). This equates to being 95% confident that the survey results are accurate within a margin of error of plus or minus 5%. Achieving appropriate confidence levels from a population of 4.2 million, such as the population of the state of Oregon in 2019, would

require a total of 784 completed surveys. This study's sample size exceeds the levels needed to achieve appropriate confidence levels of 95% and margin of error levels below 5%.

Researchers have argued that Internet surveys cannot rid themselves of sampling error just by increasing sample size (Dillman et al., 2014). Therefore, a remedy to reduce sampling error with online surveys was quota sampling. The sample was realized with the use of built-in quotas based on demographic data. This means that the survey was offered to populations that matched the demographic quota brackets built into the survey. Demographic data was used for survey quota fulfillment information because this study wanted to gain a representative sample of Oregon residents based on household income, race, and gender. Quota demographic percentages were determined by US Census rather than the researcher in an effort to reduce sampling error further. To ensure quota information was maintained and reached, the survey administrator placed all quota-based screener questions at the beginning of the survey. This confirmed that only participants matching the demographic quotas would take the survey.

Another critical error to consider is construct validity. In the basic form, “constructs are the elements of information that are sought by the researcher” (Groves et al., 2004, p. 41). Therefore, everything within a research project boils down to the construct, the appropriate use of constructs, and the ability to maintain construct validity, which is the extent to which a research instrument measures what it intends to measure (Wimmer & Dominick, 2013). The researcher addressed construct validity by using and adapting survey instruments that had been tested repeatedly for validity (Coombs & Holladay, 1996; Grunig, 1978, 1982, 1983; Illia, Lurati, & Casalaz, 2013; Lee & Xi, 2017; Major, 1993, 1998; McCroskey, 1966; Sriramesh, Morgan, & Kwok, 2007; Zhang, 2007). These instruments were found in the seminal articles from STP (Grunig 1976, 1983, 1987, Grunig & Hunt, 1984), as well as scholarship that combined aspects of risk communication with the STP (Illia et al., 2013; Lee

& Rodriguez, 2008; Major 1993, 1998; Sriramesh et al., 2007). The scales used in previous situational and risk communication literature have been validated extensively in communication research for many years (Ki, 2006). Other instruments used in this study included those for message attitudes (Grunig, 1982; Lee & Rodriguez, 2008; Lipkus, Green, & Marcus (2003) Major, 1993), behavioral intention (Ajzen & Driver, 1992; Grunig, 1983; Lin, 2006; Major, 1998), and organizational reputation (Coombs & Holladay, 1996; Lee & Xi, 2017; Sargeant, Ford, & West, 2006). Each construct was operationalized using previously validated research rooted in communication and public relations. Additionally, the researcher also validated each scale using Cronbach's alpha, which measures the internal reliability, or consistency, of a scale (Pallant, 2005). Only scales with appropriate reliability scores were used in the analysis for this study.

Measurement error is similar to construct error as they are both non-sampling errors. Measurement error can be defined as the difference between the actual value for an item being measured and the measurement taken (Dillman et al., 2014; Wimmer & Dominick, 2013). Measurement error can be divided into two different categories: random error or systematic error. Random measurement error suggests a measurement problem exists where measurements and analyses are inconsistent from study to study. The second category of measurement error is systematic, which occurs when incorrect data analyses are used to review and interpret data (Wimmer & Dominick, 2013). This can result in the production of invalid and inaccurate results. Research has found that measurement error may stem from a variety of items such as poorly worded questions, faulty data collection equipment, application of incorrect statistical methodology, or aspects of the respondent's behaviors, to name a few (Dillman et al., 2014; Wimmer & Dominick, 2013). A researcher may gain measurement error as a result of bias or variance; Respondent's behaviors and human factors, such as the unwillingness to report negative behaviors, introduce bias, while the vagaries of

memory introduce variance (Groves et al., 2004). The current projects intended to reduce measurement error by ensuring my constructs are valid and using multiple measures for the same construct when necessary. STP literature, for example, tends to apply one-item scales to measure variables. The current study used situational theory scales developed from three or more items to ensure better scale reliability and validity of the measure. Theoretical items were determined from previous literature that reviews situational theory under the lens of risk, crisis, or disaster communication (Aldoory et al., 2009; Grunig, 1983; Illia et al., 2013; Major 1993, 1998; Sriramesh et al., 2007). Also, another reinsurance of measurement error reduction was the process of a pilot test. The survey instrument underwent a pilot test of a panel of researchers, the general public, and the survey public to gauge if measurements were easy to understand, questions were poorly worded, and questions were asked correctly according to previous literature. The result of the pilot tests produced changes in some survey questions that is fully explained below. Lastly, the researchers considered the possibility that participants in this study would not want to report what might appear as negative behavior (those with high-risk perception, constraint recognition) or might not remember communication attitudes or behaviors as they relate to regional hazards. However, the researcher felt that the significance of the topic to individuals and earthquake early warning systems made the effort to elicit this information worth undertaking.

The last error reviewed in this section is the nonresponse error. For a variety of reasons, some participants will not complete a survey and only provide partial data. When participants do not complete surveys, the possibility of nonresponse error may occur. Nonresponse error occurs when those who respond to the survey differ from those who do not respond in a way that is important to the research (Dillman et al., 2014), and, furthermore, nonresponse error may result in the characteristics of those who do respond differing from the characteristics of the entire population (Wimmer & Dominick, 2013). Nonresponse error, as

well as the resulting bias of the results, is a major concern of survey researchers; however. A way to reduce the risk of nonresponse error is with high response rates (Groves et al., 2004). The current project used a paid panel of participants, so the researcher attempted to address nonresponse risk by increasing the response total to 1,041 participants.

Instrumentation

This study was modeled after previous public relations, risk communication, and situational theory literature and will follow the protocol from existing studies (Aldoory et al., 2009; Grunig, 1978, 1983; Illia et al., 2013; Major, 1993; Major 1998; Powell, 2006; Sriramesh et al., 2007). Therefore, the survey asked participants questions surrounding independent variables first. Then the survey presented participants with ShakeAlert public relations materials and gauged participant response to the materials before proceeding with the remaining variable-driven and demographic questions. Altogether, the instrument used in this study consists of a survey with five major sections. The survey included primary closed-ended measures with a total of 52 quantitative questions and one open-ended question. It took participant's approximately 15 minutes to complete (see Appendix C)

Section I. The first section of the survey asked participants questions regarding their risk perception of three major regional hazards (landslides, earthquakes, wildfires), problem recognition of earthquake risk in Oregon, previous experience with earthquakes, and familiarity with the earthquake early warning system, ShakeAlert. This information was gathered before introducing ShakeAlert public relations materials to reduce any possible response bias from participants.

Section II. In the second part of the survey, participants were exposed to the ShakeAlert public relations material, the bill insert. The bill insert has visuals and text on both the front-side and backside. Participants were shown both sides on the same webpage during exposure to the bill insert. While on the bill insert survey webpage, the online survey

forced participants to stay on this page for 10 seconds to ensure participants read the communication material. After exposure to the public relations material, participants were asked questions gauging their message attitudes, and one attention check question. The attention check question asked participants to recall the name of the earthquake early warning system, ShakeAlert. Respondents who did not pass the attention check could not proceed with the survey. Their incomplete data was removed from the data collection process and not counted in the final analysis.

Section III. Beyond the attention check, participants were introduced to the third section of the survey. This section captured the remaining independent variables and all dependent variables. First, the survey measured participant's constraint recognition and level of involvement. Then, participants were asked questions assessing the study's dependent variables and participants' communication behaviors while specifically focusing on their information-seeking behavioral intentions.

Section IV. The fourth section asked for demographic information: gender, race, household income, age, caregiver roles, county location in Oregon, and county risk level in Oregon. Information regarding county location and risk level will be used to better understand individual and regional risk perceptions via independent variable analysis. Furthermore, some of this information has been shown in risk communication to act as a predictor of risk perception, trust in message source, and behavioral intentions (Albarracin & Vargas, 2010; Mallick, Khan Rubayet, & Vogt, 2011; Sherman & Shaprio, 2005; Sorenson, 2000).

Section V. The last section of the survey asked participants their perceived organizational reputation of the USGS as an earthquake subject matter expert. Previous research found that risk communication is better received by its audience when it comes to us through channels considered reliable and trustworthy, is designed to consider specific needs

of the community and its members and comes from a relatable and trusted source (Heath, Seshadri & Lee, 1998; McBride, 2017). To that end, this study is interested in learning if a participant's organizational reputation or perceived trust in that organization influences their perception of risk information and public relations materials. Finally, the last question of the survey asked participants if they would like any additional information on the topics reviewed in the study (i.e., earthquake early warning systems, earthquake safety and protective actions, or earthquakes in Oregon). Participants were told that they would be provided with the information they requested at the end of the survey. This information was provided to all participants in the form of a debriefing message. Participants were debriefed on Oregon regional hazards and earthquake risks, ShakeAlert, and the purposes of the study. At this point, participants learned, if they did not already know, that ShakeAlert was activated for the state of Oregon and how to adjust their mobile settings to receive earthquake early warning notifications powered by ShakeAlert.

Survey instrument validation. A group of scholars specializing in public relations, risk, health communication, and research methodology (n=4) reviewed the survey items, study procedures, and provided verbal and written feedback to the principal investigator. One panelist suggested a better consistency of question introductions and survey responses. This suggestion was imposed. This panelist also suggested relocation of the questions "Before this survey, have you heard of ShakeAlert" to before participants were exposed to ShakeAlert public relations material, which would cause a minor rewording of the original question. This question relocation would further reduce response biases toward brand recognition. Therefore, the question was reworded ("Have you heard of ShakeAlert?") and relocated to be more efficient. Another suggestion was made to modify the informed consent. This suggestion was applied. One panelist suggested one-word change to a question introduction and one phrase change to a question response option list. These suggestions were reviewed

and heavily considered, however. After an extensive review of previously used survey items from the theory's seminal work and others, it was determined by the researcher that the specific word and phrase changes may not measure what the theory proposes to measure. Therefore, these items maintained unchanged and awaited the trial by the general public.

The next round of survey reviewers was individuals among the general public. A small number of Oregon residents (n=6) living in a city along the I-5 corridor served as survey reviewers. These reviewers were invited to complete the final online survey before it was release to Qualtrics. They were enlisted to provide feedback on the ease of use, grammatical correctness and note any faulty programming or technical difficulties. For the most part, feedback provided by reviewers acknowledged only editorial and clarity issues. One reviewer noticed that a demographic question needed immediate attention. This question asked participants if anyone was living in their household who was of the age of 65-years-old or older. The reviewer noted confusion because they were unsure if the question meant to include the survey respondent in the household headcount. The survey question was changed to include the phrase "including yourself" so survey respondents of the age of 65 years old or older will know to include themselves in the total count for that question.

After the panel review and survey reviewer sessions, the survey was sent to the Qualtrics survey administrator/project manager. The project manager's role is to ensure survey quotas are fulfilled and quality data is captured (no incomplete/partial responses in the final count). The project manager reviewed the survey and found multiple issues regarding the screener questions location, survey flow, and question design for mobile users. Instead of having the same question design throughout the survey, Qualtrics requested a variation in question designs from using a slider-scale response option to a matrix-style response option. The variation in question design helps promote more quality responses in data. Also, to ensure only residents of the state of Oregon complete the survey, a demographic question

capturing this information was added as a screener question to the beginning of the survey. Finally, prior to the actual survey launch, Qualtrics collected 10% (n=106) of the data to ensure the survey data loaded correctly and question designs were optimal. The review of the first 10% of data collection warranted no issues with the survey flow, design, or how data was being collected, and the remaining data was collected.

Online survey instrument design. As mentioned, the survey was housed on Qualtrics.com, an Internet-based research tool. Organizations and researchers alike can purchase a participant panel package from Qualtrics. The firm provides research services such as participant recruitment, incentive management, quota fulfillment, and real-time quality of data control, to name a few. The survey instrument was constructed in accordance with survey design recommendations from scholarly sources (Babbie, 1990; Dillman et al., 2014; Groves et al., 2014; Sue & Ritter, 2012; Wimmer & Dominick, 2013) and professional best practices presented by Qualtrics. These recommendations included structural features of the survey and question design related to the flow of items.

Qualtrics has found that nearly 53% of survey participants take surveys on their mobile devices, so best practices were employed to ensure question design was comprehensible on all digital platforms. As previously mentioned, the flow of question design interchanging from matrix-style questions to slider-style questions was purposeful to displace any survey or screen fatigue a participant may have and to, ultimately, encourage a higher quality of participant responses. Furthermore, to mitigate any additional screen fatigue issues, survey items and response choices were presented on the same area of the screen to minimize the need to scroll down to answer, thereby reducing the need for extensive screen navigation or adjustment (Sue & Ritter, 2012). Demographic items, besides screener questions, were included at the end of the survey to minimize participant fatigue and increase the quality of responses (Sue & Ritter, 2012). Finally, for better comprehension and

consistency, the survey used a brief introduction before questions and common response formats with minimal variation across all items (Wimmer & Dominick, 2013).

The use of the Qualtrics allowed for several beneficial features to be programmed into the survey. The survey was housed on a password-protected web address, for example. This increased the security of the survey (Sue & Ritter, 2012). The ‘prevent ballot stuffing’ feature was used, which minimizes the risk that participants complete the survey multiple times (Sue & Ritter, 2012). Participant identity was protected by programming the survey instrument to delete all digital identifiers, including IP addresses and Internet cookies. In this manner, there was no connection of participant identities to their survey data. Lastly, Qualtrics had three quotas programmed into the survey to ensure that a representative sample of Oregon residents was obtained during data collection. The three quotas Qualtrics used for the current project were household income, race, and gender determined by 2019 Oregon US Census data.

One of the most significant benefits of using Qualtrics was that they recruited the participants for this study. Qualtrics maintains 1.8 million panel members in the United States and has been frequently and widely used for research, as researchers can request on-demand respondents based on their target demographics (Qualtrics, 2018). The inclusion criterion for recruitment was that participants had to be permanent Oregon residents, 18 years old or older, literate in the English language, and matched the predetermined quota. Qualtrics solicited participants using an online survey link that contained an informed consent form and a questionnaire from Qualtrics.com. The firm selectively sent the link to its online panelists who matched the inclusion criterion for the study. Participants were paid to complete the questionnaire. Qualtrics handled all incentive transactions as it was included in the recruitment package. Additionally, participants who do not complete the questionnaire were removed from survey data, and those who have duplicate IP addresses were also removed

from the final survey data; therefore, no duplicate IP address or incomplete responses were included in statistical tests.

Location of Targeted Participants

The US west coast has experienced many destructive earthquakes, from the 1989 Loma Prieta magnitude 6.9 earthquake of San Francisco to the 2001 magnitude 6.8 earthquake that struck near Olympia, WA. Earthquakes are common natural hazards in this section of the US that many communities experience each year. To help prepare individuals and infrastructure systems of the possibility of ground shaking from an earthquake, an earthquake early warning system, has been developed by the USGS for the west coast of the US. This system is called ShakeAlert and is modeled after systems employed in other countries with seismic activity (Neith, 2013). An earthquake warning system, like ShakeAlert, will not predict when and where an earthquake will occur. Instead, the USGS publishes information on detected earthquakes, ground shaking at accessed locations and sends warning messages to publics likely affected by earthquake risks (Sellnow et al., 2019).

In 2019, ShakeAlert began effectively alerting publics likely impacted by an earthquake or possible ground shaking for residents in California. After ShakeAlert was successfully delivering warning messages to those living in California, their earthquake sensory network grew, and so did their test users and actual users. In 2021, ShakeAlert expanded its coverage as an active public warning system to Oregon and Washington. The state of Oregon was activated for ShakeAlert on March 11, 2021, and the state of Washington was activated for use on May 04, 2021.

Following the official activation of ShakeAlert in Oregon, multiple newsworthy items occurred regarding ShakeAlert that could influence the current project's data. In May 2021, numerous regional California newspapers covered a false alert issued by ShakeAlert that impacted thousands of San Francisco Bay area residents (Williams, 2021). This story was

covered on multiple news programs from San Francisco, California to Sacramento, California. The second news story concerned ShakeAlert in Oregon and was published in June. The Oregon story spoke about the earthquake early warning's system first use of ShakeAlert in Oregon for an earthquake near Mt Hood (Rogoway, 2021). The earthquake was considered too small to trigger a public warning system alert message to residents impacted by possible ground shaking.

In addition to the two ShakeAlert news stories, Oregon's coastal communities experienced a string of earthquakes from May to June 2021 that also received media attention, especially for Oregonians who live in proximity to the coast. During May 2021, Oregon land was shaken by one magnitude 3.8 earthquake, seven earthquakes between the magnitudes of 2.0 and 3.0, and 97 earthquakes below magnitude 2.0, usually not felt by impacted populations (USGS, n.d.). Similarly, Oregon's waters also experienced cluster earthquakes. In June 2021, five earthquakes were reported in the waters of southwestern Oregon. Two of these cluster earthquakes were magnitudes of 5.9. This grouping of earthquakes in southwestern Oregon did not power any ShakeAlert warnings or cause any tsunami threats for the at-risk communities. The researcher has no control over the news attention received by ShakeAlert or the occurrences of hazards. However, these events could influence the survey participant perceptions of the ShakeAlert and earthquake risks, and therefore, these changes in perceptions could impact the data. The researcher reviewed the data and the dates of the news stories to gauge if any issues may have raised from news attention received by ShakeAlert. Due to causal inference, it will never be genuinely determined if the ShakeAlert news articles or string of Oregon earthquakes during May and June impacted the data and analysis.

Participants

This study used a paid panel of participants from Qualtrics totaling 1,041 survey respondents who are current Oregon residents. This study focused on individuals living in Oregon because of their perceived familiarity with earthquake risks, personal protective behaviors, and due to the arrival of the earthquake early warning system, ShakeAlert, in the state. Qualtrics recruited a representative sample of Oregon residents that matched the 2019 US Census data based on Oregon's population household income, race, and gender.

The quotas for household income included approximately 16% of individuals who report a household income of \$24,999 or less, approximately 20% of individuals who report a household income of \$25,000 to \$49,999, approximately 31% of individuals with a reported income of \$50,000 to \$99,999, approximately 24% of individuals with \$100,000 to \$199,999 of a reported income, and, lastly, approximately 7% of individuals with a reported household income of over \$200,000. The percent quotas for race were based on Oregon's demographics, which lack a range of diversity compared to other states. These percentages included approximately 75% of participants from the non-Hispanic white race category, approximately 2% of participants from the non-Hispanic black category, approximately 4% of participants from the Asian category, approximately 13% of participants from Hispanic/Latino category, and approximately 6% of individuals who report Other as their race (two of more races included in "other" category). The percentage quotas for gender include approximately 50% of participants who identify as being female and the remaining participants who identify as being male.

Independent Variables

Independent variables were operationalized using the situational drivers from Grunig (1983), Grunig (1997), and Grunig and Hunt (1984), as well as other situational theory and risk communication literature (Aldoory et al., 2009; Illia et al., 2013; Lee & Rodriguez, 2008; Major, 1993, 1998; Sriramesh et al., 2007). This project had three primary independent

variables: publics as defined by situational theory (problem facers, constrained, routine, fatalistic), earthquake experience, and risk perception. Items were created to test all independent variables using scales adapted from previous literature, in which this study was modeled after, that received appropriate reliability scores for the current project. Unless marked otherwise, all survey responses items were rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree).

Situational theory of publics groupings. Three primary variables reflect the situational theory's independent variables of problem recognition, constraint recognition, and level of involvement. Thus, this project's survey measured Oregon resident's problem recognition, constraint recognition, and level of involvement by creating scales associated with each variable. All scales followed the same procedures to gain reliability and achieved a reliability, Cronbach's alpha, score higher than .60, which indicates good reliability for communication scholars (Santos, 1999).

The problem recognition scale was constructed using early STP literature (Grunig, 1997; Grunig & Hunt, 1984; Major, 1998). For this project, problem recognition was specifically operationalized as if an earthquake risk in the state of Oregon is a problem. A total of four items were used to create the problem recognition scale and a reliability test was conducted to ensure scale reliability for the scale. The Cronbach's alpha for the problem recognition items was .717. The following four items completed the problem recognition scale: 1) "How often do you stop to think about earthquakes?"; 2) "How often do you stop to think about the people impacted by earthquakes?"; 3) "To what extent do you agree that future earthquakes in Oregon are a serious problem?"; and 4) "To what extent do you agree that future earthquakes in Oregon will cause severe consequences?". The problem recognition scale will be used to develop the four STP groupings and answer research questions two through six.

The constraint recognition scale was also adapted from previous situational theory of publics literature (Grunig, 1983; Grunig, 1997; Major, 1993; Major, 1998). For this project, constrained recognition was specifically operationalized as if using earthquake protective actions in the event of an earthquake risk presented the survey respondent with any constraints. This operationalization was constraint recognition was modeled from a previous study the used situational theory of publics to analyze earthquake opinion publics. A reliability test was conducted using three survey items. The Cronbach's alpha for the constraint recognition-based items was .625. The following three items were used to create the protective actions constraint recognition scale: 1) "How much of a difference would taking protective actions (like drop, cover, hold on) make in helping you prepare for or remain safe in an earthquake?"; 2) How much of a mental difference would taking protective actions (like drop, cover, hold on) make in helping you prepare for or remain safe in an earthquake?"; 3) "How much of a physical difference would taking protective actions (like drop, cover, hold on) make in helping you prepare for or remain safe in an earthquake?"; and 4) "How beneficial would taking protective actions (like drop, cover, hold on) make in helping you prepare for or remain safe in an earthquake?". This developed constraint recognition scale will be used to develop the four situational theory of publics in risks groupings and will be used to develop the four STP groupings and answer research questions two through six.

To measure level of involvement a scale was adapted from previous literature (Grunig, 1997; Grunig & Hunt, 1984), and a reliability test was run using the following items: The following four items completed the problem recognition scale: 1) "To what extent, do you believe taking protective actions during an earthquake could affect you personally?"; 2) To what extent, do you believe taking protective actions during an earthquake could affect your loved ones or friends?"; 3) It is important to take protective actions (like drop, cover,

and hold on) during an earthquake”; and 4) “How beneficial are taking protective actions (like drop, cover, and hold on) at providing you with mental or physical preparedness or safety in an earthquake?”. The Cronbach’s alpha for the four level of involvement items was .751. The theoretical variable scale for level of involvement is considered an important aspect of the situational theory of publics’ predictability (Aldoory & Sha, 2007). This level of involvement scale will be used to inquiry research question six, which investigates how level of involvement, as defined by STP, relates to the stakeholder groupings of situational theory.

These theoretical variable scales pertaining to problem recognition and constraint recognition were combined to form the presence of four main public groups. (i.e., Grunig, 1983; Grunig & Hunt, 1984; Grunig, 1987; Major, 1998). In Grunig’s early situational theory of publics work, he proposed a typology of publics from cross-tabulating problem recognition with constraint recognition (1983, 1987). This study operationalized the four situational theory of publics groups using early situational theory work from Grunig and others who tested the theory’s applicability to risk and environmental related situations and issues (Aldoory, Kim, Tindall, 2009 Major, 1993, 1998). The four situational theory conceptualized publics are problem facers, constrained, routines, and fatalistic. For this project, individuals included in the problem facer public recognize the risk of earthquakes in Oregon is a problem and believe that they can do something to protect themselves in the event of an earthquake, whereas members of the constrained recognize the risk of earthquakes in Oregon is a problem, but individuals belonging to this public perceive constraints in protecting themselves in the event of an earthquake. These first two publics have a higher problem cognition for an earthquake risk in Oregon. The last two describes publics have a lower problem recognition of earthquake risks in Oregon. Members of the routine public do not think about the earthquake risk in Oregon problem, but they believe that they could protect themselves in the event of an earthquake. Finally, members of the fatalistic public do not

think recognize the earthquake risk in Oregon as a problem and they do not believe that they could do anything to protect themselves in the event of an earthquake. Therefore, the fatalistic public has a high constraint recognition. The groupings of these four publics will be used to answer research questions two through six.

Referent criterion. Referent criterion was conceptualized as an independent variable containing of knowledge and experience in Grunig's early work on situational theory (Grunig, 1978, 1982, 1983; Major, 1993, 1998). The current study is not interested in individual's referent criterion, entirely, as it is interested in an individual's previous experience with earthquakes. Therefore, this study will not truly test the referent criterion as operationalized by Grunig. Instead, it will explore if an individual's personal and social experience with earthquakes influences their current and future attitudes and beliefs about earthquakes and earthquake safety like protective actions. The first experience survey questions asked participants "Have you been in an earthquake?" and respondents answered No (= 0) or Yes (=1) to this question. The next experience survey questions asked participants "What harm have you experienced personally or socially from earthquakes (select all that apply)?" and respondents were able to select "injury, damage or loss to you personally"; "injury, damage or loss to your family or friends"; "injury, damage or loss to in your neighborhood or community"; "injury, damage or loss seen on TV, the internet, or in other media"; or "None of the above". These survey questions surrounding earthquake experience will be used answer the research question four.

Risk perception. Risk perception was adapted and operationalized using previous literature on situational theory and risk perception (Dunn, 2016; Grunig 1983; Major, 1998; Miller, 2013). For this project, risk perception was specifically operationalized as the severity of and susceptibility to endure an earthquake. A total of four items were used to create the risk perception scale and a reliability test was conducted to ensure scale reliability for the

problem recognition scale. The Cronbach's alpha for the risk perception items was .813. The following four items completed the risk perception scale: 1) "How frightening are earthquakes to you?"; 2) "What is the likelihood that your persons or body will get damaged in an earthquake?"; 3) "What is the likelihood that your property will get damaged in an earthquake?"; and 4) "What is the likelihood that your state will get damaged in an earthquake?". This risk perception scale will be used to answer the first research question.

Dependent Variables

The dependent variables for this project include communication behaviors, as defined by situational theory of publics, and behavioral intentions to engaging in a communication behavior during the next quarter or receive additional post-survey information. According to STP, communication behaviors refer to information seeking intentions and information processing actions and tend to be measured in situational theory literature as dependent variables (Grunig, 1978, 1982, 1983; Grunig & Hunt, 1984; Major 1993, 1998). Second, early situational theory work and some current studies have attempted to measure attitudes and behavior intentions in relation to environmental issues and health risks (Green, & Marcus, 2003; Grunig, 1982, 1983; Lee & Rodriguez, 2008; Lipkus, Major, 1993). Because this study aims to extend the situational theory to the risk communication domain, it will measure behavior intentions to gauge if this variable is dependent on the formation of the situational theory of publics

Similar to the independent variables and scales, all survey responses used a 5-point Likert-type scales to measure the dependent variables where 1 = the lowest possible score and 5 = the strongest or highest possible score, unless marked otherwise. In the creation of dependent variable scales, all scales followed the same procedures to gain reliability and achieved a reliability, Cronbach's alpha, score higher than .60 indicated good reliability (Santos, 1999).

Communication behaviors. The survey asked participants how they processed and sought information pertaining to earthquake early warning systems, protective actions, and earthquakes in Oregon. The information seeking questions were adapted and operationalized using previous literature on situational theory (Grunig 1983; Illia et al., 2013; Jin, 2007; Lee & Rodriguez, 2008). For this project, participants were asked six information seeking questions in two different sets of questions. The first set of questions included “Since the beginning of the year, how much information have you read, seen, or heard (in newspapers, on television, from radio, in magazines, from newsletters, online media, social media websites, for example) on earthquake early warning systems?”, “Since the beginning of the year, how much information have you read, seen, or heard (in newspapers, on television, from radio, in magazines, from newsletters, online media, social media websites, for example) on earthquake safety or protective actions?”, “Since the beginning of the year, how much information have you read, seen, or heard (in newspapers, on television, from radio, in magazines, from newsletters, online media, social media websites, for example) on earthquakes in Oregon?”.

The second set of information seeking questions asked participants “Since the beginning of the year, how often did you actively search for information (on the internet, in the news media, on television, from organizations, agencies, for example) on earthquake early warning systems?”, “Since the beginning of the year, how often did you actively search for information (on the internet, in the news media, on television, from organizations, agencies, for example) on earthquake safety or protective actions?”, and “Since the beginning of the year, how often did you actively search for information (on the internet, in the news media, on television, from organizations, agencies, for example) on earthquakes in Oregon?”. These six items were used to create the information seeking scale and a reliability test was

conducted to ensure scale reliability for the scale. The Cronbach's alpha for the information seeking scale items was .943.

Information processing questions were adapted and operationalized using previous literature on situational theory and risk perception (Aldoory, Kim, Tindall, 2009; Illia et al., 2013; Grunig, 1983). For this project, information processing was specifically operationalized as the degree of passive attention an individual would pay information on various topics. A total of three items were used to create the information processing scale and a reliability test was conducted to ensure scale reliability for the scale. The Cronbach's alpha for the problem recognition items was .898. The following three items completed the information processing scale "What is the degree of attention you would provide a news story, social media post, video, or flyer on earthquake early warning systems?"; "What is the degree of attention you would provide a news story, social media post, video, or flyer on earthquake safety or protective actions?"; "What is the degree of attention you would provide a news story, social media post, video, or flyer on earthquakes in Oregon?". These two scales (i.e., information seeking and information processing) will be used to answer the second and fourth research questions.

Behavioral intentions. Finally, the dependent variable "behavioral intention" was measured in two ways. The first way behavioral intention was measured was with one-item, a survey question presented to survey participants after exposure to the ShakeAlert public relations material. This survey question asked participants to select the communication actions they intend to take in the next three to four months. This particular question was a multiple response question where participants could select all options that pertained to them or their opinion. Survey participants had the option to select one or many options from the following list "Read more about ShakeAlert, protective actions, or earthquakes in Oregon", "Talk to friends or family about ShakeAlert, protective actions, or earthquakes in Oregon",

“Watch a video about ShakeAlert, protective actions, or earthquakes in Oregon” , “Post or share information online about ShakeAlert, protective actions, or earthquakes in Oregon” , “Follow” or “Like” ShakeAlert or the USGS on social media” , Participate in a free training/workshop on ShakeAlert, protective actions, or earthquakes in Oregon” , “Practice protective actions (like drop, cover, hold on) at your residence or workplace” , “Take no action”. This one multiple response survey question was collapse into a scale and a reliability test was conducted to ensure scale reliability for the item. The Cronbach’s alpha for the information engaging behavioral intention scale item was .712.

The second way behavioral intention was measured was with one-item, a survey question at the end of the survey. This survey question asked participates to select the additional information they were interested in receiving after the survey ended. Survey participates had the option to select one or many options from the following list “Information about ShakeAlert or earthquake early warning systems”, “Information about protective actions”, “Information about earthquakes in Oregon”, “Information about how to turn on WEA Oregon Test Alerts on Android & iOS Phones”, or “No thanks, I would not like any additional information”. This one multiple response survey question was collapse into a scale and a reliability test was conducted to ensure scale reliability for the item. The Cronbach’s alpha for the end information behavioral intention scale items was .813. These two measures for behavior intention (i.e., quarter information engaging behavior intention and end information behavior intention) will be used to answer the second, third, and fourth research questions related to the situational theory of public in risks groupings, previous experience with earthquakes, and an individual’s level of involvement.

Instrument Attention Check

As previous mentioned, to ensure that participants paid attention to the stimuli (ShakeAlert public relations material) and the survey, one attention check item was included

near the beginning of the survey after exposure to the ShakeAlert public relations material. The attention check question asked participants “What is the name of the earthquake early warning system mentioned in the flyer?” with the response options: a) ShakeAlert, b) Quake4Quake, c) Alerts2U, and d) EarthMe. Participants were expected to select option a. Participants who did not pass the attention check questions were thanked for their time and their survey ended. Any participants that did not pass the attention check question were excluded from data analysis.

Data Analysis

All data was automatically collected through the online survey and stored in a data file hosted by Qualtrics. Data collection started on April 31, 2021, one and a half months after ShakeAlert was activated for the state of Oregon. Data collection ended on July 15, 2021. The entire data collection process took over two months. Once the survey closed for data collection, the data was stored in a file by Qualtrics and sent to the researcher. The data file was password protected, and access restricted to the principal investigator. From here, the data was imported into IBM SPSS 27.0 for Mac.

Data screening. As commonly followed, prior to conducting analyses, data were screened for potential importation errors and cleaned (Kupzyk, 2008). The document was visually cross-referenced for data completion. All incomplete data responses were removed from data analysis. Therefore, only fully complete responses were used in the statistical testing process. Each field was checked to ensure only legal codes were present (i.e., no negative numbers), and distribution checks were run to examine for errors or outliers (Kupzyk, 2008).

Multiple steps were taken to prepare data for research inquiry testing. Scales were constructed for the independent and dependent variables. Each scale was tested using an analysis of the reliability and Cronbach’s alpha. An alpha level of .05 was required for

significance in all statistical procedures. Once scales were constructed, items were reviewed individually in histogram charts to monitor the distribution of responses and to ensure acceptable scale variance and construction. Scale variables and raw data were then recoded into different variables to signify “low” and “high” mean score variables. The risk perception item, for example, was recoded where mean scores of four to eleven were coded as “0” or low risk perception and mean score of twelve to twenty were coded as “1” or high-risk perception. This process was completed for the following variables problem recognition, constraint recognition, level of involvement, risk perception, information seeking, information processing, and organizational trust. To conduct statistical tests, household income, was collapsed from a six-item response to a three-item response and recoded into low (0), medium (1), and high (2) categories to reflect the low-, middle-, and high-income groupings.

Summary

The method section of this dissertation reviewed the steps taken to construct this project’s measurements of analysis, survey instrumentation, collection, and data analyses. This project housed its survey and gathered data using the online service Qualtrics for conveniences reasons, to recruit and maintain a represented sample of Oregonians. Modeled after previous research, this project will explore how situational theory of publics groupings form and respond to communication material Each scale is described and its associated scale item reliable and valid measurements are included in this section. The method section concludes by detailing the process of screening data to appropriate it for analyses.

CHAPTER IV

FINDINGS

This chapter discusses in detail the statistical analysis of each tested research question. The descriptive information and audience profile of the survey respondents will be reviewed first. As mentioned, statistical information and testing was completed by SPSS. To gauge an audience profile of survey participants, frequencies were run. Following the audience profile and a profile of their earthquake-related beliefs, the findings will walk through participants' attitudes toward Shake Alert and the USGS, and finally apply tests to evaluate the STP.

Descriptive Statistics

The following descriptive statistics review eight demographic categories: respondent age, gender, household income, ethnicity, education level, political affiliation, residence status (ownership status and county location), and caregiver status (caring for children, seniors, or those with a disability). As previously mentioned, the 2019 Oregon US Census Bureau data determined the representative sample population for this research. All participants were residents of Oregon, because the goal of this research was interested in learning how Oregonian's thought about earthquakes and responded to ShakeAlert public relations materials.

A total of 1,041 participants completed the Qualtrics online survey. Of those participants, a total of 6.7% (n=70) of participants were of the ages of 18 to 20. A total of 17.2% (n=179) of participants were of the ages of 21 to 29, and 24.7% (n=257) of participants were of the ages of 30 to 39. A total of 18.5% (n=193) of participants were from the age group of 40 to 49, and the age group of 50 to 59 included a total of 9.8% (n=102) of participants. The age group of 60 to 69 had a total of 12.8% (n=133) of participants. Lastly, of the total number of participants, the age group of 70 to 79 included 9% (n=94) of

participants, and participants of the age of 80 and older represented 1.2% (n=13) of the total count of survey respondents.

Table 2. Descriptive Statistics of Audience (Age, Gender, Ethnicity)

Demographic	Options	Frequency	Percentage
Age	18 to 20 years old	70	6.7%
	21 to 29 years old	179	17.2%
	30 to 39 years old	257	24.7%
	40 to 49 years old	193	18.5%
	50 to 59 years old	102	9.8%
	60 to 69 years old	133	12.8%
	70 to 79 years old	94	9%
	80 years old and older	13	1.2%
Gender	Woman	519	49.9%
	Man	498	47.9%
	Transgender Woman	4	0.4%
	Transgender Man	4	0.4%
	Gender Variant/Nonconforming	13	1.2%
	Other	3	0.3%
Ethnicity	Black	33	2.9%
	Asian	52	4.9%
	Pacific Islander/Hawaiian Native	8	0.7%
	Middle Eastern	11	1%
	American Indian/Alaska Native	35	3.1%
	Hispanic/Latinx	130	11.3%
	White	868	75.7%
	Other	9	0.8%

Table 2: Table 2 details the audience’s age, gender, and ethnicity descriptive statistics in the form of frequencies of recorded survey responses (n=1,041)

As for gender, survey respondents had the option to select from six different gender identity categories. Of the 1,041 total participants, 49.9% (n=519) of survey respondents selected woman as their gender identity and a total of 47.9% (n=498) of participants selected man as their gender identity. A total of 0.4% (n=4) of participants selected transgender woman as their gender, 0.4% (n=4) of participants selected transgender man as their gender, 1.2% (n=13) of participants selected gender variant/nonconforming, and 0.3% (n=3) of

participants selected “Other” as their gender. After the survey asked participants about their age and gender, a demographic question asked participants their ethnicity group identification. Ethnicity quotas were filled using 2019 US Census Bureau data from Oregon demographics. It should be noted that Oregon’s population lacks ethnic diversity. A total of 2.9% (n=33) of the survey population indicated they were Black, 4.9% (n=52) of participants selected Asian as their ethnicity, 0.7% (n=8) of participants selected Pacific Islanders/Hawaiian natives as their ethnicity, 1% (n=11) of participants selected Middle Eastern, 3.1% (n=35) of participants selected American Indian/Alaska Native as their ethnicity, 11.3% (n=130) of participants selected Hispanic/Latinx of their ethnicity, 75.7% (n=868) selected White, and a total of 0.8% (n=9) of participants selected “Other” as their ethnicity (see Table 2).

Participant education level was broken into seven categories. A total of 2.8% (n=29) of participants selected an education level of less than a high school degree, 18.9% (n=197) of participants selected an education level of high school graduate, 28.9% (n=301) of participants selected they held an education level of some college, 11.8% (n=123) of participants selected an education level of a 2-year degree, 24.9% (n=259) of participants selected having a 4-year degree as an education level, 10.8% (n=112) of participants selected having either a Masters or professional degree, and 1.9% (n=20) of participants selected having an education level of a doctorate degree. A demographic question asked survey respondents about their household income (HHI). Survey options for HHI included six different categories. The number of participants that selected a HHI of less than \$24,999 was 18.9% (n=197), \$25,000 to \$49,000 was 22.8% (n=237), \$50,000 to \$99,999 was 33.1% (n=345), \$100,000 to \$149,999 was 15.1% (n=157), \$150,000 to \$199,999 was 5.6% (n=58), and those that selected a HHI of \$200,000 or more included 4.5% (n=47). Finally, one of the last demographic questions asked survey respondents about this politic affiliation.

Participants had five options for political membership. Republican participants included 20.8% (n=217) of the total studied population, Democratic participants included 38.2% (n=398) of the population, Independent political affiliated participants included 25.7% (n=268) of the population, Undeclared participants include a total of 12.6% (n=131) of the population, and participants who selected “Other” as their political affiliation included 2.6% (n=27; see Table 3).

Table 3. Descriptive Statistics of Audience (Education, HHI, Political Affiliation)

Demographic	Options	Frequency	Percentage
Education	Less Than High School	29	2.8%
	High School Degree	197	18.9%
	Some College	301	28.9%
	Associate degree	123	11.8%
	Bachelor’s degree	259	24.9%
	Master’s/Professional Degree	112	10.8%
	Doctorate Degree	20	1.9%
HHI	Less Than \$24,999	197	18.9%
	\$25,000 to \$49,999	237	22.8%
	\$50,000 to \$99,999	345	33.1%
	\$100,000 to \$149,999	157	15.1%
	\$150,000 to \$199,999	58	5.6%
	\$200,000 or More	47	4.5%
Political Affiliation	Republican	217	20.8%
	Democrat	398	38.2%
	Independent	268	25.7%
	Undeclared	131	12.6%
	Other	27	2.6%

Table 3: Table 3 details the education level, household income (HHI), and political affiliation of survey respondents. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041)

A couple of demographic questions asked participants about their home ownership status, type of dwelling, county of residence, and if they perceived their residence county to be at risk at an earthquake. Of the 1,041 survey participants, a total of 536 of participants (51.5%) stated they owned their home while 461 of participants (44.3%) stated they rent their

home, and 44 participants (4.2%) selected “Other” for this question. “Other” responses include an overwhelming number of respondents who lived with family or relatives. The second dwelling question asked participants about their type of dwelling. A total of 676 of participants (64.9%) indicated they lived in a single-family home, 296 of participants (28.4%) stated they lived in a multi-unit building, 47 of participants (4.5%) stated they lived in a mobile home, and 22 participants (2.1%) selected “Other” as their type of residence. “Other” responses included respondents who rent a room in a house or live with family. As for county of residence, a participant from each 36 Oregon counties was represented in the data. The highest represented counties included Multnomah (22.1% of participants), Washington (16.2% of participants), Lane (9.9% of participants), Clackamas (9.9% of participants), and Marion (9.8% of participants). Following the county of residence survey question, a demographic question asked participants their perceived county risk. A total of 528 participants (50.7%) stated that they perceived their county to be at risk for an earthquake. In comparison, 214 participants (20.6%) indicated their county was not at risk for an earthquake, and 298 participants (28.7) stated they were unsure if their county was at risk for an earthquake.

Table 4. Demographic Descriptive Statistics (Home Ownership, Dwelling)

Demographic	Options	Frequency	Percentage
Home Ownership	Owned	536	51.5%
	Rented	461	44.3%
	Other	44	4.2%
Type of Dwelling	Single-Family Home	676	64.9%
	Multi-Unit Building	296	28.4%
	Mobile Home	47	4.5%
	Other	22	2.1%

Table 4: Table 4 details the home ownership status and type of dwelling of survey respondents. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

The final demographic questions asked participants if they identified as a caregiver for a child, adult, or individual with a disability (self or other). The first question regarding caregiver status asked participants if they had any children living in their household. A total of 674 participants (64.7%) stated they had no children, while 367 participants (35.3%) had at least one child living in their household. Children living in the household were further broken into three categories. Participants with 1 to 2 children included 28.5% (n=297), participants with 3 to 4 children included 6.1% (n=63), and participants with 5 or more children included 0.7% (n=7).

Table 5. Demographic Descriptive Statistics (caregiver)

Demographic	Options	Frequency	Percentage
Children	None	674	64.7%
	1 to 2 Children	297	28.5%
	3 to 4 Children	63	6.1%
	5 or More Children	7	0.7%
Seniors	None	687	66%
	1 to 2 Senior	323	31%
	3 to 4 Seniors	26	2.5%
	5 or More Seniors	5	0.5%
Disabilities	Yes	151	14.5%
	No	871	83.7%
	Unsure	19	1.8%

Table 5: Table 5 details the caregiver status for caring for children, seniors, or those with disabilities in the household of survey respondents. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

The second caregiver question asked if participants had any seniors of 65 or older living in their household. A total of 687 participants (66%) stated they had no seniors living in their household. The remaining 34% of participants (n=354) had at least one senior living in their household. Participants with 1 to 2 seniors included 31% (n=323), participants with 3 to 4 seniors included 2.5% (n=26), and participants with 5 or more seniors included 0.5% (n=5). The last caregiver question asks participants if they had anyone living in their

household who was disabled, including themselves. A total of 151 participants (14.5%) indicated they did live with disabled individuals or were disabled themselves, and 871 participants (83.7%) stated that they were not disabled, nor did they live with an individual who was disabled (see Table 5).

Now that the audience demographics have been reviewed, this project will review audience descriptive statistics and frequency levels for survey respondents' awareness of and attitude toward earthquake risks in Oregon, earthquake safety behaviors, and ShakeAlert.

Earthquake-Related Attitudes & Beliefs

Multiple survey questions asked participants about their awareness and perception of earthquake risks in Oregon. All earthquake risk awareness and perception questions were asked prior to participant exposure to the ShakeAlert public relations material. In order to situate the perceived level of risk susceptibility and severity of earthquakes in relation to other common regional natural hazards, the first couple of survey questions asked respondents their perception of natural hazards common in Oregon (i.e., landslides, earthquakes, wildfires). Overall, survey respondents think about the regional natural hazard of wildfires more often than earthquakes or landslides. More specifically, when asked how often survey respondents think about landslides, a total of 46.8% (n=487) of respondents stated they sometimes think about landslides, 45% (n=468) of respondents stated they never think about landslides, 4% (n=42) of respondents stated they thought about landslides about half the time, 3.6% (n=37) of respondents stated they thought about landslides most of the time, and 0.7% (n=7) of respondents stated they thought about landslides always. When asked how often survey respondents think about wildfires, a total of 49.7% (n=517) of respondents stated they sometimes think about landslides, 25% (n=260) of respondents stated they think about wildfires about half of the time, 13% (n=135) of participants stated they think about wildfires most of the time, 6.1% (n=64) of participants stated they never

think about wildfires, and 6.2% (n=65) of respondents stated they always think about wildfires. Lastly, when asked how often survey respondents think about earthquakes, a total of 62.3% (n=649) of respondents stated they sometimes think about earthquakes, 17.2% (n=179) of participants stated they never think about earthquakes, 6% (n=62) of respondents stated they think about earthquakes most of the time, and 1.9% (n=20) of participants stated they always think about earthquakes (see Table 6). Survey response items were rated on a 5-point Likert-type scale from 1 (never) to 5 (always).

Table 6. Hazard-Related Beliefs (how often audience thinks about hazard)

Hazard	Options	Frequency	Percentage
Landslides	Never	468	45%
	Sometimes	487	46.8%
	About Half of the Time	42	4%
	Most of the Time	37	3.6%
	Always	7	0.7%
Wildfires	Never	64	6.1%
	Sometimes	517	49.7%
	About Half of the Time	260	25%
	Most of the Time	135	13%
	Always	65	6.2%
Earthquakes	Never	179	17.2%
	Sometimes	649	62.3%
	About Half of the Time	131	4%
	Most of the Time	62	6%
	Always	20	1.9%

Table 6: Table 6 details the perception of regional hazard descriptive statistics of survey respondents. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

Survey respondents were also asked about how frightening they perceived common Oregon natural hazards (i.e., landslides, wildfires, and earthquakes). Overall, survey respondents perceive wildfires to be a more frightening regional natural hazard when compared to earthquakes or landslides. When asked how frightening survey respondents

perceived landslides, a total of 17.9% (n=186) of respondents stated landslides were extremely-to-very frightening, 56.1% (n=584) of respondents stated landslides were somewhat to slightly frightening, and 26% (n=271) of respondents stated landslides were not at all frightening. When asked how frightening survey respondents perceived wildfires, a total of 59.8% (n=632) of respondents stated wildfires were extremely-to-very frightening, 33.3% (n=247) of respondents stated wildfires were somewhat to slightly frightening, and 6.9% (n=72) of respondents stated wildfires were not at all frightening. When asked how frightening survey respondents perceived earthquakes, a total of 42.5% (n=443) of respondents stated earthquakes were extremely-to-very frightening, 47.4% (n=493) of respondents stated earthquakes were somewhat to slightly frightening, and 10.1% (n=105) of respondents stated earthquakes were not at all frightening (see Table 7). Survey response items were rated on a 5-point Likert-type scale from 1 (not frightening at all) to 5 (extremely frightening). These results speak to the heightened levels of perceive risk susceptibility and severity of wildfires and earthquakes in comparison of landslides.

Table 7. Hazard-Related Beliefs (how frightening audience perceives hazard)

Hazard	Options	Frequency	Percentage
Landslides	Not At All Frightening	271	17.9%
	Somewhat to Slightly Frightening	584	56.1%
	Very to Extremely Frightening	186	0.7%
Wildfires	Not At All Frightening	72	6.9%
	Somewhat to Slightly Frightening	337	33.3%
	Very to Extremely Frightening	632	59.8%
Earthquakes	Not At All Frightening	105	10.1%
	Somewhat to Slightly Frightening	493	47.4%
	Very to Extremely Frightening	443	42.5%

Table 7: Table 7 details the audience member level of fright of regional hazard. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

The surveyed Oregon population find wildfire to be slightly more frightening and a

topic they think about more often when compared to earthquakes. These findings could be compromised by the timing of data collection because data was collected during the start of Oregon wildfire season. Therefore, the amount of word-of-mouth discussions or mediated stories pertaining to local and regional wildfires could have influenced the results of these regional hazard risk questions.

After questions were asked about common natural hazards in Oregon, the remaining survey questions focused only on earthquakes. Earthquake-hazard questions were interested in learning respondent's level of concern for earthquakes, experience with earthquakes, and awareness of earthquake protective action behaviors. Survey respondents were asked if they believe future earthquakes will cause damage to their body or person, property, or state (i.e., the state of Oregon). Most respondents stated that earthquake damaged was more likely to occur to their state than to their persons or property. More specifically, when survey respondents were asked the likelihood that their state will get damaged in an earthquake, a total of 60.5% (n=630) of respondents stated that damage to their state from an earthquake was extremely-to-very likely, 35.2% (n=367) of respondents stated damage to their state from an earthquake was somewhat to slightly likely, and 4.2% (n=44) of respondents stated damage to their state from an earthquake was not at all likely. As for property damage, a total of 47.7% (n=497) of respondents stated that damage to their property from an earthquake was extremely-to-very likely, 44.4% (n=462) of respondents stated damage to their property from an earthquake was somewhat to slightly likely, and 7.9% (n=82) of respondents stated damage to their property from an earthquake was not at all likely. Next, when survey respondents were asked the likelihood that their persons or body will get damaged in an earthquake, a total of 18.7% (n=194) of respondents stated that damage to their persons or body from an earthquake was extremely-to-very likely, 67.1% (n=698) of respondents stated damage to their persons or body from an earthquake was somewhat to slightly likely, and

14.3% (n=149) of respondents stated damage to their persons or body from an earthquake was not at all likely (see Table 8). Survey response items were rated on a 5-point Likert-type scale from 1 (not likely at all) to 5 (extremely likely).

Table 8. Earthquake-Specific Beliefs (how likely earthquakes will cause damage)

Damage Location	Options	Frequency	Percentage
Person/Body	Not At All Likely	149	14.3%
	Somewhat to Slightly Likely	698	67.1%
	Very to Extremely Likely	194	18.7%
Property	Not At All Likely	82	7.9%
	Somewhat to Slightly Likely	462	44.4%
	Very to Extremely Likely	497	47.7%
State	Not At All Likely	44	4.2%
	Somewhat to Slightly Likely	367	35.2%
	Very to Extremely Likely	630	60.5%

Table 8: Table 8 details the audience member level of likelihood a future earthquake in Oregon will cause damage. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

Lastly, a survey demographic question asked participants their perceived risk of the state county they reside. The majority of participants acknowledged that their county was at-risk for an earthquake as a total of 528 participants (50.7%) stated that they perceived their county to be at risk for an earthquake. In comparison, 214 participants (20.6%) indicated their county was not at risk for an earthquake, and 298 participants (28.7) stated they were unsure if their county was at risk for an earthquake.

Table 9. County Risk (audience perception of risk in home county)

Audience Belief	Options	Frequency	Percentage
County Risk	Yes	528	50.7%
	No	214	20.6%
	Unsure	298	28.7%

Table 9: Table 9 details the perception of county risk of survey respondents. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

Earthquake Experience & Knowledge

The next set of survey questions asked respondents about their personal and social earthquake experience. The majority of participants have lived in a location where earthquakes are anticipated, have been in an earthquake, and have experienced some form of earthquake harm (injury, loss, damage). Of the 1,041 survey respondents, a total of 60.3% (n=627) of participants have lived in a place where earthquakes were anticipated, 30.5% (n=318) of participants have not lived in a place where earthquakes were anticipated, and 9.2% (n=96) of participants were unsure if they have lived in a place where earthquakes were anticipated. When respondents were asked if they have been in an earthquake, a total of 71.4% (n=743) of participants have experienced an earthquake, 25.2% (n=262) of participants have not experienced an earthquake, and 3.5% (n=36) of participants were unsure if they have experienced an earthquake. Survey respondents were asked if they experienced personal injury, damage, or loss from earthquakes, a total of 7% (n=73) of participants stated they have experienced a form of personal harm (injury, damage, loss) for earthquakes and 93% (n=968) of participants stated they have not experienced any form of personal harm from earthquakes. When asked if survey respondents have experienced earthquake injury, damage, or loss seen on TV, the internet or other media, a total of 34.2% (n=356) of participants stated they have experienced social harm from earthquakes and 65.8% (n=685) of participants have not experienced harmed from earthquakes socially, as seen in media. As for survey respondent close friends and loved ones, when asked if respondents had family or friends that have experienced an earthquake, a total of 78.2% of participants stated they has family or friend who have experienced an earthquake, 14.8% (n=154) of participants did not have a family member or friend experience an earthquake, and 7% (n=73) of participants were unsure if their family or friends have experienced an earthquake. When asked if survey respondents have family or family who has experienced physical earthquake injury, damage,

a total of 11% (n=114) of participants stated their family or friends have experienced physical harm from earthquakes and 89% (n=927) of participants stated their family and friends have not experienced harmed from earthquakes.

Table 10. Earthquake Experience (audience experience with earthquakes)

Experience	Options	Frequency	Percentage
Lived Anticipated	Yes	627	60.3%
	No	318	30.5%
	Unsure	96	9.2%
Earthquake Experience	Yes	743	71.4%
	No	262	25.2%
	Unsure	36	3.5%
Personal Earthquake Harm	Yes	73	7%
	No	968	93%
Social Earthquake Harm	Yes	356	34.2%
	No	685	65.8%

Table 10: Table 10 details the personal (physical) and social (via media) earthquake experience in terms of harm (injury, damage, loss) descriptive statistics in the form of frequencies of recorded survey responses (n=1,041).

To conclude the earthquake-hazard survey questions, respondents were asked what behavior they would take if they felt ground shaking (from an earthquake) at their location.

Table 11. Earthquake-Related Knowledge (audience awareness of safety)

Earthquake Knowledge	Options	Frequency	Percentage
Safety Behavior	Stop and Stay Put	57	5.5%
	Drop, Cover, Hold On	36	29.4%
	Protect Those Nearby	176	16.9%
	Stand in Doorway	294	28.2%
	Evacuate Building	142	13.6%
	Unsure	66	6.3%

Table 11: Table 11 details audience member knowledge of current recommended earthquake protective action behaviors and ground shaking behavioral intentions descriptive statistics in the form of frequencies of recorded survey responses (n=1,041).

A total of 5.5% (n=57) of participants stated they would stop what they were doing

and stay put, 29.4% (n=36) of participant stated they would drop, cover, and hold on, 16.9% (n=176) of participants states they would protect people, pets, or property nearby, 28.2% (n=294) of participants stated they would stand in the doorway, 13.6% (n=142) of participants stated they would evacuate their building, and 6.3% (n=66) of participants stated they did not know what they would do if they felt ground shaking at their location from an earthquake.

ShakeAlert-Related Awareness & Beliefs

Equipped with a baseline understanding of participants' attitudes, beliefs, experience and knowledge regarding earthquakes, the survey then focused on ShakeAlert itself, first to determine the level of awareness with the tool, and then to gauge the tool's effectiveness. The ShakeAlert awareness level of survey participants were low, but participants agreed that the ShakeAlert public relations material was engaging and worth their attention. A total of 21.4% (n=223) of participants stated they have heard of ShakeAlert, 71.5% (n=744) of participants stated they have not heard of ShakeAlert, and 7.1% (n=74) of participants stated they were unsure if they have heard of ShakeAlert. Survey respondents were then exposed to the ShakeAlert two-sided utility bill insert, which informed respondents on the earthquake early warning system, ShakeAlert, and the current recommended earthquake protective actions – drop, cover, and hold on. Survey respondents were asked their opinions about the ShakeAlert public relations material with a series of three questions. The first question asked participants if they thought the material was engaging, a total of 59.5% (n=620) of participants stated they strongly-to-somewhat agreed that the ShakeAlert utility bill insert was engaging to view, 15.3% (n=159) of participants stated the strongly-to-somewhat disagreed that the ShakeAlert material was engaging, and 25.2% (n=262) of participants stated they neither agreed nor disagreed with the statement. Next, participants were asked if they would pay attention to the ShakeAlert public relations material, a total of 65.1% (n=678) of participants stated they

strongly-to-somewhat agreed that they would pay attention to the ShakeAlert utility bill insert, 13.7% (n=143) of participants stated the strongly-to-somewhat disagreed that they would pay attention to the ShakeAlert material, and 21.1% (n=220) of participants stated they neither agreed nor disagreed with the statement.

Table 12. ShakeAlert-Related Beliefs (awareness of and attitude toward ShakeAlert)

ShakeAlert Item	Options	Frequency	Percentage
Heard of ShakeAlert	Yes	223	21.4%
	No	744	71.5%
	Unsure	74	7.1%
ShakeAlert Message is Engaging	Strongly to Somewhat Agree	620	59.5%
	Neither Agree nor Disagree	262	25.2%
	Strongly to Somewhat Disagree	159	15.3%
Pay Attention to ShakeAlert Message	Strongly to Somewhat Agree	678	65.1%
	Neither Agree nor Disagree	220	21.2%
	Strongly to Somewhat Disagree	143	13.7%

Table 12: Table 12 details the audience’s awareness of and attitude toward ShakeAlert and the ShakeAlert public relations material, utility bill insert, survey participants were exposed to during the survey descriptive statistics in the form of frequencies of recorded survey responses (n=1,041).

USGS-Related Awareness & Beliefs

The ShakeAlert public relations material survey respondents viewed in the survey had an USGS logo as the ShakeAlert earthquake early warning messages are powered and published by the USGS. Therefore, this survey also gauged respondent awareness of and perceived levels of confidence and trust in the USGS.

The first USGS questions asked participant if they heard of the “U.S. Geological Survey (USGS).” A total of 61.6% (n=641) of participant have heard of the USGS, 32%

(n=333) have not heard of the USGS, and 6.4% (n=67) were unsure if they have or have not heard of the USGS (see Table 13).

Table 13. USGS Awareness

USGS Awareness	Options	Frequency	Percentage
Heard of USGS	Yes	641	61.6%
	No	333	32%
	Unsure	67	6.4%

Table 13: Table 13 details the audience’s knowledge of the USGS. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041)

Next, four USGS confidence questions and four trust-related questions were asked of survey respondents. Overall participants have high levels of confidence in the USGS.

Participants have higher levels of confidence in the USGS to tell the truth about earthquake information compared to their confidence in the USGS being an expert and a reliable source on earthquakes. More specifically, when asked if survey respondents thought if the USGS was a reliable source of earthquake information, a total of 69.4% (n=723) stated that they strongly-to-somewhat agreed that the USGS was a reliable source of earthquake information, 4.7% (n=49) of participants stated they strongly-to-somewhat disagreed with the statement, and 25.8% (n=269) stated they neither agreed nor disagreed with the statement. When asked if respondents thought if the USGS was an expert on earthquakes, a total of 69.1% (n=720) stated that they strongly-to-somewhat agreed that the USGS an expert on earthquakes, 4.1% (n=43) of participants stated they strongly-to-somewhat disagreed with the statement, and 26.7% (n=278) stated they neither agreed nor disagreed with the statement. The third confidence-related question asked respondents if they trusted the USGS to tell the truth about earthquakes, a total of 70.2% (n=731) stated that they strongly-to-somewhat agreed that the USGS will tell the truth about earthquakes, 4.8% (n=50) of participants stated they strongly-to-somewhat disagreed with the statement, and 25% (n=260) stated they neither agreed nor disagreed with the statement. The last confidence-related question asked respondents if they

believe what the USGS says about earthquakes, a total of 72.6% (n=755) stated that they strongly-to-somewhat agreed that they believe what the USGS says about earthquakes, 4.1% (n=43) of participants stated they strongly-to-somewhat disagreed with the statement, and 23.3% (n=243) stated they neither agreed nor disagreed with the statement (see Table 14). All survey responses items were rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree).

Table 14. USGS-Related Beliefs (confidence in USGS)

USGS Confidence Item	Options	Frequency	Percentage
Reliable Source of EQ Information	Strongly-to-Somewhat Agree	723	69.4%
	Neither Agree nor Disagree	269	25.8%
	Strongly-to-Somewhat Disagree	49	4.7%
Expert on EQs	Strongly to Somewhat Agree	720	69.1%
	Neither Agree nor Disagree	278	26.7%
	Strongly to Somewhat Disagree	43	4.1%
Tell the Truth About EQs	Strongly to Somewhat Agree	731	70.2%
	Neither Agree nor Disagree	260	25%
	Strongly to Somewhat Disagree	50	4.8%
Believe What is Said About EQs	Strongly to Somewhat Agree	755	72.6%
	Neither Agree nor Disagree	243	23.3%
	Strongly to Somewhat Disagree	43	4.1%

Table 14: Table 14 details the perception of confidence the audience has toward the USGS. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

After the four USGS confidence-related, four USGS trust-related questions were presented to survey respondents. Overall participants have high levels of trust in the USGS to

work in the best interest of the public. Participant trust level for USGS to provide timely alerts and effectively respond to earthquakes to protect the public were in the moderate range. The first question asked participants how much trust they had in the USGS’s ability to act in the best interest of the public. A total of 64.7% (n=673) stated that they had a great deal to a lot of trust in the USGS’s ability to act in the best interest of the public, 28.2% (n=294) of participants stated they had a moderate amount of trust in the USGS’s ability to act in the best interests of the public, and 7.1% (n=74) of participants stated they had little to no trust in the USGS’s ability to act in the public’s best interest. Next, participants were asked if they trusted the USGS’s ability to provide timely earthquake alert to the public.

Table 15. USGS-Related Beliefs (trust in USGS)

USGS Trust Item	Options	Frequency	Percentage
Act in Best Interest of Public	A Great Deal to A Lot	673	64.7%
	A Moderate Amount	294	28.2%
	A Little to None at All	74	7.1%
Provide Timely EQ Alerts	A Great Deal to A Lot	576	55.3%
	A Moderate Amount	347	33.3%
	A Little to None at All	118	11.4%
Respond Effectively to Protect the Public	A Great Deal to A Lot	597	57.3%
	A Moderate Amount	328	31.5%
	A Little to None at All	116	11.1%
Respond Effectively to Protect the Public Regardless of Personal Characteristics	Strongly to Somewhat Agree	637	61.2%
	Neither Agree nor Disagree	307	29.5%
	Strongly to Somewhat Disagree	97	9.4%

Table 15: Table 15 details the perception of trust the audience has toward the USGS. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

A total of 55.3% (n=576) stated that they had a great deal to a lot of trust in the USGS's ability to provide timely earthquake alerts to the public, 33.3% (n=347) of participants stated they had a moderate amount of trust in the USGS's ability to provide timely earthquake alerts to the public, and 11.4% (n=118) of participants stated they had little to no trust in the USGS's ability to provide timely earthquake alerts. The third trust-related question asked survey respondents if they trusted the USGS's ability to respond to earthquakes effectively to protect the public. A total of 57.3% (n=597) stated that they had a great deal to a lot of trust in the USGS's ability to respond to earthquakes effectively to protect the public, 31.5% (n=328) of participants stated they had a moderate amount of trust in the USGS's ability respond to earthquakes effectively to protect the public, and 11.1% (n=116) of participants stated they had little to no trust in the USGS's ability to respond to earthquakes effectively to protect the public. The last question was similar to the third trust-related question, but it asked a bit more in term of diversity and inclusion. When survey respondents were asked if they trusted in the USGS's ability to respond to earthquakes effectively regardless of personal characteristics, such as ethnicity, income, gender, a total of 61.2% (n=637) stated that they had a great deal to a lot of trust in the USGS's ability to respond effectively to earthquake regardless of personal characteristics, 29.5% (n=307) of participants stated they had a moderate amount of trust in the USGS's ability to respond effectively to earthquake regardless of personal characteristics, and 9.4% (n=97) of participants stated they had little to no trust in the USGS's ability to respond effectively to earthquake regardless of personal characteristics (see Table 15). All survey responses items were rated on a 5-point Likert-type scale from 1 (none at all) to 5 (a great deal).

Protective Actions Attitudes & Beliefs

After exposure to ShakeAlert and the USGS, the survey returned to questions regarding participants' perceived benefits and barriers of protective actions, as well as

behavioral intentions to perform earthquake-related communication or safety behaviors.

When survey respondents were asked how beneficial receiving earthquake early warning alerts were at providing them with mental or physical preparedness or safety in an earthquake, a total of 78.6% (n=818) stated that receiving alerts would be extremely-to-very beneficial, 14.5% (n=151) said they find receiving alerts somewhat beneficial, and 6.9% (n=72) stated receiving earthquake early warning alerts would be slightly-to-not at all beneficial.

Table 16. Earthquake-Related Benefits

Earthquake-Related Item	Options	Frequency	Percentage
Receiving EEW Alerts	Slightly to Not at All Beneficial	72	6.9%
	Somewhat Beneficial	151	14.5 %
	Very to Extremely Beneficial	818	78.6%
Taking Protective Actions	Slightly to Not at All Beneficial	69	6.6%
	Somewhat Beneficial	144	13.8%
	Very to Extremely Beneficial	828	79.6%
Having EQ-Related Knowledge	Slightly to Not at All Beneficial	62	5.9%
	Somewhat Beneficial	180	17.3%
	Very to Extremely Beneficial	799	76.7%

Table 16: Table 16 details how participants responded when asked how beneficial the earthquake-related items were at providing mental or physical safety during an earthquake. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

Next, survey respondents were asked how beneficial taking protective actions were at providing them with mental or physical preparedness or safety in an earthquake, a total of 79.6% (n=828) of participants stated taking protective actions would be extremely-to-very beneficial, 13.8% (n=144) of participants stated that taking protective actions would be somewhat beneficial, and 6.6% (n=69) of participants stated taking protective actions would

be slightly-to-not at all beneficial. The last question in this series asked participants how beneficial having earthquake-related knowledge is at providing them with mental or physical preparedness or safety in an earthquake, a total of 76.7% (n=799) stated having earthquake knowledge would be extremely-to-very beneficial, 17.3% (n=180) said that having earthquake knowledge is somewhat beneficial, and 5.9% (n=62) stated having earthquake-related knowledge would be slightly-to-not at all beneficial. All survey responses items were rated on a 5-point Likert-type scale from 1 (not at all beneficial disagree) to 5 (extremely beneficial).

Next, the survey asked participants questions surrounding their perceived barriers to be mentally or physically prepared or safe in an earthquake. When asked if adequate amount of time to take action presented participants with a barrier to be mentally or physically prepared or safe in an earthquake, a total of 48.8% (n=508) of participants stated it presented a great deal-to-a lot of a barrier, 25.2% (n=262) of participants stated time for action presented a moderate amount of a barrier, and 26% (n=271) of participants stated it presented little-to-no barrier. All survey responses items were rated on a 5-point Likert-type scale from 1 (none at all) to 5 (a great deal). When asked if receiving credible information presented participants with a barrier to be mentally or physically prepared or safe in an earthquake, a total of 49.9% (n=520) of participants stated it presented a great deal-to-a lot of a barrier, 24.2% (n=252) of participants stated receiving credible information presented a moderate amount of a barrier, and 25.8% (n=269) of participants stated it presented little-to-no barrier. When asked the same question but in reference to the space or location to take protective actions, a total of 50.4% (n=525) of participants stated that space for action presented a great deal-to-a lot of a barrier to be mentally or physically prepared or safe in an earthquake, 24.9% (n=259) of participants stated it presented a moderated amount of a barrier, and 24.6% (n=257) of participants stated space to take protective actions presented a little-to-no barrier

to be mentally or physical prepared or safe in an earthquake.

Table 17. Perceived Earthquake-Safety Barriers

USGS Trust Item	Options	Frequency	Percentage
Time to Act	A Great Deal to A Lot	508	48.8%
	A Moderate Amount	262	25.2%
	A Little to None at All	271	26%
Space for Action	A Great Deal to A Lot	525	50.5%
	A Moderate Amount	259	24.9%
	A Little to None at All	257	24.6%
Physical Ability to Act	A Great Deal to A Lot	463	44.4%
	A Moderate Amount	212	20.4%
	A Little to None at All	366	35.2%
Receive Credible Information	A Great Deal to A Lot	520	49.9%
	A Moderate Amount	252	24.2%
	A Little to None at All	269	25.8%

Table 17: Table 17 details how participants responded when asked their perceived barriers to be mentally or physically safe during an earthquake. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041).

The final barrier-related question asked participants if physical ability to perform protective actions presented them with a barrier to be mentally or physical prepared or safe in an earthquake. A total of 44.4% (n=463) of participants stated that physical ability presented a great deal to a lot of a barrier to be mentally or physically prepared or safe in an earthquake, 20.4% (n=212) of participants stated it presented a moderated amount of a barrier, and 35.1% (n=366) of participants stated their physical ability to perform protective actions presented a little-to-no barrier to be mentally or physical prepared or safe in an earthquake.

Communication Behavior Intentions

As for the behavior-related questions, survey respondents were asked two of the three behavior questions after they were presented with the ShakeAlert public relations material.

The first question asked respondents to “place yourself in a situation where you just received

a ShakeAlert notification that an earthquake is nearby and ground shaking is expected immediately.” Then, respondents were asked what behaviors that might take if they found themselves in the given situation. Survey respondents were able to select all notification-related behaviors that would apply to them; therefore, the overall percentage totals do not equal 100% because categorizes were not mutually exclusive.

Table 18. ShakeAlert Notification Behavior Intention

Notification Behavior	Options	Frequency	Percentage
Notification Behavior	Take Protective Actions	863	82.9%
	Take Information	611	
	Seriously		58.7%
	Protect Those Nearby	529	50.8%
	Call/Text a Loved One	278	26.7%
	Seek Out More	214	
	Information		20.6%
	No Action	12	1.2%

Table 18: Table 18 details how participants responded when asked what behavior they might take if they felt ground shaking from an earthquake at their location. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041). Categories were not mutually exclusive.

Of the surveyed population, the majority of cases selected they would immediately try to take protective actions (82.9%), believe the alert information is serious (58.7%), or immediately try to protect those physically close to me (50.8%). Survey respondents also selected that they would immediately try to call or text a loved one (26.7%) or seek out more information (20.6%). A total of 1.2% of cases selected they would take no action if a ShakeAlert notification was received that an earthquake is nearby.

The next behavior-related question asked participants what behaviors they planned to take during the next quarter. Similar to the previously reviewed questions, item response categories were not mutually exclusive, and participant could select all options they applied to their case. Of the surveyed population, the majority of cases selected they read more about ShakeAlert, protective actions, or earthquakes in Oregon (56%), talk to friends or family

about ShakeAlert, protective actions, or earthquakes in Oregon (36.4%), practice protective actions at residence or workplace (31.5%), watch a video about ShakeAlert, protective actions, or earthquakes in Oregon (28.2%), “follow” or “like” ShakeAlert or the USGS on social media (23.2%), post or share information online about ShakeAlert, protective actions, or earthquakes in Oregon (13.8%), or participant in a free workshop/training on ShakeAlert, protective actions, or earthquakes in Oregon (13.5%). A total of 20.7% of cases selected they plan to take no related action during the next quarter.

Table 19. Quarterly Communication “Information Engaging” Behavior Intention

Quarterly Behavior	Options	Frequency	Percentage
Information Engagement	Read Earthquake-Related Content	583	56%
	Talk About Earthquake-Related Content	379	36.4%
	Watch Earthquake-Related Content	294	28.2%
	Share Earthquake-Related Content Online	144	13.8%
	Attend Earthquake-Related Event	141	13.5%
	Follow/Like ShakeAlert or USGS Online	242	23.2%
	Practice Protective Actions	328	31.5%
	No Action	216	20.7%

Table 19: Table 19 details how participants responded when asked what behavior they might take during the next three to four months. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041). Categories were not mutually exclusive.

The final behavior-related question was asked as the final question of the survey. For this question, item response categories were not mutually exclusive, and participant could select all options they applied to their case. When participants were asked, what additional information they would like to receive after the survey was complete, the majority of participants selected information about ShakeAlert or earthquake early warning systems (40.2%), and information about earthquakes in Oregon (37.2%). Other response options included receiving additional information about how to turn on WEA Oregon Test Alert on

Android & iOS Phones (29.7%) and information about protective actions (25.3%). A total of 45.4% of cases selected to no received any additional information after the survey ended. In the form of a survey debrief message (see Appendix D), each participant was presented with all the possible additional information a participant may have selected in the previous final survey question.

Table 20. Communication “Information Gaining” Behavior

Communication Behavior	Options	Frequency	Percentage
Information Gained	ShakeAlert or EEWs	419	40.2%
	Protective Actions	263	25.3%
	Earthquakes in Oregon	387	37.2%
	WEA Oregon Test Alerts	309	29.7%
	No Information Gained	473	45.4%

Table 20: Table 20 details how participates responded when asked what additional information they would like to receive at the survey’s end. Descriptive statistics are in the form of frequencies of recorded survey responses (n=1,041). Categories were not mutually exclusive.

Applying Situational Theory to Understand Earthquake Risk Stakeholders

Beyond descriptive data, the guiding research inquiries were modeled after research that applied the situational theory of public to contexts of risk (Aldoory et al., 2009; Grunig & Ipes, 1983; Major, 1993; Major, 1998). Data analyses include chi-square statistical testing. A way to compare cell and review for group differences in chi-square testing is through an examination of the adjusted standardized residual (Sharpe, 2015). Therefore, by reviewing the statistical data of chi-square test, and through the examination of adjust residual count that exceed the -2 to 2 margins, research results and conclusions are confirmed.

A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the problem recognition and constraint recognition scales. Problem recognition and constraint recognition had two groups: low and high recognition(s). The chi-square test returned a significant report ($\chi^2(1) = 69.173$,

p < .001), which signaled a relationship among variables, and a formation of the four situational theory of publics groupings (see Table 21).

Table 21. Situational Theory of Publics Groupings

Constraint Recognition		Problem Recognition		Total
		LOW	HIGH	
LOW	Count	413	244	657
	% of Total	39.7%	23.4%	63.1%
HIGH	Count	139	245	384
	% of Total	13.4%	23.5%	36.9%
Total	Count	552	489	1041
	% of Total	53%	47%	100%

Table 21: Table 21 details a chi-square test of problem recognition (LOW, HIGH) and constraint recognition (LOW, HIGH) to form four opinion publics based on the situational theory of publics literature.

Table 22. Situational Theory Publics Groupings * Information Seeking

Opinion Publics		Information Seeking		Total
		LOW	HIGH	
Routine	Count	245	168	413
	% of Total	23.6%	16.2%	39.7%
	Adjusted Residual	4.6	-4.6	
Fatal	Count	90	49	139
	% of Total	8.7%	4.7%	13.4%
	Adjusted Residual	3.6	-3.6	
ProbFace	Count	105	139	244
	% of Total	10.1%	23.4%	23.5%
	Adjusted Residual	-2.7	2.7	
Constrain	Count	86	157	245
	% of Total	8.3%	15.1%	23.4%
	Adjusted Residual	-5.4	5.4	
Total	Count	525	513	1041
	% of Total	50.6%	49.4%	100%

Table 22: Table 22 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and information seeking (LOW, HIGH).

A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the four opinion publics and information seeking behaviors. Information seeking behaviors had two categories, low and high information seekers. The chi-square test returned a significant report ($\chi^2 (3) = 51.78, p < .001$), which signaled a relationship among how opinion publics seek information on earthquake early warning systems, protective actions, and earthquakes in Oregon. A review of the adjusted residual counts determined that the routine and fatal publics are more likely to be low information seekers, compared to the constrained and problem facer publics that tend to score high on the information seeking scale.

Table 23. Situational Theory Publics Groupings * Information Processing

Opinion Publics		Info Processing		Total
		LOW	HIGH	
Routine	Count	289	124	413
	% of Total	27.8%	11.9%	39.7%
	Adjusted Residual	11.1	-11.1	
Fatal	Count	40	99	139
	% of Total	3.8%	9.5%	13.4%
	Adjusted Residual	-5.1	5.1	
ProbFace	Count	128	116	244
	% of Total	12.3%	11.1%	23.5%
	Adjusted Residual	1.3	-1.3	
Constrain	Count	51	194	245
	% of Total	4.9%	18.6%	23.4%
	Adjusted Residual	-10.0	10.0	
Total	Count	508	533	1041
	% of Total	48.8%	51.2%	100%

Table 23: Table 23 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and information processing (LOW, HIGH).

Similar results were found with the communication behavior of information processing. A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the four opinion publics and the information processing scale. Information processing has two group, low and

high information processors. The chi-square test returned a significant report ($\chi^2 (3) = 174.52$, $p < .001$), which signaled a relationship among the four situational theory of publics group and the communication behavior of information processing (passively processing information as opposed to active seeking information). By looking at the adjusted residual numbers, it was determined that for the surveyed population, members of the routine public are more likely to engage in low to no information processing and the constrained and fatal publics are more likely to be high information processing. This means, compared to the routine and problem facer publics, the constrained and fatal publics are more likely to give a higher degree of attention to information on earthquake early warning systems, protective actions, and earthquakes in Oregon when they are passively presented with such information.

A Pearson chi-square test of independence was calculated to examine the relationships between the situational theory of publics groups and quarterly “information engaging” behavioral intention. As a reminder, the quarterly behavioral intention survey question asked respondents what behaviors they planned to take during the next quarter. Response items included eight options, read more about ShakeAlert, protective actions, or earthquakes in Oregon, talk to friends or family about ShakeAlert, protective actions, or earthquakes in Oregon, practice protective actions at residence or workplace, watch a video about ShakeAlert, protective actions, or earthquakes in Oregon, “follow” or “like” ShakeAlert or the USGS on social media, post or share information online about ShakeAlert, protective actions, or earthquakes in Oregon, participant in a free workshop/training on ShakeAlert, protective actions, or earthquakes in Oregon, and take no action. Information engaging had two groups, low and high information engagers. A significant interaction was found ($\chi^2 (3) = 130.749$, $p < .001$). The adjusted residual data shows the routine public is most likely not to engage in any earthquake-related information behaviors compared to the

fatalistic and constrained publics. The fatalistic and constrained publics are more likely to engage in earthquake-related information communication behaviors.

Table 24. Situational Theory Publics Groupings * Quarterly Information Engaging Intention

Opinion Publics		Information Engaging		Total
		LOW	HIGH	
Routine	Count	293	120	413
	% of Total	28.2%	11.5%	39.7%
	Adjusted	10.7	-10.7	
	Residual			
Fatal	Count	50	88	139
	% of Total	4.8%	8.5%	13.4%
	Adjusted	-3.6	3.6	
	Residual			
ProbFace	Count	113	130	244
	% of Total	10.9%	12.5%	23.5%
	Adjusted	-1.4	1.4	
	Residual			
Constrain	Count	69	176	245
	% of Total	6.6%	16.9%	23.4%
	Adjusted	-8.0	8.0	
	Residual			
Total	Count	525	514	1041
	% of Total	50.5%	59.5%	100%

Table 24: Table 24 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and information engaging (LOW, HIGH).

To understand the breadth of survey respondent quarterly “information engaging” behavioral intention, a Pearson chi-square test of independence was calculated to examine the relationships between the situational theory of publics groups and segmented quarterly “information engaging” behavioral intention. Quarterly “information engaging” behavioral intention options were segmented into five groups: no action, one action, two actions, three actions, and four or more actions. The maximum number of actions a survey participant could select was six. A significant interaction was found ($\chi^2 (12) = 234.244, p < .001$). The adjusted residual data shows the routine public is most likely to take no action compared to the other publics, problem facers are more likely to select two quarterly behavioral intentions

compared to the other publics, and the constrained and fatal publics are more likely to select four or more quarterly behavioral intentions compared to the other publics.

Table 25. Situational Theory Publics Groupings * Quarterly Information Engaging Items

Opinion Publics		Info Engage					Total
		None	One	Two	Three	Four+	
Rout	Count	152	141	56	36	28	413
	% of Total	14.6%	13.6%	5.4%	3.5%	2.7%	39.7%
	Adjusted Residual	11	2.1	-3.0	-2.5	-8.6	
Fatal	Count	9	41	30	15	43	138
	% of Total	0.9%	3.9%	2.9%	1.4%	4.1%	13.3%
	Adjusted Residual	-4.3	-0.2	1.3	-0.3	3.6	
Prob F	Count	33	80	62	34	34	243
	% of Total	3.2%	7.7%	6%	3.3%	3.3%	23.4%
	Adjusted Residual	-2.9	0.9	3.5	1.2	-2.6	
Const	Count	14	55	38	37	101	245
	% of Total	1.3%	5.3%	3.7%	3.6%	9.7%	23.6%
	Adjusted Residual	-6.4	-3.1	-1.1	1.9	9.6	
Total	Count	208	317	268	122	206	1041
	% of Total	20%	30.5%	25.7%	11.7%	19.8%	100%

Table 25: Table 25 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and quarterly information engaging behavioral intention (NO item, ONE item, TWO items, THREE items, FOUR OR MORE items).

As for the communication behavior of information gaining, the last survey question asked participant what information they were interested in gaining after the survey ended. Survey participates could select to gain information about ShakeAlert or earthquake early warning systems, protective actions, earthquakes in Oregon, how to turn on WEA Oregon Test Alerts on Android & iOS Phones or to not gain any additional information. A Pearson chi-square test of independence was calculated to evaluate the potential for systematic

relationships between categorical variables of the situational theory of publics groups and information gaining. Information gaining had two groups: gained information, did not gain information. The chi-square test returned a significant report ($\chi^2 (3) = 89.21, p < .001$), indicating that information gaining behaviors may be influential in how the situational theory of publics form in the context of earthquakes. More specifically, the adjusted residual counts specified that the routine public is less likely to perform information gaining behaviors, while the constrained public is most likely to perform a form of information gaining behaviors.

Table 26. Situational Theory Publics Groupings * Information Gaining

Opinion Publics		Information Gaining		Total
		LOW	HIGH	
Routine	Count	322	91	413
	% of Total	30.9%	8.7%	39.7%
	Adjusted Residual	7.9	-7.9	
Fatal	Count	78	61	139
	% of Total	7.5%	5.9%	13.4%
	Adjusted Residual	-1.9	1.9	
ProbFace	Count	157	87	244
	% of Total	15.1%	8.4%	23.4%
	Adjusted Residual	0.3	-0.3	
Constrain	Count	103	142	245
	% of Total	9.9%	13.6%	23.5%
	Adjusted Residual	-7.9	7.9	
Total	Count	508	533	1041
	% of Total	48.8%	51.2%	100%

Table 26: Table 26 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and information gaining (LOW, HIGH).

Multiple Pearson chi-square tests were performed on demographic variables such as gender, socioeconomic status, education level, political affiliation, to determine if demographic influence how opinion publics form. The only demographic features that revealed significant chi-square tests were socioeconomic status, gender, and political

affiliation.

A Pearson chi-square test of independence was calculated comparing to evaluate the potential for systematic relationships between categorical variables of the situational theory of publics groups and household income. Household income had three groups: low (\$49,000 and below), middle, (\$50,000 to \$99,999), high (\$100,000 and above). The chi-square test returned a significant report ($\chi^2 (6) = 13.97, p = 0.030$), indicating that household income may be influential in how the situational theory of publics form in the context of earthquakes. More specifically, the adjusted residual counts showed that the fatalistic public is less likely to belong to a high-income group.

Table 27. Situational Theory Publics Groupings * Household Income (HHI)

Opinion Publics		HHI			Total
		LOW	MIDDLE	HIGH	
Rout	Count	175	203	35	413
	% of Total	16.8%	19.5%	3.4%	39.7%
	Adjusted Residual	0.4	0.5	-1.4	
Fatal	Count	67	66	6	139
	% of Total	6.4%	6.3%	0.6%	13.4%
	Adjusted Residual	1.7	-0.2	-2.4	
ProbF	Count	89	123	32	244
	% of Total	8.5%	11.8%	3.1%	23.4%
	Adjusted Residual	-1.9	0.8	1.8	
Constr	Count	103	110	32	245
	% of Total	9.9%	10.6%	3.1%	23.5%
	Adjusted Residual	0.1	-1.2	1.8	
Total	Count	434	502	105	1041
	% of Total	41.7%	48.2%	10.1%	100%

Table 27: Table 27 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and household income (LOW, MIDDLE, HIGH).

A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the situational theory of publics

groups and gender. Survey respondents had six difference gender selections to choose from on the survey. Because low sample size count in the categories of transgender male (n=2), transgender female (n=4), and gender non-conforming (n=4), these groups were removed from data analysis. This decision to remove nonbinary gender identifies from the data analysis of research question two is a major limitation of this research and will be further reviewed in the limitations selects. For this chi-square test, gender had two groups, female and male. The test returned a significant report ($\chi^2(3) = 10.83, p = .013$). The data showed that women are more likely to be members of the fatalistic public compared to men who are less likely to be members of the fatalistic public.

Table 28. Situational Theory Publics Groupings * Gender Identity

Opinion Publics		Gender Identity		Total
		FEMALE	MALE	
Routine	Count	194	212	406
	% of Total	19.1%	20.8%	39.9%
	Adjusted Residual	-1.7	1.7	
Fatal	Count	82	55	137
	% of Total	8.1%	5.4%	13.5%
	Adjusted Residual	2.2	-2.2	
ProbFace	Count	108	126	234
	% of Total	10.6%	12.4%	23%
	Adjusted Residual	-1.7	1.7	
Constrain	Count	135	105	240
	% of Total	13.3%	10.3%	23.5%
	Adjusted Residual	1.8	-1.8	
Total	Count	519	498	1017
	% of Total	51%	49%	100%

Table 28: Table 28 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and gender identity (FEMALE, MALE).

A Pearson chi-square test of independence was calculated comparing to evaluate the potential for systematic relationships between categorical variables of the situational theory of publics groups and political affiliation. A significant interaction was found ($\chi^2(12) = 36.96, p < .001$). For the surveyed population, Republicans are more likely to be members of

the routine public, while fatal and constrained publics are more likely to not identify as Republican. Democrats were more likely to be members of the constrained public and the routine public is more likely to identify as a Democrat.

Multiple Pearson chi-square tests were performed to evaluate the potential for systematic relationships between the categorical variables for participant’s various experiences with earthquakes and the four opinion fours of situational theory of publics. For the surveyed public, it appears as though previous earthquake experience does indeed influence some public formations.

Table 29. Situational Theory Publics Groupings * Political Identity

Opinion Publics		Political					Total
		R	D	I	U	Other	
Rout	Count	108	122	116	60	7	406
	% of Total	10.4%	1.7%	11.1%	5.8%	0.7%	39.9%
	Adjusted Residual	3.4	-4.7	1.4	1.5	-1.5	
Fatal	Count	19	62	33	18	7	137
	% of Total	1.8%	6%	3.2%	1.7%	0.7%	13.5%
	Adjusted Residual	-2.2	1.7	-0.6	0.1	1.9	
ProbF	Count	50	97	64	28	5	234
	% of Total	4.8%	9.3%	6.1%	2.7%	0.5%	23%
	Adjusted Residual	-0.2	0.6	0.2	-0.6	-0.6	
Constr	Count	40	117	55	25	8	240
	% of Total	3.8%	11.2%	5.3%	2.4%	0.8%	23.5%
	Adjusted Residual	-2.0	3.5	-1.3	-1.3	0.8	
Total	Count	217	398	268	131	27	1041
	% of Total	20.8%	38.2%	25.7%	12.6%	2.6%	100%

Table 29: Table 29 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and political identity (REP, DEM, IND, UNC, OTHER).

A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the situational theory of publics groups and if participants lived in a location where earthquakes were anticipated. Lived where earthquakes were anticipated had three groups: yes, no, unsure. The chi-square test returned a significant report ($\chi^2 (6) = 60.46, p < 0.001$), indicating that a participant's previous experience living where earthquakes are anticipated may be influential in how the situational theory of publics form. More specifically, the adjusted residual counts showed that the problem facer and constrained publics are more likely to have lived where earthquakes are anticipated, whereas the routine and fatal publics are more likely to not have lived where earthquakes are anticipated.

Table 30. Situational Theory Publics Groupings * Lived Where Earthquake Are Anticipated

Opinion Publics		Lived Anticipated			Total
		YES	NO	UNSURE	
Routine	Count	221	163	29	413
	% of Total	21.2%	5.7%	2.8%	39.7%
	Adjusted Residual	-3.6	5.1	-2.0	
Fatal	Count	61	53	25	139
	% of Total	5.9%	5.1%	2.4%	13.4%
	Adjusted Residual	-4.2	2.1	3.8	
ProbFace	Count	170	52	22	244
	% of Total	16.3%	5%	2.1%	23.4%
	Adjusted Residual	3.4	-3.6	-0.1	
Constrain	Count	175	50	20	245
	% of Total	16.8%	4.8%	1.9%	23.5%
	Adjusted Residual	4.1	-3.9	-0.7	
Total	Count	627	318	96	1041
	% of Total	60.2%	30.5%	9.2%	100%

Table 30: Table 30 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and lived anticipated (YES, NO, UNSURE).

A Pearson chi-square test of independence was to evaluate the potential for systematic

relationships between categorical variables of the situational theory of publics groups and if participants have had previous earthquake experience, as in if participants have ever been in an earthquake. Response items for earthquake experience had had three groups: yes, no, unsure. Chi-square tests indicted a nonsignificant report ($\chi^2(6) = 8.35, p = 0.214$).

Table 31. Situational Theory Publics Groupings * Experienced Earthquake Harm

Opinion Publics		Earthquake Harm		Total
		YES	NO	
Routine	Count	155	258	413
	% of Total	14.9%	24.8%	39.7%
	Adjusted Residual	-3.6	3.6	
Fatal	Count	55	84	139
	% of Total	5.3%	8.1%	13.4%
	Adjusted Residual	-1.2	1.2	
ProbFace	Count	132	112	244
	% of Total	12.7%	10.8%	23.4%
	Adjusted Residual	3.5	-3.5	
Constrain	Count	119	126	245
	% of Total	11.4%	12.1%	23.5%
	Adjusted Residual	1.5	-1.5	
Total	Count	461	580	1041
	% of Total	44.3%	55.7%	100%

Table 31: Table 31 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and experienced earthquake harm (YES, NO).

The next chi-square tests evaluated the potential for systematic relationships between categorical variables of the situational theory of publics groups and if participants have had previously been harmed in an earthquake experience, that is if an earthquake caused the participant injury or loss to their persons, property, family, or community. Earthquake harm had three groups: yes, no, unsure. The chi-square test returned a significant report ($\chi^2(3) = 20.24, p < 0.001$), indicating that a participant's previous earthquake injury and loss experience may be influential in how the situational theory of publics form. More

specifically, the adjusted residual counts showed that the problem facer public are more likely to have had some sort of previous earthquake harm experience and the routine public is more likely not to have any earthquake injury or loss experience.

A Pearson chi-square tests were performed to evaluate the potential for systematic relationships between categorical variables of the four opinion publics and participants perceived level of organization trust for the USGS. Perceived organizational trust had two groups: low organizational trust and high organizational trust. The chi-square test returned a significant report ($\chi^2(3) = 38.94, p < 0.001$). For the surveyed public, it appears as though organizational trust does indeed influence some situational theory of publics group membership. More specifically, the adjusted residual counts showed that the routine public is more likely to low organizational trust in the USGS, whereas the constrained public is more likely to have high levels of USGS organizational trust compared to the other opinion publics.

Table 32. Situational Theory Publics Groupings * Organizational Trust

Opinion Publics		Organizational Trust		Total
		LOW	HIGH	
Routine	Count	244	169	413
	% of Total	23.4%	16.2%	39.7%
	Adjusted Residual	5.4	-5.4	
Fatal	Count	68	71	139
	% of Total	6.5%	6.8%	13.4%
	Adjusted Residual	0.0	0.0	
ProbFace	Count	112	132	244
	% of Total	10.8%	12.7%	23.4%
	Adjusted Residual	-1.0	1.0	
Constrain	Count	84	161	245
	% of Total	8.1%	15.5%	23.5%
	Adjusted Residual	-5.2	5.2	
Total	Count	508	533	1041
	% of Total	48.8%	51.2%	100%

Table 32: Table 32 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and organizational trust (LOW, HIGH).

A Pearson chi-square test of independence was calculated to evaluate the potential for systematic relationships between categorical variables of the four situational theory of publics and the level of involvement scale for earthquakes in Oregon. This level of involvement scale had two groups, low or high low level of involvement. This particular level of involvement scale measured if participants believe an earthquake in Oregon would involve or impact the participant or their friends and family, or how involved or impactful an earthquake in Oregon would be to a participant's life. The chi-square test returned a significant report ($\chi^2 (3) = 233.160, p < .001$), which signaled a relationship among a publics' level of involvement and their membership to a situational theory opinion public (see Table 33). After reviewing the adjust residual outcomes, the routine public is more likely to have a low level of earthquakes in Oregon involvement, and the fatal and constrained publics are more likely to have high level of involvement scores.

Table 33. Situational Theory Publics Groupings * Level of Involvement with Earthquakes

Opinion Publics		Level of Involvement		Total
		LOW	HIGH	
Routine	Count	329	84	413
	% of Total	31.6%	8.1%	39.7%
	Adjusted Residual	13.5	-13.5	
Fatal	Count	61	78	139
	% of Total	5.9%	7.5%	13.4%
	Adjusted Residual	-2.5	2.5	
ProbFace	Count	123	121	244
	% of Total	11.8%	11.6%	23.4%
	Adjusted Residual	-1.2	1.2	
Constrain	Count	48	197	245
	% of Total	4.6%	18.9%	23.5%
	Adjusted Residual	-12.3	12.3	
Total	Count	561	480	1041
	% of Total	53.9%	46.1%	100%

Table 33: Table 33 details a chi-square test of situational theory opinion publics (constrained, problem facer, routine, fatalistic) and level of involvement with earthquakes (LOW, HIGH).

Summary

This chapter explored this project's online survey descriptive statistics and research inquiry statistical analyses. To answer the first research question, descriptive statistics and frequencies were calculated and evaluated. Chi-square tests were conducted to answer the remaining research questions. Statistical tests were selected due to the type of variables tested (i.e., categorical, continuous). The next chapter will explore and discuss these results in further detail, as well as provide recommendation for this study's theoretical and practical implications, limitations, and future research avenues.

CHAPTER V

DISCUSSION

The discussion section of this dissertation will synthesize the study's research inquiries and outcomes. Then, this section will focus on the possible theoretical implications made to public relations theory, specifically the situational theory of publics. Following the theoretical implications, a section on practical implications is addressed in this discussion section.

Earthquake-Related Awareness & Attitudes Inquiries

The first research question was interested in learning survey participants' awareness of and attitudes toward earthquake risks, earthquake safety behaviors, and ShakeAlert. More specifically, the first research questions asked, what are survey respondents' beliefs toward earthquake risks in Oregon, earthquake safety behaviors, and ShakeAlert? To answer this research question, frequencies were recorded for numerous survey questions, as reviewed in the findings section. The following paragraphs will discuss earthquake-related and ShakeAlert-related awareness and attitude inquiries from the survey findings.

As for earthquake-related inquiries, earthquake risk was acknowledged by survey participants as nearly 75% of participants stated that future earthquakes in Oregon could cause serious consequences for the state, and almost half of participants stated a future earthquake could cause damage to their property. Participants thought differently about bodily harm, however, with more than 80% of participants believing their persons or bodies would not be harmed or injured in a future earthquake. Participants perceive that the state of Oregon or their property has a higher likelihood of being damaged in an earthquake compared to participants' persons or bodies. Participants were also familiar with earthquake-related content as many have previously lived in a location where earthquakes were anticipated (60.2%) or have had direct earthquake experience (71.4%). Participants also

perceived protective actions as beneficial, however, some participants noted barriers with taking protective actions during an earthquake. The credible information to take protective action and the space for taking protective action were among the highest barriers for survey participants to take safety during an earthquake.

Current ShakeAlert-Related Beliefs of Oregonians

Survey participants were not too aware of ShakeAlert as slightly more than 20% of participants stated they heard of ShakeAlert. During the recent ShakeAlert public alerting activation in Oregon, media coverage was used to promote the arrival of the EEW system. Therefore, these findings suggest the media coverage was not sufficient or did not reach as many publics as intended.

When participants were exposed to the ShakeAlert public relations material, overall, participants found the information to be important as more than half of participants stated they strongly-to-somewhat agreed that the ShakeAlert utility bill insert was engaging to view. Similarly, more than half of participants stated they strongly-to-somewhat agree that they would pay attention to the ShakeAlert bill insert. These results are beneficial; however, they should be received with caution as it is unclear if a form of confirmation bias was present or if survey participants were unconsciously responding in a conforming manner. A different type of analysis may help researchers and practitioners understand if the public has a positive opinion or impression of ShakeAlert or its communication material. Future research could partake in focus group or interview research to gain a more robust understanding of attitudes.

The first research questions broadly investigated the surveyed publics' awareness of and attitudes toward earthquake risks in Oregon, earthquake safety behaviors, and ShakeAlert. It is essential to have a foundational understanding of audience beliefs because to date, no research has been conducted on Oregonian populations' comprehension of and responses to possible ShakeAlert messaging, and whether they distinct earthquake risks from

other commonly occurring regional hazards. This information is formative research to help build and construct better research-informed practices and messaging design.

Situational Theory of Publics Research Inquiries

Apart from determining the current earthquake-related and ShakeAlert-related beliefs of Oregonians, the second research question was interested in understanding how Oregon publics form according to STP. More specifically, the second research questions asked, how do Oregon publics form and perform communication behaviors according to the situational theory of publics? The four theoretical opinion publics used for this dissertation included problem facers, constrained, routine, and fatalistic categorization.

Statistical tests confirmed a forming of situational theory publics according to the variables of problem recognition and constraint recognition. The constrained public totaled 23.5% of the study's survey population. The constrained public holds a high problem recognition for an earthquake risk in Oregon, but this public also have a high constraint recognition, which hinders their motivation to take safety or protective actions in the event of an earthquake. A total of 23.4% of individuals fell into the problem facer public categorization. The problem facers tend to have a high problem recognition for earthquake risks in Oregon and they believe that they can do something, like protective actions, to protect themselves in the event of an earthquake. The routine public was the largest formed public and tallied 39.7% of the total survey population. Individuals in the routine public have a low problem recognition toward an earthquake risk in Oregon, but they believe they could do something to protect themselves in the event of an earthquake. Lastly, the fatalistic public was the smallest public with a total of 13.4% of the survey population (see Table 35). The fatalistic public has a low problem recognition toward earthquake risks in Oregon and a high constraint recognition toward participating in earthquake safety or protective action behaviors in the event of an earthquake.

Table 35. Situational Theory of Publics Theoretical Information

Public	Percent	Variables	Communication Behavior
Constrained	23.5%	H CR; H PR	Thinks about the problem, too constrained to act
Problem Facer	23.4%	L CR; H PR	Thinks about the problem, not constrained to act
Routine	39.7%	L CR; L PR	Does not think about problem, not constrained to act
Fatalistic	13.4%	H CR; L PR	Does not think about problem, too constrained to act

Situational Theory Communication Behaviors

The STP provides a means of identifying and segmenting a general population into relevant groups based on predicted communication behavior (Grunig, 1997). Therefore, along with understanding the formation of Oregon publics according to the STP, this study also examined how opinion publics performed or intended to perform theoretical-driven communication behaviors. Survey questions gauged participant information seeking, information processing, information engaging intentions, and information gaining behaviors. Statistical testing for the current project confirmed theoretical predictions from previous research (Grunig & Hunt, 1984), which found the problem facer opinion public is more likely to score high on the information seeking scale. As for information processing, contrary to previous research findings where the problem facer also scored high on information processing, this study found the problem facer public did not score statistically different of information processing compared to the other publics. The constrained and fatalistic publics both scored statistically significantly high on the information processing scale and the routine public score low on this scale. For the current project, the publics with high levels of constraint recognition (constrained and fatalistic) were more likely to engage in passive communication behaviors and the publics with high problem recognition (constrained and problem facer) were more likely to engage in active communication behaviors. The public with high constraint recognition and high problem recognition (constrained public) score high in both information seeking and processing behaviors.

As for information engaging intentions, the current project found that publics with high problem recognition were more likely to perform information engaging behavioral intentions. More specifically, when participants were asked what communication-related behaviors they planned to take during the next quarter, they had the option to select read more about ShakeAlert, protective actions, or earthquakes in Oregon, talk to friends or family about ShakeAlert, protective actions, or earthquakes in Oregon, practice protective actions at residence or workplace, watch a video about ShakeAlert, protective actions, or earthquakes in Oregon, “follow” or “like” ShakeAlert or the USGS on social media, post or share information online about ShakeAlert, protective actions, or earthquakes in Oregon, or participant in a free workshop/training on ShakeAlert, protective actions, or earthquakes in Oregon. This project found that the constrained and problem facer publics are more likely to intend to participant in at least two of these communication-related behavioral intentions. More specifically, the problem facer group is more likely to intend to perform two actions and the constrained public is more likely to perform four or more of these information engaging intentions. The routine public was significantly more likely not participate in any communication behavior when compared to the other publics. The last communication behavior questions asked participants what additional information they would like to gain after they completed the survey. Participants had the option to select to gain additional information about ShakeAlert or earthquake early warning systems, earthquakes in Oregon, how to turn on WEA Orgon Test Alert on Android & iOS Phones, and information about protective actions. The constrained public was more likely to gain additional earthquake-related information and the routine public was more likely to not select to gain any additional information.

In conclusion, in terms of communication behaviors, this study found that high problem recognition publics tend to have higher communication behaviors and behavioral

intentions compared to low problem recognition publics. This runs parallel to the theoretical prediction and previous research that states when a public's opinion about an issue is high or highly formed, then that public will engage in more communication behaviors (Grunig & Hunt, 1984; Hamilton, 1993).

Table 36. Situational Theory of Publics Groupings * Communication Behaviors

	Constrained	Prob Facer	Routine	Fatalistic
Info Seek	HIGH	HIGH	LOW	LOW
Info Process	HIGH	-	LOW	HIGH
Info Share	HIGH	MODERATE	LOW	HIGH
Info Gain	HIGH	-	LOW	-

Demographic Influence

The third research question was interested in exploring how demographic characteristics influenced the groupings for the STP stakeholder groups. More specifically, the third research questions asked, do demographic variables of (a) gender (b) household income and (c) political identity influence how Oregon publics form according to the situational theory of publics?

STP states that publics do not form due to demographic features but in terms of their opinions or positions on an issue, however. A portion of risk-related situational theory of public research has found that demographic do matter when publics form, especially in times of environmental or health uncertainty. Similarly, this dissertation found, in Oregon, when publics form according to the situational theory, they formed in terms of their opinions toward the issue, earthquake risks in Oregon, and due to some demographic and social features like a participant's gender, HHI, political affiliation, and previous experience with earthquakes. More specifically, for the current study, members of the fatalistic public are more likely to be women with a lower income household income. In terms of political identity, members of the routine public tend to identify as Republican, and the constrained

public more likely include members who identify as Democratic.

Table 37. Situational Theory of Publics Groupings * Demographics

	Constrained	Prob Facer	Routine	Fatalistic
HHI	-	-	-	Low HHI
Gender	-	-	-	Women
Political	Democrat	-	Republican	-

The Influence of Experience and Contextual Variables

The fourth research question was interested in learning how variables like previous experiences with the risk influence the formation of situational theory opinion publics. More specifically, the fourth research questions asked, does previous experiences with earthquakes influence how Oregon public form and perform communication behaviors according to the situational theory of publics?

Just as demographic features might be important to consider when forming the situational theory of publics in the contexts of risk, social features like previous experience with the risks is an important feature to consider as well. As previously mentioned, the start of STP scholarship analyzed experience as an important theoretical variable but experience was not consistently a strong predictor, therefore, scholars decided to not consider previous experience as an important variable to consider when developing publics (Grunig, 1997; Grunig & Hunt, 1984; Hamilton, 1993), however. Previous research has studied the variable of experience and found that it may indeed be an important to consider when investigating issue closely related to individuals or publics. Among the studies where experience was found to be a moderating theoretical variable, for example, the issue or problem under investigation has a personalized element to the population studied (see Aldorrey & Sha, 2007; Kim & Grunig, 2011).

The current study found previous experience with the risk, an earthquake, was influential to a publics' formation and their communication behaviors. In terms of public

formation, this study found that individuals who have lived where earthquakes are anticipated belonged to the problem facer and constrained publics. The similarity among these publics is that both have high problem recognition of earthquake risks in Oregon. Additionally, this dissertation determined that individuals who have previously been harmed in an earthquake tend to make-up members of the problem facer public. Statistical tests also showed that the routine public has not lived where earthquakes are anticipated nor have, they been harmed in an earthquake, which is logical considering the routine public has a low problem recognition of earthquake risks in Oregon. Additionally, this study found that experience with earthquake was an influential variable for a publics' performance of communication behaviors. Statistical tests revealed that those with earthquake experience requested additional post-survey information at higher rates compared to those without earthquake experience. Also, the current study found that individuals who have previously been harmed in an earthquake were more likely to participate in information seeking and information engaging behaviors. Therefore, the research findings of this study suggest previous experience may indeed influence how situational theory of publics form and perform communication behaviors in the contexts of risk.

Table 38. Situational Theory of Publics Groupings * Earthquake Experience

	Constrained	Prob Facer	Routine	Fatalistic
Lived Anticipated	YES	YES	NO	-
EQ Experience	-	-	-	-
EQ Harm	-	YES	NO	-

The Role of Trust and the USGS

The fifth research question was interested in learning about moderating effects of organizational trust. More specifically, the fifth research questions asked if organizational trust toward the USGS, the main publisher of the ShakeAlert public warning messaging,

influenced how publics formed according to situational theory. A small portion of STP research has reviewed how message source credibility and trustworthiness influences the development of STP groupings. One study, for example, found problem facers with high levels of involvement (active publics) had higher levels of trust in the risk message source and, thus, were more likely to perform the recommended behaviors (Lee & Rodriguez, 2008). Similarly, in disaster studies, a study found that message source trust was a stronger predictor for hazard preparedness behavioral intentions compared to previous hazard experience (Paton, 2008). The current study also found a relationship among levels of organizational trust and the formation of the STP groups. Statistical analyses determined that the constrained public had significantly higher levels of organizational trust toward to source of the ShakeAlert public relations message, the USGS, compared to the routine public that had significantly lower levels of organizational trust toward the USGS.

Table 39. Situational Theory of Publics Groupings * Organizational Trust

	Constrained	Prob Facer	Routine	Fatalistic
Organization Trust	HIGH	-	LOW	-

Driving the Level of Involvement

The sixth, and final, research questions research questions asked if the independent variable of level of involvement influenced how Oregon publics formed according to theory. The current project found that the level of involvement is influential for the formation of some publics. Members of publics with high constraint recognition, fatalistic and constrained, are statistically more likely to higher levels of involvement. In contrast, the routine public is statistically more likely to have low level of involvement.

Theoretical Implications

Research has shown the STP is a well-tested and highly regarded theory among public relations scholars (Aldoory & Sha, 2008; Grunig, 1992; Grunig, Grunig, & Dozier, 2002).

The theory entered public relations literature in the late 1960s and was tested for over 20 years in different contexts to determine the variable's utility and the theory's best fit within the research community (Aldoory & Sha, 2008). Early situational theory research investigated environmental and health risk situations, for example. Throughout the years, the theory's success was solidified as a means to research organizational issues. However, as previously reviewed in this dissertation, the theory has been seen as an asset for risk and crisis communication scholars (Aldoory et al., 2010; Lee & Rodrigues, 2008; Grunig & Ipes, 1983; Major, 1998).

Knowing the growth and body of research from risk communication as a paradigm of study within itself, STP needs to evolve to address contexts of risk better. To date, examples of risk have been used to support situational theory. Research, for example, often uses situational theory on risk-specific situations where research findings prolong support for situational theory, but these studies do not allow scholars to elaborate on the risk itself or the implications for risk communication. Research needs to investigate the risk under investigation (i.e., earthquake) by applying situational theory to support the inquiry instead of having situational theory at the center of the investigation. To that end, situational theory's utility should be challenged to address the actual risk instead of the theory.

Situational theory can be customized to address risk communication by adjusting aspects of the theory's shortcomings and attributes in terms of methodological approaches, theoretical variables, public classifications, and theoretical outcomes. With the additions and validations of these theoretical adjustments, the risk becomes the primary concern and situational theory, in turn, used supplemental to explain outcomes and predictions.

The most common method to measure situational theory's predictability is survey design, and research produced through this method has been rich in findings, however; scholars have noted some areas for improvements. A few challenges with situational method

are the operationalization of variables, scale reliability construction, and complexity in statistical analyses (Aldoory & Sha, 2008). The current project agrees that these methodological challenges are present in situational theory testing. The operationalization of variables has not remained consistent from study-to-study. Furthermore, some studies have overlapping definitions of variables. Multiple studies, for example, measure level of involvement by asking study respondents how important the problem under investigation is to them (Lee & Rodrigues, 2008; Hamilton, 1992; Major, 1993) and other studies ask a similar question (i.e., how important the problem is to respondents) to measure a respondent's problem recognition (Hamilton, 1993; Kruger-Ross & Walters, 2013). An explanatory factor in the inconsistency of variable definitions might be because the variables need to adjust to match the context they are investigating. When a study is investigating an organizational issue, for example, the problem recognition variable can easily be labeled and defined through external means (i.e., is the organization bad), while the investigation of a risk-related situation might include both internal and external problem recognition definition attributes (i.e., is the risk a problem for you or others, do you have control over the problem or do others). Situational theory has been applied to a plethora of risk-specific contexts (Aldoory et al., 2010; Aldoory, 2001; Grunig & Ipes, 1983; Lee & Rodriguez, 2008; Major, 1998), which could serve as a library to define theoretical variables customized for risk-related communication or organizational-related communication research.

The lack of consistency in variable definition might have influences a theoretical shortcoming in terms of scale reliability or consistency. In term of scale reliability, situational theory research often reaches acceptable scale reliability score at or near Cronbach alpha of .70 (Aldoory & Sha, 2007). However, there has been some issues with scale item consistency. Some studies have used one or two variable items to construct a scale (Aldoory et al., 2010; Grunig, 1983; Grunig & Hunt, 1984; Grunig, 1982; Illia et al., 2013; Major,

1993) while other studies have constructed (consistently) reliable scales with three or more scale items (Aldoory & Sha, 2007; Grunig, 1997; Hamilton, 1992; Lee & Rodrigues, 2008; Werder, 2005). This inconsistency in scale item numbers for scale construction might skew research results in terms of reliability of variables being measured and assessed. A consistent scale protocol should be implemented and adhered to in situational theory research to maintain theoretical validity and reliability longevity. A consistent protocol may be one that has distinct routes for measuring various variables under various contexts (i.e., organization context, risk context). For instance, if a researcher is investigating an organizational matter than that research would use the situational theory variable operationalization and variable scales purposefully created for organizational issues and vice versa for risk-related situations.

The last methodological challenge discussed in this dissertation is the statistical analyses applied and practiced by situational theory scholars. Often, archaic statistical tests like canonical correlations are used to determine situational opinion publics groups and dependent variable interactions, which has called scholars to suggest using tests like multiple regression techniques to explore theoretical predictions (Aldoory & Sha, 2007). Both of these quantitative approaches might be too intimidating for beginner researchers. A simpler approach to testing the theory's variables could be applied with using chi-square analyses to gauge for any potential relationship among variables. In fact, early situational research used chi-square tests to determine public groupings (see Grunig, 1978; Major, 1993). By organizing variables as categorical and according to their low and high mean levels for chi-square testing as opposed to continuous variable more advanced testing, upholds the integrity of the theoretical underpinning of situational theory, which investigates how those with low and high recognitions consume and use information. To that end, the theory lends itself to categorize variables and not to view them as continuous or more complex factors.

The findings also provide valuable insights specific to STP and publics. As discussed, through STP, publics can be grouped according to their levels of problem recognition, constraint recognition, and level of involvement (Aldoory & Sha, 2007; Grunig, 1997). In this classification, four main opinion publics are created from member's low or high (problem and constraint) recognitions. These public combinations are labeled as active, aware, latent, and nonpublic. Public groups can then be classified as having either low or high involvement. Altogether, the public classification develops twelve groups (i.e., active with low involvement, active with high involvement, aware with low involvement, aware with high involvement, latent with low involvement, latent with high involvement, nonpublic with low involvement, nonpublic with high involvement). Drawing research conclusions and suggesting practical implications segmented to twelve different opinion public is complex, time burdening, and lacks a perceived return of investment. Therefore, having a third independent variable that is fluid might complicate the applied aspect of the theoretical and practical implications.

Scholars have found usefulness in categorizing publics according to two independent variables (problem recognition and constraint recognition), instead of the previously mentioned three variables (problem recognition, constraint recognition, level of involvement). By combining the two independent variables (i.e., high problem recognition, low constraint recognition; high problem recognition, high constraint recognition; low problem recognition, low constraint recognition; low problem recognition, high constraint recognition), four opinion public groups can be created. These public combinations are labeled as constrained, problem facers, routine, and fatalistic. A selection of situational theory risk-related research used this two-variable categorization strategy to construct opinion publics and few risk-related studies applied the three-variable categorization method (see Grunig & Ipes, 1983; Grunig, 1987; Major, 1993, Major 1998). Therefore, this dissertation

proposes to develop a customized categorization of publics for situational theory to distinct research studied in different contexts. For instances, if a researcher would like to focus on an organizational issue, then one should apply the organizational-lens situational theory of publics operationalization where publics are classified mainly as active, aware, latent, and non-public – by the combination of the three independent variables. Similarly, when a researcher would like to investigate a risk-related situation, then they might use the risk-categorization of situational publics, where publics are classified according to two independent variables (labeled as constrained, problem facer, routine, and fatalistic).

Some seasonal situational theory scholars might balk at the suggestion to ignore the third independent variable of level of involvement, by not including it in the risk-categorization of publics, because this variable has been suggested to be the most predictable or important situation theory independent variable (Aldoory & Sha, 2007). In terms of organizational issues, an individual's level of involvement might be more important to consider or a separate variable altogether than when investigating a risk-related issue. With a risk-related issue, an individual's level of involvement is naturally combined and measured with the problem recognition measure as a problem or risk might naturally impact or influence an individual's life. Other scholars have noted that risk-related situational research innately has a personal involvement aspect. One study, examining health risk messaging, used the personalized moderating variable "consciousness of everyday life" when investigating how publics form and behave (Aldoory, 2001). Another situational theory study, looking at environmental risks and attitudes, found that an individual's personalized risks, when stakeholders have an issue problem that personally impacted their life or self, impacted how publics viewed the risk-related issue (Major, 1993). Both studies noted personalized-risk publics form and behaved differently compared to publics that form when an issue is of or from a third-party like an organization. To that end, this dissertation argues

that the removal of the level of involvement variable to create the risk-categorization of situational publics does not hinder the theory's ability to predict or measure the concept of involvement as involvement and impact is included in other measures like problem recognition and social experiences.

The dependent variables of STP are the communication behavior of information seeking and information processing. The theory suggests the independent variables (problem recognition and constraint recognition) represent attributes of a public that predict whether a public will engage in active (information seeking) or passive (information processing) communication behavior (Grunig & Hunt, 1984; Grunig, 1997). When engaging in information seeking behaviors, people purposefully scan the environment for messages and endeavor to understand information on a certain topic. Passive communication behavior is a characteristic of the dependent variable information processing. Just recently, the theory expanded to encapsulate information sharing on social media (Kim & Grunig, 2011).

As mentioned, in the literature review of this dissertation, the most recent extension to situational theory's communication behaviors has been with STOP. STOP attempts to extend communication behaviors, labeled as communicative actions in problem solving, to account for the technological advancements with information and communication technologies (Kim & Grunig, 2011). STOP divides information seeking and processing into six communicative action categories (information forefending, information permitting, information forwarding, information engaging, information seeking, information attending). The addition of four communicative action categories might be cumbersome for some researchers unfamiliar with the theory or advance statistical testing of SEM.

Knowing that communication behaviors have changed with the addition of the internet as, nowadays individuals passively process more information than prior to the advent of the internet when individuals were not inundated with as much information processing

opportunities, the situational theory of publics' communication behaviors needs to evolve accordingly. Therefore, the current project was interested in learning more about situational opinion publics performance of information seeking/gaining, processing, and engaging behaviors. Information gaining was a one-item scale that asked participants what information they were interested in gaining after the survey ended. Similarly, information engaging was a one-item scale that asked participants what type of information-related communication or behavior they intended to take within the next couple of months. Research findings show that publics that were high information seekers (constrained) are also high information gainers, and those publics who are low information seekers (routine) are also low information gainers. As for information engaging, publics with high constraint recognition (constrained and fatalistic) were also high information engagers; meaning that these publics are statistically more likely to engage in more earthquake information-related activities (i.e., watch an earthquake-related informative video, talk about earthquake-related content, read about earthquake-related content, post about earthquake-related content) compared to the other publics. The fatalistic public, low problem cognition and high constraint recognition, were found to be low information seekers but high information processors and engagers. These results speak to the high amounts of information processing that occurs online or in our current media landscape. Situational theory researchers should take note of the changing world of communication behaviors and how publics are communicating and using information online. Therefore, this dissertation proposes adding a form of information engaging or a focus on information processing due to the influx of passive information an individual might process each mediated interaction.

Altogether, the findings indicate there is merit in adapting the situational theory of publics to better-address risk-related contexts. To that end, below is a proposed situational theory of publics at risk (STPR) model (see Figure 1). In the STPR model, public

categorization is formed by the recognition independent variables (i.e., problem recognition and constraint recognition), which is modeled after previous situational theory of publics risk-related research (see Grunig & Ipes, 1983; Grunig, 1987; Major, 1993, 1998), and creates four risks situational opinion publics appropriate for risk-related research – constrained, problem facers, routine, and fatalistic.

Figure 1. Situational Theory of Publics at Risk (STPR) Conceptual Model

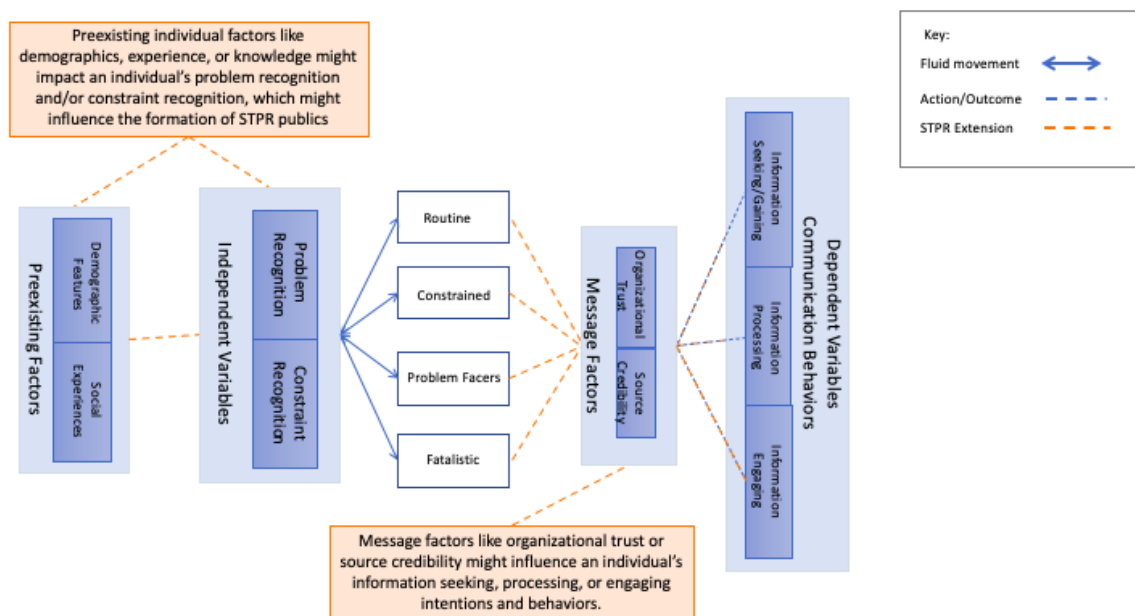


Figure 1. Figure 1 show situational theory of publics with the addition of demographic and social attributes to specify how these variables may influence the formation of STPR groups and, therefore, communication behaviors, and possibly behavioral intentions. An aspect of message factor such as organizational trust or source credibility might influence how publics decided to perform communication behaviors and behavioral intentions.

The proposed backbone of the model are the four situational theory of publics at risk opinion publics (i.e., constrained, problem facer, routine, fatalistic) and the respected situational theory of publics theoretical outcomes or dependent variables (information seeking, information processing) with the addition of the dependent variable of information engaging to account for aspects proposed by STOP, an inundation of passive information presented to individual's with the internet, and data conclusions drawn from this dissertation (i.e., high constraint recognition publics are high information processors and engagers,

earthquake injury experience predictor for information engaging intentions).

Other additions to the basic situational theory of publics theoretical model include demographic and social features. Located at the beginning of the model are demographic features and social experiences because these preexisting factors might mold an individual's problem or constraint recognitions. Risk-related situational theory of publics research has found that demographics are influential to the formation of situational of publics groupings, especially when the issue under investigation is a personalized risk or issue to the individual or public (Aldoory, 2001; Major, 1998). Previous risk-specific situational theory of publics explored demographic relationships between situational publics and socioeconomic status (Lee & Rodriguez, 2008), gender (Aldoory, 2001), political affiliation (Major, 1998), and education (Major, 1998). Additionally, multiple studies have found that cultural identity does impact risk-related situational theory of publics formation and, thus, publics' communication behaviors (Aldoory, 2001; Aldoory & Sha, 2007; Powell, 2006; Sha, 2006). Given the previous mentioned research and the increase in results that show demographic features are influential for situational publics, the current project also explored how demographics influences the development of situational opinion publics and found that some demographic features might be important to consider for earthquake-risk publics. An individual's political affiliation, gender, and HHI, for example, were some preexisting factors that influenced individual's opinion public membership. To that end, these studies outline the importance of considering demographics while applying situational theory to risk-related situations.

Another addition to the beginning of the model is the preexisting factor of social experiences. In the foundational literature of situational theory, a fourth independent variable, similar to experience, was often measured (Aldoory & Sha, 2007; Gruning & Ipes, 1983; Grunig, 1978; Grunig, 1997; Sha, 1995). This variable was titled referent criterion and was defined as the knowledge and experience an individual takes from one situation to another in

order to find a solution about a current or future problem or issue (Grunig, 1997). Although, research analyzing the effectiveness and predictivity of referent criterion claimed the variable was statistically inefficient (Aldoory & Sha, 2007). Scholars have argued that knowledge and/or experience are collectively and individually important to consider. When expanding the situational theory of publics to adapt to the changing information environment, scholars included referent criterion in the updated STOP model (Kim & Grunig, 2011). Similarly, when applying and modifying situational theory to examine an individual's motivation to perform communication behaviors, the referent criterion concept of knowledge was used to develop situational opinion publics (Hallahan, 2002). Lastly, during a review of situational theory and the elaboration likelihood model, research argued that referent criterion should be reignited in the situational theory discussion (Sha & Lundy, 2005).

Running parallel to the previously mentioned research on situational theory and experience, the current study found previous experience with earthquakes influences the theory's independent and dependent variables. More specifically, those with previous earthquake experience (lived where earthquakes are anticipated or have been in an earthquake) were members of publics with high problem recognition scores. Additionally, individuals who have previously been in an earthquake were considered low information seekers but high information engagers. The results from this dissertation and other risk-related situational theory research highlight the impact of social experiences. Therefore, in contrast to situational theory of publics originating underpinnings, this model believes demographic and social characteristics do matter, and that an individual comes to a situation with a set of identities, demographics, experiences, and risks perceptions, which might influence other variables of the model.

An important, but exploratory, feature of the model is the organizational trust variable, which might influence an individual's communication behaviors. One project,

studying the utility of situational theory and behavioral intentions, found that factors such as source credibility, argument strength, and argument quality influences the amount of information seeking and processing behaviors an individual might engage in (Sha & Lundy, 2005). Additionally, another study, focusing on bioterrorism risk messaging and situational theory, found problem facer publics with high levels of involvement and high levels of trust in the message source were more likely to perform communication and recommended risk behaviors (Lee & Rodrigues, 2008). The STPR model believes that an individual's or publics' level of organizational trust can create noise in the linear process of situational theory from problem recognition to information seeking. This noise or level of distrust in the organization or source of message might, in turn, limit or hinder communication behaviors and behavioral intentions. In contrast, when levels of organizational trust and problem recognition are high, publics are more like to perform and engage in communication behaviors. The attribute of organizational trust is included in this model because of the research findings of the current study and the previously reviewed situational research, which found trust in organization or message source credibility were, indeed, motivating factors for performing communication behaviors (Hallahan, 1999; Lin et al., 2008; Sha & Lundy, 2005).

In conclusion, the situational theory of publics at risk, which would act as a branch to the main situational theory of publics theory. The situational theory of publics at risk conceptualized of variables and publics would be better suited to investigate times of environmental, natural, or health risks and uncertainty because of the attention to the stakeholder and the personalized risk and barrier aspects of problem recognition and constraint recognition. This theoretical implication section is meant to be exploratory in nature. Scholars are encouraged to provide constructive criticism and future tests to the situational theory of publics at risk proposal. The purpose of the situational theory of publics at risk theory extension and model proposal is to ignite an academic discussion surrounding

what a recategorization of the situational theory of publics would look like under the contexts of risks and uncertainty.

Practical Implications

This dissertation suggests implementing segmented messaging targeted at STPR opinion publics with various demographic and social characteristics. Segmented messaging should be purposefully created to raise awareness of ShakeAlert and the USGS and to create a public conversation about earthquake risks in Oregon, earthquake safety behaviors, and EEW systems via digital and traditional means.

A large portion of public relations and risk communication ignores demographic and social variables when developing communication campaigns, and instead adapts a “one size fits all” risk communication messaging approach (Connelly & Knuth, 1998; Vaughan, 1995). Messages intended for one community might not result in action from a different community due to the difference in message reception from each community. Therefore, research has pointed to the importance of formulative research prior to message design. When designing risk messaging or trying to motivate preparedness behaviors, it is important to gather information about the person’s or population’s existing beliefs and attitudes because these attitudes and social norms influence an audience’s perception of hazards and ultimately how they prepare for them (McIvor & Paton, 2007).

The situational theory of publics can provide risk communication researchers with a framework for studying responses to risk messages, as the theory is a repeatedly researched theory for managing public relations strategically (Aldoory & Van Dyke, 2004; Grunig & Ipes, 1983; Major, 1993). It can be used to help develop messages and design campaigns for stakeholders who communicate about an issue in similar ways (Aldoory & Sha, 2007). When correctly applied, the theory can reveal a group’s perceptions and the situations that would facilitate communication (Grunig, 1997). Emergency managers and communication

practitioners may then use their findings to segment the larger stakeholder population into smaller publics (Grunig, 1997).

In terms of the situational theory of publics, the current study found that of the surveyed population, nearly 40% of participants formed as the routine public. Members of the routine public had statistically lower levels of perceived barriers with taking earthquake protective actions, lower levels of perceived problem recognition of an earthquake risk in Oregon, and lower levels of perceived personal impact of earthquake compared to the other situational opinion publics. Previous risk-related situational research found that message placement is an important factor to consider when trying to target low problem recognition publics, like the routine publics. One study, examining the effects of bioterrorism risk messaging, suggested that placing risk messaging in public spaces might enhance individual's problem recognition and sense of personal impact, which in turn, can induce more information seeking behaviors from individuals, favorable attitudes about and greater willingness to try out the campaign's recommended behaviors (Lee & Rodriguez, 2008). Another study, investigating environmental issues and the situational opinion publics, suggested to reach low problem recognition publics with passive information (Major, 1993). This study determined that passive information processors do not seek out information, but these publics may engage in interpersonal discussion or watch a specialized media on the issue or topic. To that end, keeping with the current mediated times and knowing that the communication environment of social media and the internet provides spaces for information to be passively presented to a variety of audiences, emergency managers should design a communication campaign targeted at routine publics via social media or the internet. Campaign messages should come from a trusted source and acknowledge an individual's high levels of perceive protective action efficacy due to the results of this study.

Moving on to the constrained public. Members of the constrained public included

nearly 25% of the surveyed population. These individuals see the earthquake risk as a severe problem and have a high level of perceived constraints in gaining safety during an earthquake. As for descriptive information, for the surveyed population, members of the constrained public were statistically more likely to politically identify as Democrats, have earthquake experience, have high levels of USGS organizational trust, and high levels of information seeking, processing, engaging, and gaining behaviors. The problem facer public is similar to the constrained, as in the problem facer public also included nearly 25% of the surveyed population. These individuals see the earthquake risk as a severe problem and have a low level of perceived constraints in gaining safety during an earthquake. For the studied population, individuals with earthquake experience, were more likely to be members of the problem facer and constrained publics and not the routine public. The current study also found that the constrained and problem facer publics were more likely to perform an information engaging behavior during the next quarter. This finding runs parallel to previous research, that investigated publics' communication behaviors for an environmental issue, which found that the problem-facing and constrained publics were more likely to conduct information-seeking behavior (Major, 1993).

Knowing this project suggests the problem facer and constrained publics will most likely have earthquake experience and be apt to seek and engage in earthquake-related information, a communication campaign strategy can be designed around this information. More specifically, a practical way to apply these research findings is to develop a communication campaign that uses individuals who are considered "information engagers" with previous earthquake experience, problem facer and constrained publics, as opinion leaders ready to share their earthquakes and earthquake safety behaviors stories and experiences. This campaign would be target at primarily the routine public who has low problem recognition and low communication behaviors. Through a volunteer service or

nonprofit organization, such as The Community Emergency Response Team (CERT), regional opinion leaders, or those with earthquake experience, may perform a question-and-answer session through a social media website like Reddit's IMA format. Reddit's regional subcommunities can host local and regional IMA sessions, where individuals with earthquake experience and injury answer questions and share information on earthquakes and earthquake safety. A similar format could take place on other social media websites like Facebook, and in their neighborhood, local, and regional Facebook group pages. In addition to targeting information processors, those who do not seek out information, the communication campaign may be targeted at individuals with heightened barriers or constraints in performing protective actions or enduring an earthquake in Oregon. Therefore, the individuals with previously earthquake experience and injury, the opinion leader public, may help to validate concerns and reduce earthquake uncertainty, for a constrained or high-risk perception public.

Another opportunity for segmented risk communication material may be for publics or individuals who have various levels of constraints or barriers in performing earthquake protective actions or taking an action to remain safe during an earthquake. The current project found that the majority of surveyed population believes protective actions are beneficial for providing mental or physical safety during an earthquake. Of the barriers measured, participants stated having a sufficient space or location (50.4%), credible earthquake information (49.9%), and adequate amount of time to act (48.8%) presented them with the highest number of barriers to take protective actions, like drop, cover, and hold on, during an earthquake.

A practical way to incorporate this research on Oregonian's favorable attitude toward protective actions and their varying level of perceived barriers with protective actions is with an educational and promotional outreach campaign, specifically coming from a regulating body or subject matter expert on earthquakes and protective actions. This recommendation

may be practically implemented by governmental or nongovernmental agencies, or community emergency preparedness groups offering earthquake risk educational promotional information or training outreach programming that focuses on the time it takes to perform protective actions and the various spaces and locations one may perform protective actions in. Individuals experiencing ground shaking from an earthquake might not be able to drop, cover, and hold on. Therefore, publics and stakeholders need to be educating on what actions to take in different, situational environments (McBride et al, 2022).

Some emergency management agencies and risk communication experts have started to provide more inclusive campaigns to stakeholder groups. One potential example of inclusivity is a ShakeAlert campaign, for example, incorporated tailored messaging into a recent protective action campaign, where messages featured individuals who use a cane, walker, and wheelchair, and describe how each can perform protective action recommendations. Other than this ShakeAlert example, current earthquake protective action messaging does not offer a variety of actions or possible protective action location (i.e., under a table) to appeal to a diverse set of audiences. Those with ranging body types, physical disabilities, or living in a compacted space may not be able to perform protective actions as recommended for abled-bodied individuals with access to shelters during an earthquake. Having a variety of contexts to perform the recommended protective actions that suits various individuals and situations may be beneficial in helping to removal some protective action barriers while encouraging and promoting participant efficacy of earthquake safety.

Another highly regarded barrier to taking protective actions in the event of an earthquake present for survey respondents was receiving credible earthquake information. Trust and credibility of information is an essential factor of risk communication. Research has found that the more trust a stakeholder has in the massager, the more likely they will proactively follow the recommendations in the message (Palenchar & Heath, 2003). Of the

surveyed publics, a total of just over half of participants stated they had a great deal-to-a lot of trust in the USGS's ability to provide timely earthquake alert to the public, and a total of nearly 60% of participants stated they had a great deal-to-a lot of trust in the USGS's ability to respond to earthquakes effectively to protect the public. These levels of organizational trust in the USGS from could be explained by the low-to-moderate levels of awareness of the USGS and low level of awareness of ShakeAlert, as a total of 61.6% of participants have heard of the USGS and 21.4% of participants have heard about ShakeAlert. A way to remedy this knowledge gap in the USGS and ShakeAlert being subject matter experts on earthquakes is with a thorough an educational campaign on the two governmental entities.

A gentle way to introduce the idea of an earthquake early warning system like ShakeAlert providing public alerting that promoting protective actions due to ground shaking expected from a nearby earthquake could be with the already implemented the Great ShakeOut earthquake drill program. The Great ShakeOut is an international day to recognize the importance of earthquake safety like protective actions, and it occurs every third Thursday in October (McBride et al, 2022). Registered participants are encouraged to practice protective actions and partake in an earthquake safety drill at a particular time during the day. A way to include ShakeAlert into the Great ShakeOut would be to have the registered Great ShakeOut participants prompted to take protective actions with a ShakeAlert test message. Providing the Great ShakeOut participants with the ShakeAlert message (instead of a Great ShakeOut email) will help build brand awareness around ShakeAlert and how ShakeAlert in sequence of and in addition to public alerting and protective actions. This implication of adding ShakeAlert to the Great ShakeOut would require significant technical coordination, especially for the areas where ShakeAlert is activated (i.e., California, Oregon, Washington), however. Educational workshops and programming have been found to help people gain confidence with earthquake safety protocols and protective actions with drills and

other opportunities for practice (Major, 1998). These recommendations are consistent with a previous study that used the situational theory of publics in risks categorizations to analyze a public health risk communication campaign (Grünig & Ipe, 1983). This study suggested a segmented risk messaging campaign that reduced perceived constraints by demonstrating the steps an individual may take to overcome or mitigate barriers that prevent action from correcting the problem.

The previously mentioned practical implications are meant to be exploratory in nature. The current study confirmed that demographic and social characteristics are important to consider when developing groups according to the situational theory of publics. These findings from this dissertation echo what other studies have found that previous experience with the risk, education level, and gender predicts situational theory's problem recognition and constraint recognition levels (Aldoory, 2001; Major, 1993; Xifria, 2016). Practitioners should measure the effectiveness of implications to better understand the usefulness of segmented risk communication messaging, earthquake safety educational drills or workshops, social media communication campaign.

CHAPTER VI

CONCLUSIONS & LIMITATIONS

This final section of the dissertation will review the study's conclusions, limitations of research, and future directions of scholarship.

To conclude, the purpose of this dissertation was to gauge the awareness of and attitude toward earthquake-related information and ShakeAlert, as well as learn how Oregon publics form and perform communication behaviors according to the situational theory of publics. Research results provide emergency management agencies and risk communication experts formative research that can be use during the campaign planning process to provide accurate and up-to-date guide on Oregon resident's beliefs on regional natural hazards with a narrowed focus on earthquakes, how protective actions are viewed and the barriers in taking such actions, what communication information behaviors publics use for hazard-related items, and how people would respond if they felt ground shaking from an earthquake. More specifically, this project provides campaigns and emergency managers with a critical reference point for assessing change. Theoretically, the current study presented a STPR proposed model that explores the relationship between demographic and social characteristics, like previous hazard experience, and the formation of the situational theory of publics. The proposed model predicts that a message factors, like organizational trust or source credibility, influence publics' communication behaviors. This dissertation concludes by suggesting a route of situational theory of publics research appropriate for risk scholars and encouraging segmented risk messaging targeted at groups with various levels of hazard experience and communication behaviors.

Limitations

Although the results of this study yielded beneficial information for the field of public relations, there are limitations to its utility and application. The most prominent limitation to

the current study is the sample size and generalizability. The purpose of the dissertation was to analyze how residence in the state of Oregon responded to ShakeAlert public relations material, however. The state of Oregon is homogenous and lacks much diversity. Therefore, the sample size does not represent a diverse point of view on earthquake early warning. This sample size used in the study only offers a very White perspective of earthquake early warning and protective actions, given the demographic make-up of the state of Oregon and the representative sample size used for analyses. In order to overcome the limitations of this current study, multiple precautions could be applied to future research endeavors. First, it would be beneficial to expand this study to have a larger sample size that has an EEW system or ShakeAlert activated for public alerting. A large sample size for the West Coast of US could entail the states of Washington and California while accounting for any future state implementations.

This study was also limited in that the survey was only administered online and not both in person and online. With an Internet survey, accruing some sampling error may be inevitable. This study aimed to reduce sampling error by increasing the sample size, which in turn, increased confidence levels and decreased the sample's margin of error.

Another limitation to this study is the bracketed time frame of the online survey. This project's online survey data collection process started in late April 2021 and ended in early July 2021. The EEW system, ShakeAlert, was activation in the state of Oregon in March 2021. Therefore, the online survey data collection occurred after ShakeAlert was available for Oregon residents, and the current study only measured one time point of data (i.e., after ShakeAlert was activated in Oregon). To gain a pure understanding of Oregonian public formation and response to ShakeAlert public relations material, multiple surveys conducted with the same sample size at different time points would have created a bountiful array of

results applicable to measure for true attitude and behavioral intention effects. The potential generalizability of such a limited comparison is compelling, but uncertain.

Future Research

This dissertation is exploratory in nature as it proposes a new branch of situational theory of publics research. Therefore, there are many opportunities for future research beyond overcoming the shortcomings presented in the limitations section.

In order to gain traction and understand the breadth of situational theory of publics in risks, more research is needed that tests the theory's reliability and validity. When future researcher investigate STPR, a set of boundaries should be followed in order to remain within the scope of the proposed conceptual model. Previous research and this study found that publics form differently when the situational of theory of publics is applied to contexts of risk that directly impact or disrupt a publics or individual's life (Aldoory, 2001; Major, 1998). Therefore, a concluding argument of this dissertation is the STPR should be applied to investigations interested in a personalized risks or disruption to a publics and individuals conscious of life's routine (Aldoory, 2001).

In terms of risk-related inquiries (i.e., environmental, natural, and public health risks), previous STP research conceptualized situational theory of publics' groupings by the theory's independent recognition-focused variables (i.e., problem recognition and constraint recognition) to formulate the publics four risk opinion publics of constrained, problem facers, routine, and fatalistic. To that end, when applying the STP to contexts of risk publics forming by recognitions, as presented in the STPR model, should be the only public categorization. This attempts to maintain consistency in the operationalization of constructs and fruitfulness of the STP and STPR. These publics categorizations are not perfect, but they define publics in a manner that more closely aligns with publics impacted or possibly impacted by risks, compared to the popularly used active, aware, latent, and nonpublic situational theory of

publics categorization, and this research argues that the situational theory of publics in risks is different from the situational theory of publics, mainly, because of the personalized or consciousness of a possible life disruption.

APPENDIX A

INFORMED CONSENT

You are invited to participate in a research study conducted by doctoral candidate Meredith L. Morgoch from the School of Journalism and Communication at the University of Oregon.

This study is interested in learning about your natural hazard experiences and informational needs. Procedures: If you decide to participate, you will be asked to answer a series of questions about yourself and natural hazards in your community. The survey should take no more than 15 minutes to complete.

Risks/Discomforts: Risks are minimal for involvement in this study. You are welcome to skip any question that you feel uncomfortable answering, and you may stop participating at any time.

Benefits: You may not receive any direct benefit from taking part in this study. However, it is hoped that through your participation, the study may help to increase your natural hazard knowledge.

Confidentiality: All information that is obtained in connection with this study will be kept confidential and will only be reported in an aggregated format (by reporting only combined results and never reporting individual ones). No names or identifying information is collected in this study. Compensation: With a full survey completion, you will be compensated from your respective panel providers.

Questions about the Research: If you have questions or concerns regarding this study, contact Meredith L. Morgoch, Ph.D. candidate at mmorgoch@uoregon.edu.

Questions about your Rights as Research Participants: If you have any concerns about your rights as a research participant, please contact the University of Oregon Research Compliance Services office, 677 E. 12th Ave, Ste 500, Eugene, OR 97401; phone (541) 346-2510; email researchcompliance@uoregon.edu.

If you consent to take part in this study, you are certifying that you understand the information I just read to you and agree to take part in the survey.


If at this point you choose to continue in this research study, please click "Yes, I provide my consent to participate in this study" to continue.

Yes, I provide my consent to participate in this study.

No, I do not provide my consent to participate in this study.

APPENDIX B

SHAKEALERT BILL INSERT/PUBLIC RELATIONS MATERIAL




It is vital to be aware of the ShakeAlert® Earthquake Early Warning system and how to protect yourself when shaking is expected.

In an earthquake, you could have precious seconds of warning to take protective action, such as **DROP-COVER-HOLD ON**, before shaking begins.

When weak or greater shaking is expected at your location, you may get an alert on your cell phone through the Wireless Emergency Alert (WEA) system, just like a severe weather or AMBER alert, or through a downloadable mobile app. You could also get an alert as a public announcement on TV or radio, at work, or at another public venue. It is important to be able to get alerts by as many means as possible.

Immediately **DROP-COVER-HOLD ON** as soon as you feel shaking or get an alert. You may have to adapt to your situation and environment when taking protective action. **Do not wait!**



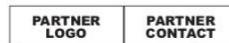
ShakeAlert Bill Insert Front

Take immediate action to protect yourself when shaking is expected at your location!

- **DROP** where you are onto your hands and knees. This position protects you from being knocked down and allows you to stay low and crawl to shelter if it is nearby, such as a desk or table.
- **COVER** your head and neck with both arms and hands. If a sturdy table or desk is nearby, crawl underneath it for shelter.
- **HOLD ON** to your shelter until shaking stops; be prepared to move with your shelter if it shifts.
- If there is no available place to shelter, crawl next to an interior wall, away from windows, hanging objects, and tall furniture. Stay on your knees and bend over to protect vital organs. **HOLD ON** to your head and neck with both arms and hands until shaking stops.



For more information, visit ShakeAlert.org and follow USGS on Twitter [@USGS_ShakeAlert](https://twitter.com/USGS_ShakeAlert).



ShakeAlert Bill Insert Back

APPENDIX C
SURVEY INSTRUMENT

What is your age?

- Under 18 years
- 18 - 20 years
- 21 - 29 years
- 30 - 39 years
- 40 - 49 years
- 50 - 59 years
- 60 - 69 years
- 70 - 79 years
- 80 + years

Do you currently reside in the state of Oregon?

- Yes
- No
- Unsure

With which gender identity do you most identify?

- Woman
- Man
- Transgender woman
- Transgender man
- Gender variant/non-conforming
- Prefer not to answer
- Other (please specify)

Please specify your ethnicity (select all that apply)

- Black or African American
- East Asian
- South Asian
- Southeast Asian
- Native Hawaiian or Pacific Islander
- Middle Eastern
- American Indian or Alaska Native
- Hispanic/Latinx
- White
- Other (please specify)

What is your yearly household income (before taxes)?

- Less than \$24,999
- \$25,000 to \$49,999

\$50,000 to \$99,999
\$100,000 to \$149,999
\$150,000 to \$199,999
\$200,000 or more

How often do you stop to think about the following?

Landslides

Never
Sometimes
About half the time
Most of the time
Always

Wildfires

Never
Sometimes
About half the time
Most of the time
Always

Earthquakes

Never
Sometimes
About half the time
Most of the time
Always

How often do you stop to think about the people impacted by the following?

Landslides

Never
Sometimes
About half the time
Most of the time
Always

Wildfires

Never
Sometimes
About half the time
Most of the time
Always

Earthquakes

Never
Sometimes
About half the time
Most of the time
Always

How frightening are the following natural disasters to you?

Landslides

Not frightening at all
Slightly frightening
Somewhat frightening
Moderately frightening
Extremely frightening

Wildfires

Not frightening at all
Slightly frightening
Somewhat frightening
Moderately frightening
Extremely frightening

Earthquakes

Not frightening at all
Slightly frightening
Somewhat frightening
Moderately frightening
Extremely frightening

To what extent do you agree that future earthquakes in Oregon are a serious problem?

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

To what extent do you agree that future earthquakes in Oregon will cause severe consequences?

Strongly disagree
Somewhat disagree
Neither agree nor disagree

Somewhat agree
Strongly agree

What is the likelihood that _____ will get damaged in an earthquake?

Your persons/body

Not likely at all
Slightly likely
Somewhat likely
Moderately likely
Extremely likely

Your property

Not likely at all
Slightly likely
Somewhat likely
Moderately likely
Extremely likely

Your state

Not likely at all
Slightly likely
Somewhat likely
Moderately likely
Extremely likely

Have you lived in a place where earthquakes are anticipated?

Yes
No
Unsure

Have you been in an earthquake?

Yes
No
Unsure

Have your family or friends been in an earthquake?

Yes
No
Unsure

What harm have you experienced personally or socially from earthquakes (select all that apply)?

- Injury, damage or loss to you personally
- Injury, damage or loss to your family or friends
- Injury, damage or loss in your neighborhood or community
- Injury, damage or loss seen on TV, the internet, or in other media
- None of the above

What behavior would you take if you felt ground shaking at your location from an earthquake?

- Stop what you are doing but stay put
- Drop, cover, and hold on
- Protect people, pets, or property nearby
- Stand in a doorway
- Immediately leave the building you are in
- I do not know

How interested are you in the following?

- Earthquake early warning systems
- Earthquake safety & protective actions
- Earthquakes in Oregon

I would like to receive information to better understand...

- Earthquake early warning systems
- Earthquake safety & protective actions
- Earthquakes in Oregon

Have you heard of ShakeAlert?

- Yes
- No
- Unsure

ShakeAlert bill insert exposure

To what extent do you agree that the flyer is important for you to see?

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

To what extent do you agree the flyer is a source of timely information?

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

What is your opinion of the flyer you just viewed?

The flyer is engaging

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

I would pay attention to this flyer

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

I have a positive impression of the earthquake early warning system

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

What is the name of the earthquake early warning system mentioned in the flyer?

ShakeAlert
Quake4Quake
Alerts2U
EarthMe

Try to place yourself in a situation where you just received a ShakeAlert notification that an earthquake is nearby and ground shaking is expected immediately. What would you do (select all that apply)?

In the next 3-4 months, I plan to....(select all that apply)

Read more about ShakeAlert, protective actions, or earthquakes in Oregon
Talk to friends or family about ShakeAlert, protective actions, or earthquakes in Oregon
Watch a video about ShakeAlert, protective actions, or earthquakes in Oregon

Post or share information online about ShakeAlert, protective actions, or earthquakes in Oregon
"Follow" or "Like" ShakeAlert or the USGS on social media
Participate in a free workshop/training on ShakeAlert, protective actions, or earthquakes in Oregon
Practice protective actions (like drop, cover, hold on) at your residence or workplace
Take no action

How much of a difference would the following make in helping you prepare for or remain safe in an earthquake?

Receiving an alert of a nearby earthquake
Taking protective actions (like drop, cover, hold on)
Having earthquake-related knowledge

Would any of the following make a difference in you being more mentally prepared for an earthquake (select all that apply)?

Receiving an alert of a nearby earthquake
Practicing protective actions (like drop, cover, hold on)
Learning more about earthquake-related topics
Talking to family or friends about earthquake-related topics
Attending emergency preparedness events
Other (please specify)

Would any of the following make a difference in you being more physically prepared for an earthquake (select all that apply)?

Receiving an alert of a nearby earthquake
Practicing protective actions (like drop, cover, hold on)
Learning more about earthquake-related topics
Talking to family or friends about earthquake-related topics
Attending emergency preparedness events
Other (please specify)

How difficult are the following for you to understand?

Earthquake early warning systems
Protective actions (like drop, cover, hold on)
Earthquakes in Oregon

To what extent do you agree with the following? It is important to...

Receive an alert of ground shaking from an earthquake
Have an earthquake early warning system in Oregon
Take protective actions (like drop, cover, hold on) during an earthquake
Have earthquake-related knowledge

To what extent do you believe in the future...

The use of an earthquake early warning system could affect you personally
The use of the protective actions (like drop, cover, hold on) could affect you personally
Experiencing earthquakes in Oregon could affect you personally

To what extent do you believe in the future...

Receiving an earthquake early warning alert could help protect you or someone close to you
Performing protective actions (like drop, cover, hold on) could help protect you or someone close to you
Experiencing earthquakes in Oregon could harm you or someone close to you

How beneficial are the following at providing you with mental or physical preparedness or safety in an earthquake?

Receiving earthquake early warning alerts
Taking protective actions (like drop, cover, on)
Having earthquake-related knowledge

How much of a barrier do the following present for you to be mentally or physically prepared or safe in an earthquake?

Adequate amount of time to take action
Receiving credible information
The space or location to take protective actions
My physical abilities to perform protective actions

What is the degree of attention you would provide a news story, social media post, video, or flyer on the following?

Earthquake early warning systems
Earthquake safety or protective actions
Earthquakes in Oregon

Since the beginning of the year, how much information have you read, seen, or heard (in newspapers, on television, from radio, in magazines, from newsletters, online media, social media websites, for example) on the following?

Earthquake early warning systems
Earthquake safety or protective actions
Earthquakes in Oregon

Since the beginning of the year, how often did you actively search for information (on the Internet, in the news media, on television, from organizations, agencies, for example) on the following?

Earthquake early warning systems
Earthquake safety or protective actions
Earthquakes in Oregon

Where would you go to find trustworthy disaster or earthquake information? Why?

What is the highest level of education you have completed?

- Less than high school
- High school graduate
- Some college
- 2 year degree (Associate's degree, occupational)
- 4 year degree (Bachelor's degree)
- Master's of professional degree
- Doctoral degree

What best describes your political affiliation?

- Republican
- Democrat
- Independent
- Undeclared
- Other (please specify)

Do you rent or own your place of residence?

- Rent
- Own
- Other (please specify)

What best describes your type of residence?

- Single-family house
- Multi-unit building (apartment, duplex)
- Mobile home
- Other (please specify)

How many children under the age of 18 are currently living in your household?

- 0
- 1-2
- 3-4
- 5 or more

Including yourself, how many individuals over the age of 65 are currently living in your household?

- 0
- 1-2
- 3-4
- 5 or more

Including yourself, is there anyone currently living in your household who has a disability requiring assistance from others?

- Yes
- No
- Unsure

Select the Oregon county of your permanent address

- | | | |
|-----------|------------|------------|
| Baker | Harney | Morrow |
| Benton | Hood River | Multnomah |
| Clackamas | Jackson | Polk |
| Clatsop | Jefferson | Sherman |
| Columbia | Josephine | Tillamook |
| Coos | Klamath | Umatilla |
| Crook | Lake | Union |
| Curry | Lane | Wallowa |
| Deschutes | Linn | Wasco |
| Douglas | Lincoln | Washington |
| Gilliam | Malheur | Wheeler |
| Grant | Marion | Yamhill |

Do you think your county is at-risk for an earthquake?

- Yes
- No
- Unsure

Before this survey, have you heard of the U.S. Geological Survey (USGS)?

- Yes
- No
- Unsure

To what extent do you agree with the following statements about the USGS?

This organization is a reliable source of earthquake information

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

This organization is an expert on earthquakes

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree

Somewhat agree
Strongly agree

I trust this organization to tell the truth about earthquakes

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

Under most circumstances, I believe what this organization says about earthquakes

Strongly disagree
Somewhat disagree
Neither agree nor disagree
Somewhat agree
Strongly agree

How much trust you have in the USGS's ability to do the following?

Act in the best interest of the public
None at all
A little
A moderate amount A lot
A great deal

Provide timely earthquake alerts to the public

None at all
A little
A moderate amount A lot
A great deal

Respond to earthquakes effectively to protect the public

None at all
A little
A moderate amount A lot
A great deal

Respond to earthquakes effectively regardless of personal characteristics (ethnicity, income, gender)

None at all
A little
A moderate amount A lot
A great deal

Thank you for your time. Before you go, what additional information would you like to receive (select all that apply)? Once you have completed the survey, you will be provided with the selected information.

Information about ShakeAlert or earthquake early warning systems

Information about protective actions

Information about earthquakes in Oregon

Information about how to turn on WEA Oregon Test Alerts on Android & iOS Phones

No thanks, I would not like any additional information

APPENDIX D

SURVEY DEBRIEFING MESSAGE

Thank you for your participation in my study! Your participation is greatly appreciated.

The purpose of the study was to gauge how demographically diverse Oregon populations perceive, understand and attend to act upon messages promoting an earthquake early warning system and personal protective actions. The goal of this research is to provide pertinent communication message recommendations to the earthquake early warning system that can be applied and tested in other areas across the western US set to implement the system.

I realize that some of the questions asked may have provoked a sense of curiosity or uncertainty surrounding earthquake risks in Oregon, earthquake safety, and the earthquake early warning system, ShakeAlert®, which was activated for Oregon in March 2021.

For information on earthquakes in Oregon

The Oregon Office of Emergency Management's website has information on the Cascadia Subduction Zone and how individuals, groups, and communities can prepare for an earthquake risk. For more information, please visit the OEM website here: <https://www.oregon.gov/oem/hazardsprep/Pages/Cascadia-Subduction-Zone.aspx>.

For information on ShakeAlert® or earthquake early warning systems

An earthquake early warning (EEW) system, ShakeAlert®, has been developed for the West Coast of the United States. The US Geological Survey (USGS) manages ShakeAlert® and publishes its messages that contain data about the location, estimated magnitude, and estimated shaking from an earthquake. ShakeAlert® partners, for instance utility and transportation agencies, use message information from the EEW system to inform agency practices so action can be taken to protect life and property. ShakeAlert® can save lives and reduce injuries by potentially giving people seconds to take protective action, such as DROP-COVER-HOLD ON, or to move away from hazardous areas before shaking begins. You may have to take other safety measures based on your situation and environment. The USGS issues ShakeAlert® messages, but alert delivery is by other public and private means (internet, radio, television, cellular), including Wireless Emergency Alerts (WEA), which are delivered to cell phones automatically by FEMA's Integrated Public Alert and Warning System (IPAWS). You can also download apps; check with your state or local emergency management agency for the apps that cover your area. For more information, please visit the ShakeAlert® website here: <https://www.shakealert.org>

For information on how to turn on WEA Oregon Test Alerts on Android & iOS Phones

No sign up is required to receive ShakeAlert notifications, and no action needs to be taken other than enabling emergency alerts on your cell phone. To do this, check your phone's settings to ensure Wireless Emergency Alerts (WEA) are turned on. Mobile phones that have WEAs turned on are able to receive ShakeAlert Messages starting March 11, 2021. The Oregon Office of Emergency Management's website has directions on how to turn on WEA test alerts. You get find these step-by-step directions here: <https://www.oregon.gov/oem/hazardsprep/Pages/orshakealert.aspx>

You may decide that you do not want your data used in this research. If you would like your data removed from the study and permanently deleted contact Meredith L. Morgoch, Ph.D. Candidate at mmorgoch@uoregon.edu. Whether you agree or do not agree to have your data used for this study, you will receive the compensation via Qualtrics for your participation.

If you would like to receive a copy of the final report of this study (or a summary of the findings) when it is completed, please feel free to contact Meredith L. Morgoch, Ph.D. Candidate at mmorgoch@uoregon.edu.

If you have any questions or concerns regarding this study, its purpose or procedures, or if you have a research-related problem, please feel free to contact the researcher, Meredith L. Morgoch, Ph.D. Candidate at mmorgoch@uoregon.edu.

If you have any concerns about your rights as a research participant, please contact the University of Oregon Research Compliance Services office, 677 E. 12th Ave, Ste 500, Eugene, OR 97401; phone (541) 346-2510; email researchcompliance@uoregon.edu.

If you feel upset after having completed the study or find that some questions or aspects of the study triggered distress, talking with a qualified clinician may help. If you feel you would like assistance, please contact the Oregon Health Authority at 1-800-273-8255 or for national help please contact 1-800-273-TALK (8255) to reach a 24-hour crisis center, text MHA to 741741, call 911, or go to the nearest emergency room.

Further Reading(s):

If you would like to learn more about earthquake early warning system or risk communication, please see the following references:

Becker, J. S., Paton, D., Johnston, D. M., Ronan, K. R., & McClure, J. (2017). The role of prior experience in informing and motivating earthquake preparedness. *International Journal of Disaster Risk Reduction*, 22, 179-193.

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