EFFECTS OF MESSAGE FRAMING AND INFORMATION SOURCE ON INFORMATION RECALL, TRUST, SOURCE EXPERTISE, SOURCE CREDIBILITY, AND ANTICIPATED CONSUMPTION BEHAVIOR OF AN AMINO ACID-BASED ALTERNATIVE MEAT CURING SYSTEM

A Thesis

by

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ABSTRACT

This study was a 2x4 randomized between-groups experiment (Mertler & Reinhart, 2017) on information recall, trust, source expertise, source credibility, and anticipated consumption behavior. The sample consisted of students attending Texas A&M University (TAMU), randomly assigned to one of eight experimental groups (Fraenkel & Wallen, 2008). An online Qualtrics instrument was used to collect data from participants. The independent variables tested were message frame (analytical/narrative) and information source (consumer/producer/reporter/meat scientist). Information recall, trust, source expertise, source credibility, and anticipated consumption behavior were the dependent variables.

After answering a screening question to ensure the sample consisted of Generation Z students 18 years or older, participants were randomly assigned to view one of eight videos about an innovative amino acid-based alternative meat curing system (AAACS). The videos were either narratively or analytically framed. The information source in the video was either a consumer, producer, reporter, or meat scientist. After watching the video, participants were asked to recall information about the AAACS, indicate their trust toward the message, indicate the source's expertise and credibility, and indicate their anticipated future consumption of products cured with the AAACS. At the end of the instrument, participants responded to demographic questions.

I used a two-way multivariate analysis of variance (MANOVA) to determine the experimental effects of the two independent variables on the five dependent variables,

concurrently (Mertler & Reinhart, 2017). I further analyzed all statistically significant MANOVAs with a discriminant function analysis (DFA) to break down the linear combination in more detail (Field, 2018). I analyzed all data with SPSS v.28 with an a priori alpha of .05.

I used a two-way MANOVA to determine the experimental effects of the two independent variables on the five dependent variables, concurrently (Mertler & Reinhart, 2017). There was not a significant interaction effect on the combined set of dependent variables, and a significant main effect for frame was not detected. However, a significant main effect for information source was detected. The follow-up DFA revealed only one significant underlying function and that source expertise was the most powerful discriminating variable for information source.

DEDICATION

I dedicate my thesis to my grandparents, Reese and Roene Chambers and Bill and Sam Scott. My Grandma and Grandpa Chambers truly instilled my passion for agriculture and sparked my desire to serve agriculturalists in any capacity I can. Grandma Roene was an incredible example of working hard on the ranch, running a household, earning an education, and never complaining about any of it. Grandpa Chambers truly believed education was the most valuable asset someone could have. He attended the University of Wyoming (UW). However, when World War II broke out, he enlisted in the United States Navy. While serving his country his father passed away. Grandpa Reese had to return home after the war to raise his six siblings instead of finishing the education he always wanted. I chose to pursue a master's degree because I knew it would mean so much to my grandpa to see that those of us who can further their education are doing so.

My Grandpa Bill moved off his family's Wyoming homestead and began running a trail riding operation in Tempe, Arizona, and Jackson Hole, Wyoming. I grew up hearing so many stories about how him and Grandma Sam, as well as their seven kids, were able to share their western heritage with people from all walks of life. The Scott family continues to help those disconnected from the western way of life experience it. Witnessing the impact they have had on so many individuals continues to inspire me to pursue a future that enables me to teach and communicate about the industries that keep our world turning.

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I would also like to thank my friends and colleagues I have spent the last two years working with. Graduate school truly is a team sport. I am so grateful for their unconditional friendship and support.

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This work was supervised by a thesis committee consisting of the committee chair, Dr. Matt Baker of the Department of Agricultural Leadership, Education, and Communications, and committee members, Dr. Holli Leggette of the Department of Agricultural Leadership, Education, and Communications and Dr. Wes Osburn of the Department of Animal Science.

Dr. Peng Lu of the Department of Agricultural Leadership, Education, and Communications oversaw data analysis and data interpretation, as well. All other work conducted for the thesis was completed by the student independently.

This work was complete without outside financial support.

NOMENCLATURE

AAACS	Amino Acid-Based Alternative Meat Curing System
CFI	Center for Food Integrity
CSPI	Center for Science in the Public Interest
CSSC	Committee on the Science of Science Communication
DFA	Discriminant Function Analysis
ELM	Elaboration Likelihood Model
FSIS	Food Safety Inspection Services
NASEM	National Academies of Sciences, Engineering, and Medicine
TAMU	Texas A&M University
USDA	United States Department of Agriculture

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CHAPTER I

INTRODUCTION

Meat products, specifically cured meat products, have long been labeled as contributors to negative health implications, including cardiovascular disease and colon cancer (Boada et al., 2016). However, meat and meat products are a critical source of iron and provide humans with many essential amino acids. Calories consumed from plant-based foods are not nutritionally equivalent to meat-based calories. Because of this, more plant-based calories and supplements are required to reach the nutritional equivalency of consuming meat and meat products (McCullough, 2019). Plant-based calories are not nutritionally equivalent to meat or meat products (Wu, 2020), and more plant-based calories and supplements are required to replace the nutritional benefits of consuming meat (McCullough, 2019). Therefore, meat and meat products are a critical component of a human's diet.

Despite this, consumers have been advised to reduce consumption of red meat and cured meat products (United States Department of Agriculture [USDA], 2020). The 2020–2025 Dietary Guidelines for Americans (DGFA) suggest that dietary patterns high in fruit, vegetables, legumes, nuts, whole grains, low-fat/non-fat dairy products, and seafood, paired with patterns lower in red meat and processed meats, refined grains, and added sugars are associated with a lower risk of obesity and all-cause mortality (USDA, 2020).

However, the evidence used to develop the DGFA has limitations. The current DGFA exclude virtually all clinical nutrition research trials, use epidemiological research that is not transparent or replicable, and disregard the last decade of science regarding saturated fats (Teicholz, 2020). Alternative dietary guidelines that use reliable and transparent methodologies recommend red meat and cured meat consumption remain the same (Johnston et al., 2019).

In addition to DGFA's recommendation to reduce cured meat consumption, cured meat markets are also negatively impacted by public perceptions of conventional meat curing by the direct addition of sodium nitrite. Sodium nitrite is an important additive for cured meat products. It contributes to cured meat color and flavor, suppresses microbial growth, and inhibits oxidation in meat products (Jo et al., 2020). Currently, most meat curing systems use sodium nitrite, which is efficient and safe. However, sodium nitrite has caused consumer concern (Sindelar & Milkowski, 2012). Improved curing systems could help combat consumer misguidance, enhance the public's perceptions of the healthiness of cured meat products, and benefit cured meat markets (Hung et al., 2016).

In response to concerns about conventional meat curing, many meat curing alternatives have been explored including tomato paste (Deda et al., 2007), herbs and berries (Haugaard et al., 2014), and vegetable powder (Osburn, 2021). However, these alternatives still involve the addition of sodium nitrite through high nitrite sources. Additionally, some curing alternatives have resulted in undesirable organoleptic properties such as a less intense cured meat color and a vegetable taste and aroma

(Redfield & Sullivan, 2015). However, no single ingredient exists that effectively replaces the functionality (color, flavor, shelf life, and safety) of curing meat with sodium nitrite.

As an improved alternative, meat scientists at Texas A&M University (TAMU) have explored the feasibility of using L-arginine to activate the endothelial nitric oxide synthase (eNOS) system in post rigor skeletal muscle. This alternative curing system generates nitric oxide and residual nitrite without the direct or indirect addition of sodium nitrite (Osburn, 2021) or undesirable organoleptic properties. Raw post-rigor supernatant samples treated with L-arginine had higher levels of nitric oxide than control samples, providing evidence of the viability of the eNOS system to cure meat in a manner such as conventional curing (Modrow & Osburn, 2020).

This intersection of science innovation and food production is not unique to the amino acid-based alternative meat curing system (AAACS).

Science and technology are embedded in nearly all aspects of life (National Academies of Sciences, Engineering, and Medicine [NASEM], 2017) as people must integrate information from science with their own personal values to make almost every decision in their life (NASEM, 2017), including the food they consume.

However, effectively communicating about science is a complex task (NASEM, 2017). Furthermore, the growing gap between agricultural producers and consumers makes communicating about food challenging (White et al., 2014). Wager and Miller (2019) describe the gap as two to six generations between consumers and agricultural producers. A study by the Center for Food Integrity (CFI, 2017) found that only 25% of

participants strongly agree with the statement, “I trust today’s food system” (p. 1). As cured meat production and consumption become controversial (Hung et al., 2016), trust is diminishing (CFI, 2017), and consumers are susceptible to misinformation (White et al., 2014).

The plethora of information makes communicating problematic. To cope with the exorbitant amount of information one is exposed to, individuals have developed a mechanism to prioritize specific aspects of messages over other aspects (Gong & Cummins, 2016). This means that the information communicated about the AAACS must be strategic and effective if the public is to prioritize that information. Thus, as a result, effective communication strategies are critical to the acceptance of the AAACS.

Statement of Problem

New agricultural products continue to be developed to adhere to changing consumer preferences and to overcome consumer concerns. However, the growing gap between producers and consumers (White et al., 2014) makes marketing and communicating about agricultural innovations difficult. To overcome this growing gap and to connect consumers to the agriculture industry and innovative agricultural products, effective communication strategies must be implemented. Continued research is important to explore best practices for communicating about emerging meat curing systems and other agricultural innovations.

Purpose of Study

My study aims to address questions proposed by the Committee on the Science of Science Communications (CSSC) in their science communication research agenda.

The research agenda states that due to the complex individual and social phenomena involved in science communication, more scientists need to be recruited from neighboring disciplines, particularly social and behavior sciences (NASEM, 2017). My study is a collaborative effort between the meat science discipline and the social science discipline of agricultural communications.

The CSSC research agenda further proposes that more research must be conducted regarding the structures and processes for public engagement that best enable science to be communicated effectively (NASEM, 2017). Specifically, the agenda suggests research in understanding what structures and processes enable accurate scientific information to be heard among the competing messages and sources of information (NASEM, 2017). My study aims to evaluate structures including message framing and information source to engage the public and contribute to messages understood and prioritized by the public.

The CSSC research agenda further suggests research to understand the effect science communication can have on beliefs, values, and interests (NASEM, 2017). My study experimentally changes communication methods to understand how science communication strategies affect information recall, trust, source expertise, source credibility, and anticipated consumption behavior. Additionally, the CSSC research agenda suggests that research be conducted regarding the best strategies for communicating science about contentious social issues when there is distrust in science or a scientific community (NASEM, 2017). Messages about the AAACS are being tested

due to distrust present with respect to cured meat products specifically, and the meat industry in general.

My study aims to explore two peripheral cues—message framing and information source—important to the passive processing of new information through the peripheral processing route. Peripheral cues must engage consumers and motivate them to seek further information that they can then actively process through the central processing route (Petty & Cacioppo, 1986). Previous research has evaluated the effectiveness of narrative versus analytical message frames. However, the interaction of message frames and information source and their impacts on information recall, trust, source expertise, source credibility, and anticipated consumption behavior, have not been explored.

The science communication research agenda outlines a need for research regarding the effective framing or reframing of issues, how much framing matters, and when framing is best done (NASEM, 2017). Additionally, previous literature indicates that the way information is presented is often more important than the content (Yang & Hobbs, 2020). Different framing strategies may represent different cognitive pathways of communication (Monteagudo-González, 2011), influence attitudes, and impact behaviors (Chong & Druckman, 2007).

Narrative message framing has been recommended to reduce cognitive load and increase positive attitudes toward complex issues (Dillard et al., 2017; Gordon et al., 2018; Seo et al., 2018; Williams et al., 2010b). However, storytelling has negative connotations within science (Katz, 2013). Narrative frames are often contrasted with

analytical message frames (Fisher, 1985), which require generalizing down to a specific case (Bruner, 1986), presenting context-free information that remains true in various situations (Dahlstrom, 2012), and attempting to provide abstract truths (Bruner, 1986). Although narrative messages have been perceived as easier to understand, analytical messages have been perceived as more trustworthy and from a more credible source than narrative messages (Yang & Hobbs, 2020).

The science communication research agenda recommends randomized controlled field experiments to assess impacts of specific communication approaches on changes in people's understanding, perception, or use of science (NASEM, 2017). Thus, the purpose of my study was to use a 2x4 factorial design to determine if the message frame and/or information source impact viewers' information recall, trust, source expertise, source credibility, and anticipated consumption behavior of meat products cured using the AAACS. As recommended by the CSSC research agenda, my study was a randomized controlled experiment (NASEM, 2017). Conditions of the communication environment produced in my study simulated conditions of real-world communication as closely as possible. The dependent variable of information recall tested changes in people's understanding of science; trust, source expertise, and source credibility evaluated individuals' perception changes; and the dependent variable of anticipated consumption behavior evaluated people's use of science (NASEM, 2017).

Research Questions

1. Is there significant interaction between message frame and information source on combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior?
2. Are there significant differences in the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for message frame (analytical/narrative)?
3. Are there significant differences in the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for information source (consumer/producer/reporter/meat scientist)?

Theoretical Framework

Two theoretical frameworks—the elaboration likelihood model (ELM) and message framing—guided my study. The ELM describes how individuals process information (Petty & Cacioppo, 1986) and message framing is an important framework in communication research that describes what is transcribed from actual events (Goffman, 1974).

Elaboration Likelihood Model

Previous studies about communicating agricultural and science information have used the ELM as a theoretical framework (Frewer et al., 1999; Hill et al., 2022; Meyers, 2008). The ELM explains that individuals process information through either a central or

peripheral route (Petty & Cacioppo, 1986) and refers to the extent someone will consider a persuasive message (Hill et al. 2022; Petty & Wegener, 1999).

An individual's motivation and ability to process information determines which route information is processed through (central or peripheral) (Petty & Cacioppo, 1986). The route information is processed through influences individuals' attitudes regarding that information (Randolph et al., 2021). The more connections an individual makes to a message, the more persuasive that message will be (Hill et al., 2022; Petty & Cacioppo, 1986).

Passive processing occurs through the peripheral route. Information is passively processed based on peripheral cues including specific features of the message (Petty & Cacioppo, 1986). Peripheral cues include message characteristics such as the number of arguments, message frame, attractiveness of the source, graphic elements of a message, and credibility of the source. If motivation or ability to process information is absent, participants will process messages peripherally (Petty & Cacioppo, 1986). Processing information through the peripheral route can result in an individual's original attitude or a temporary attitude shift (Petty & Cacioppo, 1986). After information is processed through the peripheral route, individuals can develop favorable or unfavorable thoughts, seek further information, and potentially process new information through the central processing route (Petty & Cacioppo, 1986).

Active processing takes place through the central route and occurs when an individual processes information with high cognitive effort and pairs the information with previous knowledge. Active processing, through the central route, results in

attitudes that are resistant to counterarguments and predictive of future behaviors (Petty & Cacioppo, 1986). Active processing results in a cognitive structure change that impacts attitudes and can be more predictive of future behavior (Randolph et al., 2021).

Message Framing

The way a message is framed is an important peripheral cue affecting how information is processed in the peripheral processing route. Message frames provide instructions to help one understand the message (Bateson, 1972). Message framing is a communication strategy that determines and limits what is transcribed from the actual events to organize and make sense of information (Goffman, 1974). Early framing experiments demonstrated that frames call attention to certain aspects of reality and direct attention away from other aspects (Kahneman & Tversky, 1984).

Message frames are a psychological concept dealing with the "spatial and temporal bounding of a set of interactive messages" (Bateson, 1972, p. 197). Bateson (1972) compares message frames to picture frames and proposes that picture frames are used in society because humans' psychological characteristics must be externalid. Like a picture frame, psychological frames order and organize one's perception by including some information and excluding other information. Whatever is within the frame is defined in a class, based on specific virtues. Frames aid the mind in realizing that messages are mutually relevant. They signal one to use a similar type of thinking to interpret all the information within the frame and ignore everything outside of it (Bateson, 1972).

Message framing influences responses to communication (Kahneman & Tversky, 1984) as a communication frame organizes information, assigns meaning to events, and promotes interpretations of specific issues (Chong & Druckman, 2007). Message framing can determine what people notice about the message and how they comprehend the information, how they remember the information, and how they react to the message being communicated (Entman, 1993).

Message framing exerts an influence on the reported opinion because the message frame aids in rendering information that is available, accessible, and applicable (Chong & Druckman, 2007). Framing impacts the receiver's response because they only perceive one interpretation of the information, without regarding others. A variety of potential realities can be suggested by altering the way information is framed (Entman, 1993).

Although framing does not likely have a universal effect, it is implied that message frames have a general effect on large portions of the audience (Entman, 1993). Message framing is critical to communication efforts as it influences the attitudes and behaviors of individuals (Chong & Druckman, 2007). Framing allows information to become more accessible, maintain its value, and guides what people think about (Shulman & Sweitzer, 2018). Message framing can even have an impact beyond the individual. If a term set forth by a new frame is widely accepted, using a different term can result in a lack of credibility or potential misunderstanding. This means that message frames can be as powerful as the language itself (Entman, 1993).

In the context of science communication, message framing is used to emphasize the relevant aspects of findings (Scheufele, 1999). Message framing is an important aspect of science communication, specifically science communication around agriculture innovations. The science communication research agenda specifies a need for research to further understand how to effectively frame or reframe issues, how much framing matters, and when framing is best done (NASEM, 2017).

Summary

Meat scientists at TAMU have developed an amino acid-based alternative meat curing system to cure meat products (Osburn, 2021). At the same time, consumers are being advised to reduce consumption of red meat and cured meat products (USDA, 2020), strategic and effective communication are critical to the acceptance of the AAACS.

According to the ELM, when consumers are exposed to new or unfamiliar information, they passively process it through the peripheral processing route (Petty & Cacioppo, 1986). Peripheral cues, such as message characteristics and source credibility are critical to passive processing (Petty & Cacioppo, 1986). Because most consumers are not familiar with the amino acid-based alternative meat curing system, my study investigated how two peripheral cues—message frame and information source—impact information recall, trust, source expertise, source credibility, and anticipated consumption behavior of meat cured using the AAACS.

CHAPTER II

REVIEW OF LITERATURE

Misconceptions About Meat

Meat and meat products play a vital role in a healthy and balanced diet. They are an excellent source of iron and provide many amino acids necessary for proper human nutrition. Meat products are a source of important functional amino acids, dipeptides, creatine, and such nutrients have important physiological roles in anti-oxidative and anti-inflammatory reactions. Therefore, meat is important to neurological, muscular, retinal, and cardiovascular functions (Wu, 2020). Contrary to some argument, plant-based calories do not provide nutritional equivalency to meat-based calories (Wu, 2020). Individuals must consume more plant-based calories and supplements to reach the same nutritional value meat-based calories provide (McCullough, 2019).

Though scholars have documented the nutritional benefits of meat products, particularly processed meat products, meat and meat products have been inaccurately labeled as contributors to negative health implications like cardiovascular disease and colon cancer. These claims affect consumers' diets and attitudes toward meat and meat products. In fact, the 2020-2025 Dietary Guidelines for Americans (DGFA) claim dietary patterns high in fruits, vegetables, legumes, nuts, whole grains, low-fat/non-fat dairy products, and seafood, paired with patterns lower in red and processed meats, refined grains, and added sugars are associated with a lower risk of obesity and all-cause mortality (USDA, 2020).

The DGFA were created to provide food-based recommendations to promote health, prevent diet-related diseases, contribute to nutritionally adequate diets for Americans, serve as the cornerstone for federal nutrition programs, and be used as a resource for health professionals (USDA, 2020). However, the evidence supporting the DGFA's association of lower red meat and cured meat consumption with positive health impacts has limitations. The current DGFA exclude virtually all clinical nutrition research trials, use epidemiological research that is not transparent or replicable, and disregard the last decade of science regarding saturated fats (Teicholz, 2020). Alternative dietary guidelines using reliable, transparent methodologies encourage adults to continue current consumption of red and processed, or cured, meats (Johnston et al., 2019).

Curing Meat with Sodium Nitrite

Historically, meat curing has been a critical food preservation strategy. Meat and poultry curing is one of the oldest forms of food preservation that remains in existence. Before refrigeration, people preserved meat by using curing methods that controlled spoilage and extended food supplies during times of scarcity (Sindelar & Milkowsi, 2012). Cured products include, but are not limited to, sausages, bacon, hams, jerky/dried meat products, and fermented/acidulated products.

Currently, most meat products are cured through the direct addition of sodium nitrite. Sodium nitrite is a highly reactive crystalline salt that can function as an oxidizing, reducing, or nitrosylating agent. It can be converted to a variety of compounds including nitrous oxide and nitrate (Honikel, 2008). Nitrite is an important additive for cured meat products because it contributes to cured meat color and flavor, aids in the

suppression of microbial growth, and inhibits oxidation. The amount of nitrite and its distribution affect its ability to act as a curing agent, and increased nitrite distribution improves product shelf life and stability (Sindelar & Milkowski, 2012).

Sodium nitrite and nitric oxide play profound and important roles through the human body and contribute to its successful functioning (Sindelar & Milkowsi, 2012). Research since the 1980s has indicated that nitrite contributes to human health. Dietary nitrates, consumed through sources such as vegetables, serve as a significant source for the endogenous production of nitrite and nitric oxide in the body (Sindelar & Milkowsi, 2012). Additionally, nitric oxide can be produced directly from nitrite (Bryan et al., 2007). Nitric oxide contributes to many important bodily functions such as controlling blood pressure, immune response, wound repair, and neurological functions (Hunault et al., 2009) and it is involved in controlling blood flow in cardiac muscle and other tissues (Bryan et al., 2007). Thus, nitric oxide and nitrite have the potential to prevent various types of cardiovascular diseases such as hypertension, atherosclerosis, and stroke (Bryan et al., 2007; Hunault et al., 2009).

Despite the benefits of sodium nitrite, consumers have, for years, expressed concerns around curing meat products with sodium nitrite (Sindelar & Milkowsi, 2012). For example, in the 1970s, concerns regarding nitroso compounds potentially yielding carcinogenic nitrosamines nearly resulted in banning meat curing with sodium nitrite (Cassens, 1997). Since then, other concerns related to cancer and leukemia have been directly related to meat products cured by the direct addition of sodium nitrite. Such concerns periodically resurface (Sindelar & Milkowsi, 2012).

Furthermore, the meat curing industry often uses synthetic nitrite to cure meat because it is less expensive and easier to use. However, such practices have further contributed to consumer concern and driven demand for natural nitrite sources and meat curing alternatives (Jo et al., 2020). Therefore, scholars have developed alternative curing methods in which nitrite is indirectly added to meat through high nitrite sources like vegetable powder.

Many alternatives to the direct addition of sodium nitrite have been explored to cure meat products. For example, the addition of tomato pastes to frankfurter sausages produced reduced nitrite levels without compromising the specific cured characteristics of the frankfurters (Deda et al., 2007). Additionally, meat has been preserved with herbs and berries (Haugaard et al., 2014). The primary alternative meat curing system on the market has been the indirect addition of sodium nitrite, through high nitrite sources like vegetable powder (Osburn, 2021).

However, alternative meat curing methods are not as efficient as the direct addition of sodium nitrite because such methods often result in less desirable organoleptic properties like vegetable taste, vegetable aroma, and a less intense cured meat color (Redfield & Sullivan, 2015). Therefore, no single ingredient exists that replaces the functionality (color, flavor, shelf life, and safety) of curing meat with sodium nitrite.

Labeling

Currently, meat products cured by the indirect addition of sodium nitrite and/or nitrites from natural sources, rather than by conventional curing through the direct

addition of synthetic or chemical sodium nitrite, must be labeled as "uncured." The Center for Science in the Public Interest (CSPI) contends that current, federal labeling requirements of uncured meat products mislead consumers (CSPI, 2019). CSPI proposes that current labeling requirements cause consumers to believe that alternative curing methods are safer, although sodium nitrite is still added to "uncured" products.

In August 2019, CSPI petitioned the USDA-Food Safety Inspection Services (FSIS), via petition 19-03, to request labeling changes be made for uncured, processed meat products. CSPI requested that FSIS no longer require meat processed with non-synthetic sources of nitrates and nitrites to be labeled as "uncured" and/or "no nitrates or nitrites added." CSPI further requested that FSIS reserve these claims for meat and meat products that do not contain nitrates or nitrites from any source. CSPI asked FSIS to require all products containing nitrates or nitrites, whether from synthetic or natural sources, to be labeled as "nitrates or nitrites added (CSPI, 2019)."

FSIS partially granted CSPI's request (FSIS, 2020). FSIS indicated that it intends to conduct rulemaking to propose prohibiting statements like, "no nitrates or nitrites added" and "uncured," on products processed with any source of nitrates or nitrites and intends to approve non-synthetic sources of nitrates or nitrites as curing agents. Finally, FSIS declared their intent to amend and clarify meat and poultry regulations and establish new definitions of "cured" and "uncured (FSIS, 2020)." If FSIS fully grants CSPI's request, many meat products currently required to be labeled as "uncured" will be required to relabel as "nitrites/nitrates" added. This will likely create a demand for products that can continue to be labeled as "no nitrites/nitrates added."

Amino Acid-Based Alternative Meat Curing System

Demand for alternative meat curing methods to replace the direct and indirect addition of sodium nitrite is being driven by concerns regarding conventional meat curing and the potential for new meat curing labeling regulations. Improved meat curing methods could help combat consumer misguidance and enhance the public's perception of the healthiness of cured meat products and benefit cured meat markets (Hung et al., 2016). Therefore, TAMU researchers have conducted several studies to determine the feasibility of using the amino acid L-arginine to cure meat products. No synthetic or natural sources of nitrate or nitrite are added using the amino acid-based alternative meat curing system (AAACS). Instead, the amino acid, L-arginine, activates the endothelial nitric oxide synthase (eNOS) system that produces nitric oxide and residual nitrite.

The eNOS system is vital for muscle function because of its ability to convert L-arginine to nitric oxide (Osburn, 2021). The eNOS system forms nitric oxide and oxygen simultaneously. Nitric oxide improves vasodilation and muscle metabolism (Bryan, 2016). In the presence of oxygen, nitric oxide is oxidized to nitrite and then to nitrate (Tengan et al., 2012). Nitric oxide produces the cured meat color and residual nitrite contributes to antimicrobials and antioxidants that improve shelf life and safety (Osburn, 2021). L-arginine is a substrate of the eNOS system, and the ratio of nitric oxide and oxygen depends on the concentration of L-arginine, as well as the redox conditions of cofactors associated with the eNOS system

Although there has not been a lot of research evaluating the eNOS system's ability to generate nitric oxide and nitrite in post-harvest muscle, or meat, it is possible

that the same mechanics in living muscle can be activated in post-rigor meat. Modrow and Osburn (2020) are among the innovative leaders studying the AAACS by investigating the feasibility of using L-arginine to activate the eNOS system in post rigor skeletal muscle to generate nitric oxide and residual nitrite. They prepared individual test batches of ground beef, pork, and poultry which were blended with Prague powder (6.25% sodium nitrite) to achieve 120, 156, or 200 ppm sodium nitrite or 1,000, 2,000, 3,000, 4,000, or 5,000 ppm L-arginine with 547 ppm sodium erythorbate. After mixing for one minute, sample tubes were prepared and placed in a controlled water bath and cooked to either 55.6, 70.0, or 73.9°C. Samples were then chilled and stored at 2^{o}C for seven days. Residual nitrite of each sample was then analyzed. The experiment was a factorial randomized complete block design, replicated three times (Modrow & Osburn, 2020).

Results indicated that L-arginine concentrations of 1000-4000 (beef), 1000-3000 (pork), and 1000-2000 ppm (poultry) generated residual nitrite values comparable to sodium nitrite treated beef, pork, and poultry samples at concentrations of 120, 156 and 200 ppm. Higher endpoint cooking temperatures tended to decrease residual nitrite levels. Additionally, further research investigating the AAACS in a holistic manner confirmed the potential to use L-arginine to cure meat. The AAACS was compared to conventional meat curing methods with respect to color, shelf life, sensory properties, nutrient composition, and safety (Bludau et al., 2021). Beef frankfurters manufactured with the AAACS contained ~0.5% more protein compared to sodium nitrite cured frankfurters. Analysis of volatile compounds indicates a chance that L-arginine treated

products may have an enhanced cured meat flavor intensity (Bludau et al., 2021). These studies indicate that an amino acid (L-arginine) based alternative curing system shows potential to replace synthetic sodium nitrite used in conventional curing systems or natural sources of sodium nitrite used in alternative curing systems (Modrow & Osburn, 2020).

Science Communication

Science and technology are embedded in all parts of life (NASEM, 2017), and accurately informing the public about scientific information is important because of the impact of daily decision making, including decisions about food products and food production practices. People must integrate information from science with their personal values to make decisions. Because of this, communicating scientific information about the agriculture industry, food production practices, and innovations can be as important as the scientific work and production, itself (NASEM, 2017).

Therefore, for scientists to develop innovations to address food scarcity and other pressures of a growing population and changing environment, public communication and engagement is critical as consistent and effective communication efforts positively impact innovation acceptance. As a result, communication efforts should promote the understanding of risks, benefits, and goals of scientific work to combat misinformation (Georges & Ray, 2017).

The Committee on the Science of Science Communication (CSSC) developed a science communication research agenda (NASEM, 2017). This agenda provides a broad spectrum of information regarding the current state of science communication and

recommends specific areas of science communication that should be prioritized and funded. I developed and designed my study using objectives, questions, and suggested areas of research outlined in the science communication research agenda.

One of the key questions proposed by the agenda is what structures and processes for public engagement best enable science to be communicated effectively (NASEM, 2017). Additionally, the CSSC agenda acknowledged that the involvement of science in public controversy further contributes to the difficulty of science communication, which is already a complex task. Science-related controversies involve conflicts over beliefs and values rather than objective knowledge from science. The science communication research agenda suggests research to understand the affect science communication can have on these circumstances. The agenda further encourages research regarding the best strategies for communicating science about contentious issues when there is distrust regarding science or a scientific community (NASEM, 2017).

Communication Challenges Around Meat Products

Agriculture has shifted towards a consumer-driven industry in which the attitudes and opinions of consumers affect the structure and management of the U.S. food system (Veneman, 2001). However, few consumers live on farms and most know little about how food is produced, processed, transported, or prepared (Godwin et al., 2005). Additionally, because more food is produced and processed using advanced technologies or imported from countries worldwide (Jerardo, 2003), consumers have begun to voice concern regarding the safety and nutritional value of the nation's food supply (Wood & Vedliltz, 2007).

The Committee on the Science of Science Communication defines science communication as the "exchange of information and viewpoints about science to achieve a goal or objective such as fostering a greater understanding of science and scientific methods or gaining greater insight into diverse public views and concerns about the science related to a contentious issue (NASEM, 2017, p. 1)." In the context of the AAACS, the novel meat curing system is the science intended to be communicated. Information regarding the meat curing innovation need to be exchanged to foster the general public's understanding of the innovation so they can better see how it will impact their lives. Thus, research investigating effective ways to communicate about the AAACS should align with the goals in the science communication research agenda.

Effectively communicating about science is a complex task (NASEM, 2017) and communicating about agriculture science can be even more complex. Agricultural scientists often struggle to communicate information that is palatable and easy to consume. A growing gap in agriculture production and consumption makes communicating about food challenging (White et al., 2014). Wager and Miller (2019) explain that most consumers are two to six generations removed from farming or other agricultural practices, which places consumers both generationally and geographically distant from the agricultural industry (Laskaway, 2011). Additionally, science-based topics are polarizing in nature and people often communicate about them in a hostile manner (Baker et al., 2021).

The vast amount of information individuals receive further contributes to communication challenges (Fischer et al., 2020). To cope with the exorbitant amount of

information one is exposed to, individuals have developed a mechanism to prioritize specific aspects of messages over other aspects (Gong & Cummins, 2016). Individuals tend to ignore information inconsistent with attentional goals and usually do not consider information inconsistent with prior beliefs and attitudes (Smith et al., 2007). Based on the information consumers appear to prioritize, it seems they prefer evidence that those in the agriculture industry possess shared values regarding topics they care about such as animal husbandry, environmental stewardship, and food safety (CFI, 2017) over scientific information (LaGrande et al., 2021).

The science communication research agenda suggests evaluating how accurate scientific information can be heard among many competing messages and sources of information (NASEM, 2017). Due to the growing disconnect from production agriculture (White et al., 2014) and the abundance of information individuals receive, it is critical to be strategic when communicating about the AAACS and other agricultural innovations.

Science communicators must make scientific information relevant (Fischer et al., 2020). As consumers continue to place more emphasis on convenient, ethically raised, healthy food (USDA, 2013), they are searching for more information regarding how their food is grown (Hamilton, 2004), where their food is coming from, and how it is made (White et al., 2014).

Therefore, it is critical that science communication efforts positively impact consumer perception. Consumer perception is the process of selecting, organizing, and interpreting information about new products to form a meaningful picture (Kotler et al.,

2013). Consumer perception plays a key role in consumer acceptance, likeliness to purchase, future consumption, and industry competitiveness (Grunert et al., 2011). Failure to understand consumer acceptance and its determinants could result in the market failure of innovative food products and/or food production processes (Hung et al., 2016), like the AAACS.

Trust in Agriculture Communication

A lack of trust exists in today's agriculture industry (CFI, 2017) and in communication about agriculture (Tarpley, 2017). A recent study from CFI revealed that only 25% of participants strongly agree with the statement, "I trust today's food system" (CFI, 2017, p. 1). This lack of trust can lead to pressure for additional and unnecessary regulations, rejection of food products, and consumers seeking alternative, unreliable, or inaccurate sources of information (Henderson, 2018). Lack of knowledge about and trust toward scientific information can make the public vulnerable to misinformation and susceptible to fear-based marketing of food (Baker et al., 2022a; Wager & Miller, 2019).

Trust is important in a variety of communication contexts. The trust paradigm is the listener's degree of confidence in and level of acceptance of the speaker and the message (Ohanian, 1990). Trust provides social license, or the privilege of operating with minimal formalized restrictions. When trust is lost, so is social license and it can take only one incident for trust to be lost (CFI, 2009). Trust is critical to consumers' future engagement with emerging agricultural products because it influences attitudes, shifts opinions, and changes behaviors (Baker et al., 2022b; LaGrande et al., 2021).

Public trust can be maintained through establishing values and actions consistent with stakeholders' expectations (CFI, 2009). In the past, when consumers ask questions, the food industry has replied with more scientific or economic information. However, distrust grows when individuals are bombarded with information (CFI, 2009). Communicating shared values is three to five times more important than sharing information (Sapp et al., 2009). Previously, communicators have primarily focused on increasing knowledge (Besley et al., 2016). However, significant evidence indicates that communication efforts to increase knowledge do not change behavior (NASEM, 2017).

Simply, facts do not drive trust—feelings, beliefs, and values drive trust (CFI, 2009). After establishing shared values and trust, people are much more likely to consider facts. Consumers would like to know that those producing their food have values aligning with their own (Baker et al., 2022c). Such values include having access to safe, healthy, affordable food; caring for animals; providing employees with a safe and healthy workplace; supporting the community; and protecting the environment (CFI, 2009). When consumers see an authentic commitment to doing what is right, trust is established (CFI, 2009).

CFI identifies three primary elements to earn trust including influential others, competence, and confidence. The first element, influential others, is described by CFI (2009) as including the people who share information and can include family, friends, and credentialed experts. The second element is competence which includes the skills, expertise, and information that validates what one does and what one knows (CFI, 2009). The third element is confidence. Confidence is built through the demonstration

that one shares similar values toward people, animals, and the environment. Confidence has a two to three times larger impact on trust than simply sharing information (Sapp et al., 2009).

A sustainable communication system should be ethically grounded, but both scientifically verified and economically viable (CFI, 2009). This is because, although facts do not build trust, they do provide information and increase consumers' knowledge. To achieve this ethically grounded model of communication, CFI has proposed a three-step process. The first step in the process is to listen with the intent to understand concerns, priorities, and values. One must first seek to understand, then to be understood (CFI, 2009). The next step is to ask questions that demonstrate an interest in learning more. Questions should clarify opinions and perspectives and help one understand more about the individual, what they know, and why it is important to them (CFI, 2009). The final step is for the communicator to share the values that authentically align and share information relevant to concerns. Only after these three steps have been taken should one follow up with more information, facts, science, and research that validate how those values are being lived out (CFI, 2009).

Although today's food supply is safer, more affordable, easier to access, and provides a larger variety of choices than ever before, there is an abundance of questions and skepticism around agriculture products and the way they are produced. To address such skepticism, consumers seek information about how and where their food is produced and seek to understand how the production of agricultural products impacts animals, the environment, and themselves (CFI, 2009). Yet, informing the public about

technologies and policies arising from operations within complex social systems is difficult. The literature indicates that only communicating facts is a flawed approach (Bradbury, 1989; Cohen, 1985; Fischhoff, 1995), and social science theories posit that emotional elements of communication strategies can potentially be more important than cognitive elements in affecting interpersonal trust (Sapp & Downing-Matibag, 2009). Sapp et al. (2009) concluded that building trust is not just giving consumers more science, more research, or more information. It is demonstrating shared values regarding the topics they care most about. The CFI (2009) has concluded that some of these topics include safe food, quality nutrition, outstanding animal care, and environmental stewardship (CFI, 2009).

The recreancy theorem proports that trust reflects the assessment of competence, or skills and expertise, of institutional actors as well as the belief they will express fiduciary responsibility. To test the recreancy theorem, individuals' opinions about food and food production were collected (Sapp & Downing-Matibag, 2009). The model variables of competence and fiduciary responsibility accounted for 98.62% of explained variance in the first study and 97.65% of explained variance in the second study. The effects of fiduciary responsibility outweighed those of competence by three to one, indicating that actions, rather than words, are needed to promote public confidence in fiduciary responsibility (Sapp & Downing-Matibag, 2009). In another study, when the communicator of fear-arousing information was considered highly trustworthy, an opinionated message was more effective than a non-opinionated message in producing attitudinal change. However, when trustworthiness of the source was low, this

relationship was no longer significant (Miller & Baseheart, 1969). Hoveland et al. (1953) describes source trustworthiness as individuals' degree of confidence in communicator's intent to communicate certain assertations. For trust to be developed, institutional actors must be perceived as competent and reasonably responsive to citizens (Freudenburg, 1988). Trust is not developed through statements issued by quantitative risk assessors. Instead, trust is developed through the actions of agents who are directly involved and will be held responsible for risk (Sapp & Downing-Matibag, 2009).

Framing as an Effective Communication Strategy

The way message content is framed can contribute to building trust toward agricultural messages (LaGrande et al., 2021) because the way science information is framed impacts the public's attitudes and beliefs about science (Hill et al., 2022; Nisbet et al., 2002; Meraz, 2009).

My study focused on framing as a communication strategy to communicate information about agriculture more effectively. Previous studies indicate that information presentation is as important as information content (Yang & Hobbs, 2020). Message framing, along with science communication and media relations/practices, have been identified as a research priority in agricultural communications over the past two decades (Parrella et al., 2021).

Value-oriented communication frames have been proposed as a strategy to connect scientific information to personal values and present information in a more relevant light (Krause et al., 2016; Ruth & Rumble, 2017). Strategic communication using value-oriented messages is an important strategy for the agriculture industry to

better connect with consumers (Fischer, 2017) because they provide an opportunity to increase saliency, resulting in the higher processing of low involvement audiences (Fischer et al., 2020). Value-oriented messages increase the level of information processing and impact attitude formation (von Borgstede et al., 2014) and make information relevant to consumers' values, social beliefs, personal beliefs, and cultural connotations (Schultz & Zelezny, 2003). Thus, media with value-congruent messages have a better chance of resonating with consumers and increasing trust (LaGrande et al., 2021).

Furthermore, previous research has suggested value-oriented messages elicit more attention allocation than message frames using scientific reasoning, especially when the messages are about low involvement topics (Fischer et al., 2020). Although message frames for highly involved audiences should be more scientific in nature, value-oriented message frames should be used for audiences less involved (Fischer et al., 2020). Food products and scientific information are low involvement (Dodds et al., 2008). Gong and Cummins (2016) suggest that low involvement products such as food and low involvement information like scientific information be advertised and communicated in a way that increases perceived involvement to make consumers aware of personal connections to information. Teaching consumers about the technical aspects of messages instead of connecting with them is a mistake the agriculture industry has made in a variety of communication efforts (Fischhoff, 1995; Sapp et al., 2009).

Narrative message framing is one strategy used to create value-oriented messages. Narrative communication provides specific cases that require generalizing up

to a general truth (Bruner, 1986). Narrative framing uses personal stories, anecdotes, perspectives, and appeals to support the facts around an issue. Narrative framing puts more emphasis on the engaging, interesting, and easily comprehended aspects of information (Dahlstrom, 2014).

Narrative and analytical message frames are often contrasted in framing research (Fisher, 1985). Value-oriented messaging is more prevalent in narrative frames and scientific reasoning occurs in analytical messages. Analytical communication attempts to provide abstract truths that can remain true through various situations with individuals generalizing down to a specific case (Bruner, 1986). Analytical information follows deductive reasoning while narrative information follows inductive reasoning (Dahlstrom, 2014).

Previous studies have found narratively framed messages easier to comprehend (Bruner, 1986; Dahlstrom, 2014; Green & Brock, 2000; Randolph et al., 2021; White et al., 2014; Yang & Hobbs, 2020). Narrative persuasion has been recommended by previous research to aid in reducing cognitive load and increasing positive attitudes toward difficult and complex issues (Dillard et al., 2017; Gordon et al., 2018; Seo et al., 2018; Williams et al., 2010b). Narrative framing helps to reduce mental efforts when communicating with consumers about complex agricultural issues. Despite familiarity or interest in the content, participants typically read and recall narrative text twice as fast as analytical text (Graesser & Ottati, 1995). Additionally, narrative processing appears to be more efficient and narrative communication is often associated with increased recall, ease of comprehension, and shorter reading times (Zabrucky & Moore, 1999).

Furthermore, narrative framing strategies also produce higher interest (Dahlstrom, 2014) and intentions to continue learning about issues (Dillard et al., 2017). Narrative frames positively impact viewers' willingness to share and accept messages (Cho et al., 2014) and aid in reducing negative perception of agriculture and food technologies (Yang & Hobbs, 2020). Additionally, they are intrinsically persuasive (Dahlstrom, 2014) and appear to offer benefits within the four primary steps of information processing including motivation and interest, cognitive resources, elaboration, and transfer into long-term memory (Glaser et al., 2009). Narrative persuasion's strategic design engages audiences in emotional matters (Dahlén et al., 2010).

Narrative transportation causes individuals to become less aware of their world of origin and the facts that could contradict their transportation experience (Green & Brock, 2000). Narrative transportation results in reduced counterarguing because individuals are not willing to disrupt the enjoyment of the narrative by arguing with the message (Green & Brock, 2000) and positively impacts viewers' willingness to share and accept message (Cho et al., 2014). Narrative transportation increases enjoyment and engagement with messages (Williams et al., 2010b) and individuals often do not realize they are being persuaded as a result (Green & Brock, 2000). Additionally, higher narrative transportation has resulted in viewers having higher intentions to continue learning about the issue (Dillard et al., 2017).

Stories and the way they can transport audiences have become a central part of human life and information consumption (Van Laer et al., 2014). In agriculture, when

communicating about scientific innovations, analytical frames have been perceived as more trustworthy and from a more reliable source than narratively framed messages (Yang & Hobbs, 2020). Both rhetoric and evidence are pointing to the need for agriculturalists to share their stories and perspectives (White et al., 2014) because most of the information people encounter day-to-day comes in the form of a story or narrative (Appel & Malečkar, 2012).

Although storytelling is not a typical frame used by scientists to deliver scientific information, there is evidence that it is an effective way to relay information to more diverse audiences (Dahlstrom, 2014). In opposition, Katz (2013) documented that storytelling has negative connotations within science, and through the scientific lens, stories have been viewed as baseless and even manipulative. Yet, data collection processes of science must remain objective, and as a result, narratives could be a more appropriate way to communicate objective scientific findings with nonexperts.

Source of Information

Individuals' perceptions of the messenger, or source of information, could influence how the message is perceived (Petty & Cacioppo, 1981). Source credibility theory examines the level people accept information coming from a source perceived as an expert (Okeefe, 1990). Hoveland et al. (1953) describes source expertise as the extent a communicator is perceived to be a source of valid assertations. Previous research indicates that source credibility and source expertise affect outcomes, including attitudes, disposition towards information, and intention to consume (Ayeh, 2015; Jin et al., 2009; Kerstetter & Cho, 2004; Lafferty & Goldsmith, 1999; Lamm et al., 2016).

Credible sources are more persuasive than sources with low credibility (Ohanian, 1990) and highly credible sources induce more behavioral compliance, compared to less-credible sources (Ross, 1973; Woodside & Davenport, 1976). Telg et al. (2021) found that messages delivered by a more credible individual may have a more meaningful impact than a message delivered by someone who is perceived as less credible. Furthermore, a study testing different sources of information found messages delivered by a farmer have a significantly higher score on an item asking about the impact of agriculture on open spaces when compared to messages delivered by a nature conservancy. These results could further confirm that farmers may be considered experts in that context (Lamm et al., 2016) and individuals may listen more closely to information from a source with higher expertise (Erdem & Swait, 2004; Lamm et al., 2016).

When manipulating source expertise, sources perceived as experts generate opinion change. Furthermore, trustworthy communicators generate the most opinion change, regardless of whether they are perceived as an expert or not (McGinnies & Ward, 1980).

Source of information is important to consider when exploring the effectiveness of various communication strategies. The acceptance of scientific information not only depends on the way information is presented, but who is presenting the information (Yang & Hobbs, 2020). In a recent framing study using biological information, participants perceived narrative messages as easier to understand but considered analytical messages more trustworthy and from a more credible source than the narrative

messages (Yang & Hobbs, 2020). However, treatment groups in this study differed both on message frame and source of information. Bloggers and journalists delivered narratively framed messages, while government agencies and scientists delivered the analytical messages. It is difficult to determine whether the message frame or message source impacted participants' engagement with and trustworthiness of messages because the message frames being compared were each delivered by different information sources.

Message frames need to be investigated separately from information source to better understand the impacts each variable has, independent of the other. Understanding the interaction between message framing and information source can contribute to the construction of more effective messages about agricultural innovations.

Thus, the sources of information evaluated in my study include a consumer, producer, reporter, and meat scientist because a wide array of people may receive information from one of these four sources. Although consumers tend to perceive government and independent third parties as more reliable sources (Huffman et al., 2004), information from these sources only reach a limited audience (National Science Board, 2016). Because of this, the credibility of other sources must be evaluated to achieve a larger reach of scientific information. I selected four information sources to evaluate based on a review of literature and recommendations from CSSC's science communication research agenda.

Because individuals receive much of their information from their peers, people's social networks affect their beliefs, attitudes, and behaviors and social media and blogs

are a common source of accurate and inaccurate scientific information (NASEM, 2017). The science communication research agenda suggests more research to better understand the roles and effective approaches to communicate science through social media platforms and blogs (NASEM, 2017). Therefore, my study includes a peer, or fellow consumer, as a source of information because peers are likely to communicate information via blogs, social media, or by word of mouth.

I will also include a producer as a source of information in my study. Both rhetoric and evidence point to the need for agriculturalists to share their stories and perspectives (White et al., 2014). Better understanding how consumers view the credibility of agriculturalists contributes to understanding how agriculture innovations will continue to be perceived. Additionally, it is important to evaluate if distrust in agriculture is rooted in distrust of the industry, the products, the type of information, or the agriculturalists themselves.

In addition, I included a reporter as a source of information in my study. The science communication research agenda recognizes that although there is a growing impact on new media, much of the scientific information received by Americans originates from traditional journalism. Because of this, it is important to understand and evaluate how traditional media outlets continue to affect people's perceptions, understanding, and use of science (NASEM, 2017).

Last, I included a meat scientist as a source of information in my study. The science communication research agenda suggests research to examine how science communicators that openly communicate about their own values and preferences effect

audiences (NASEM, 2017). It is important to evaluate if potential exists to train scientists to use value-oriented communication strategies to present scientific facts and evidence to broad audiences. For these reasons, communication coming directly from scientists involved in agricultural innovations should be evaluated.

Generation Z Food Preferences

The narrative message developed for my study attempts to appeal to two primary preferences of Generation Z regarding food consumption. These preferences are the social component of food consumption and sustainability. Generation Z stands out for placing value on social relations as a motive for buying food and this relational element of food consumption is an identifying feature of Generation Z within the realm of food consumption and beyond (Chaney et al., 2017). Furthermore, sustainability is on the forefront of Generation Z's discussions regarding food production and will likely continue to permeate the lifestyles and food preferences of current and forthcoming generations (Neuman et al., 2019).

Video as a Medium

As a digital marketing method or communication strategy, online videos are one of the most powerful storytelling mediums used to promote products, including agricultural products (Schroeder, 2015). Videos continue to emerge as a vehicle by which information is disseminated and consumed (Chris, 2012). Testing message framing and information source in video messages provides timely and relevant findings that can be applied across communication strategies.

Using a two by three factorial experimental design, Randolph et al. (2021) evaluated the effects of narrative and analytical framing on elaboration, attitude, and narrative transportation to understand how to better communicate messages regarding food safety practices. The framing strategy (analytical/narrative) and length of video (short/medium/long) were evaluated using a Qualtrics survey disseminated online (Randolph et al., 2021). Although the videos' narration, tone, opening, and closing remained the same, they differed on how often farmers mentioned personal stories. Additionally, narrative videos used the pronoun "you," but analytical videos did not. Videos with narrative messages had the highest mean for both elaboration and attitudes (Randolph et al., 2021). This provides evidence that narrative framing helps reduce negative perceptions of agricultural and food technologies (Yang & Hobbs, 2020) and results in more engagement with information (Randolph et al., 2021).

The length of videos used in a study is important to ensure that participants remain engaged. Based on a study testing engagement of online learning videos, shorter videos are more engaging than longer videos (Guo et al., 2014). Regardless of total video length, median engagement time is no longer than six minutes. Videos between 0-3 minutes have the highest engagement (Guo et al., 2014). Medium length videos (90 seconds) have higher elaboration and transportation scores, paired with high attitude scores (Randolph et al., 2021). Based on these findings, videos produced for my study were ± 2 minutes in length.

Summary

Despite some information suggesting otherwise, meat and meat products are an important component of a balanced diet. Meat products are a source of important functional amino acids, dipeptides, and creatine that foster physiological, neurological, muscular, retinal, and cardiovascular functions (Wu, 2020). Though contrary to popular claims, plants are not nutritionally equivalent to meat (Wu, 2020). Yet, the DGFA encourage reducing the consumption of red meat and processed meat products (USDA, 2020) without sound scientific backing (Teicholz, 2020).

To combat the negative impact of DGFA recommendations on cured meat products and address consumer concerns around conventional meat curing (Sindelar & Milkowski, 2012), a variety of alternative meat curing systems have been explored. However, these alternatives have had negative organoleptic properties (Redfield & Sullivan, 2015). As an improved alternative, meat scientists at TAMU have explored the functionality of adding L-arginine to meat to activate the eNOS system, which produces residual nitrite (Osburn, 2021).

Effectively communicating about the new, alternative meat curing system will be difficult because the information about the amino acid-based meat curing system will be unfamiliar to consumers, and unfamiliar information is normally processed passively, through the peripheral processing route (Petty & Cacioppo, 1986). Additionally, the polarizing climate of science related topics (Baker et al., 2021) presents communication challenges. Although difficult, communication could be enhanced by using message framing and strategically selecting an information source because message elements,

such as message framing and source of information, contribute to the acceptance of passively processed information.

Narrative framing has been recommended to aid in reducing cognitive load and increasing positive attitudes toward difficult and complex issues (Dillard et al., 2017; Gordon et al., 2018; Seo et al., 2018; Williams et al., 2010b). Audiences appear to engage more with narrative information, but in some instances, they perceive analytical messages as more trustworthy and from a more credible source (Yang & Hobbs, 2020). However, because storytelling has negative connotations within science (Katz, 2013), my study evaluated differences between narratively framed and analytically framed messages.

Source of information is also an important peripheral cue affecting the acceptance of scientific information (Yang & Hobbs, 2020). Although previous research has explored the effectiveness of information sources, little research has been conducted on the interaction of message framing and information source on information recall, trust, source expertise, source credibility, and anticipated consumption behavior. My study explored messages delivered by four sources of information including a consumer, producer, reporter, and meat scientist.

CHAPTER III

METHODS

Study Design

My study is a 2x4 randomized between-groups experiment (Mertler & Reinhart, 2017) on the effects of message frame and information source on information recall, trust, source expertise, source credibility, and anticipated consumption behavior, simultaneously. Factorial designs extend the number of relationships that can be examined in an experimental study, and they are an efficient way to identify many different relationships within one set of data (Fraenkel & Wallen, 2008).

According to Fraenkel and Wallen (2008), a factorial design with randomization controls many threats to internal validity. This study design strongly controlled internal validity threats including subject characteristics, mortality, instrument decay, maturation, regression, and attitude of subjects, and it somewhat controlled testing and history threats.

Population

The population included individuals who are part of Generation Z and 18 years or older. In a Pew Research study, Taylor and Keeter (2010) defined Generation Z as those born between 1993 and 2005. Generation Z is the newest group of current and emerging primary shoppers, and their differing preferences are becoming increasingly relevant and important to today's food industry (Taylor & Keeter, 2010).

Sampling

A non-random sample of the population was taken from students attending TAMU. A total of 470 participants accessed the instrument. However, after cleaning the data to eliminate participants who did not provide informed consent, pass the screening question, or answer any questions following the video, the sample size was 266 (n = 266). Individuals were included in the sample if they viewed the video and answered at least one question following the video.

About half of the participants indicated they were female (n = 148), making up 55.64% of the sample with 31.20% indicating they were male (n = 83). Most participants indicated they were white (n = 168, 63.16%) and undergraduate students (n = 177, 66.54%). Table 1 summarizes some of the demographic characteristics of the sample.

Table 1

Participants' Demographic Characteristics

Characteristic	*n*	%
Gender		
Female	148	55.65
Male	83	31.20
Nonbinary	4	1.50
Multiple Gender Categories	2	.75
Prefer Not to Answer	2	.75
Non-Response	27	10.15
		100.00
Ethnicity		
White	168	63.16
Hispanic, Latino, or Spanish Origin	30	11.28
Multiple Ethnicity Categories	16	6.02
Asian	14	5.26
Black or African American	4	1.50
Prefer Not to Answer	4	1.49
American Indian or Alaska Native	1	.38
Native Hawaiian or Other Pacific Islander	1	.38
Some Other Race, Ethnicity, or Origin	1	.38
Non-Response	27	10.15
		100.00
Education Level		
Undergraduate Student	177	66.54
Graduate Student	54	20.30
Other	6	2.26
Non-Response	29	10.90
		100.00

The sample represented fourteen (n = 14) colleges and schools at TAMU. The largest percentage of participants (n = 73, 27.44%) indicated they were in a major within the College of Agriculture and Life Sciences with 11.28% indicating they were students in the College of Architecture (n = 30), 10.15% indicating that they were students in the College of Liberal Arts (n = 27), and 9.02% indicating they were students in the College

of Engineering (n = 24). Table 2 provides information about the distribution of the sample across TAMU colleges and schools.

Table 2
University, College, School, or Program Representation

College	*n*	%
College of Agriculture and Life Science	73	27.44
College of Architecture	30	11.28
College of Liberal Arts	27	10.15
College of Engineering	24	9.02
College of Education & Human Development	17	6.39
Mays Business School	14	5.26
College of Veterinary Medicine & Biomedical Sciences	14	5.26
Multiple Colleges Selected	14	5.26
College of Science	10	3.76
Irma Lerma Rangel College of Pharmacy	5	1.88
College of Geosciences	4	1.50
Transition Academic Programs	3	1.13
School of Law	1	.38
College of Nursing	1	.38
School of Public Health	1	.38
Non-Response	28	10.53
		100.00

Most participants indicated their home country as the United States of America (n = 221, 82.46%). A total of 12 countries were represented within the sample (Table 3).

Table 3

Participants' Home Country

Country	*n*	%
United States of America	221	83.07
Mexico	5	1.87
India	3	1.12
Afghanistan	1	.38
Azerbaijan	1	.38
Cameroon	1	.38
China	1	.38
Columbia	1	.38
Dominican Republic	1	.38
Ecuador	1	.38
Russian Federation	1	.38
Singapore	1	.38
Non-Response	28	10.52
		100.00

Participants indicated how often they consume cured meat products (Table 4). The largest percentage of participants (n = 69, 25.94%) indicated that they consumed cured meat products a few times a week with 20.68% (n = 55) indicating they consumed cured meat products a few times a month, and 11.28% (n = 30) indicating they consumed cured meat products once a week.

Table 4

Participants' Cured Meat Consumption

Yearly Cured Mead Consumption	*n*	%
Not at All	10	3.76
Yearly	3	1.13
A Few Times a Year	21	7.90
Monthly	24	9.02
A Few Times a Month	55	20.68
Once a Week	30	11.28
A Few times a Week	69	25.94
Daily	21	7.89
Unsure	7	2.63
Non-Response	26	9.77
		100.00

Instrumentation

The CSSC science communication research agenda suggests researchers use randomized controlled field experiments to assess how approaches to communicating science change people's understanding, perception, and use of science (NASEM, 2017). Therefore, my randomized experiment evaluated message frame and information source as approaches to communicating science. As suggested by the agenda, my study evaluated people's understanding, perception, and use of science (NASEM, 2017) with five dependent variables. Information recall was selected as a dependent variable based on CSSC's recommendation to evaluate people's understanding of science. Trust, source expertise, and source credibility were selected as dependent variables based on CSSC's recommendation to evaluate people's perceptions of science. Finally, anticipated consumption behavior was selected as a dependent variable based on CSSC's recommendation to evaluate people's use of science. Table 5 summarizes the independent and dependent variables in this study.

Table 5
Summary of Variables

Variable	Type of Measurement	Level of Measurement
Independent Variables		
Message Frame	Nominal	1 = Analytical 2 = Narrative
Information Source	Nominal	1 = Consumer 2 = Producer 3 = Reporter 4 = Meat Scientist
Dependent Variables		
Information Recall	Interval	Total score on four multiple-choice questions (0–4)
Trust	Interval	Average of scores from five sets of bipolar adjectives measured on 7-point semantic differential scales (1 = negative; 7 = positive)
Source Expertise	Interval	Average of scores from six sets of bipolar adjectives measured on 7-point semantic differential scales (1 = negative; 7 = positive)
Source Credibility	Interval	Average of scores from three sets of bipolar adjectives measured on 7-point semantic differential scales (1 = negative; 7 = positive)
Anticipated Consumption Behavior	Interval	Average of scores from four items measured on 6-point Likert scales (1 = strongly disagree; 6 = strongly agree)

Research Stimuli Development

My study tested two independent variables including message frame and information source.

Message Frame

My study tested message frame (analytical message frame and narrative message frame) as one of the two independent variables as message framing studies often contrast

analytical and narrative messages (Fisher, 1985). I measured message frame at the nominal level (1 = analytical; 2 = narrative).

I developed two message scripts using the two message frames. Message frames limit what is transcribed from actual events (Goffman, 1974). The message script used to create the video operationalized message frame and differentiated the analytical message frame from the narrative message frame (Appendix A).

The analytical message script included results from previous experimental research trials to support claims about the AAACS. The analytical message frame did not attempt to connect to individuals' personal lives or appeal to their unique preference because analytical message frames rely heavily on objective scientific evidence rather than personal connection to support claims. Analytically framed messages are context-free and communicate abstract truths that can remain true in various situations (Bruner, 1986). Analytical information follows deductive reasoning (Dahsltrom, 2014) in which individuals must generalize down to a specific case (Bruner, 1986). Analytical frames use a less personal tone, more formal language, and do not use pronouns (Yang & Hobbs, 2020). The analytical script I developed for my study did not use any pronouns, included some of the technical language used by meat scientists, and somewhat resembled a scientific abstract.

I developed the narrative script to appeal to general food preferences of Generation Z including the social component of food consumption (Chaney et al., 2017) and sustainability (Neuman et al., 2019). Generation Z stands out for placing value on social relations as a motive for buying food (Chaney et al., 2017). The narrative script

mentioned a variety of cured meat products participants were likely familiar with and have consumed in social settings (barbeques, tailgates, family dinners, etc.). Because sustainability has begun to permeate the lifestyle and food consumption of Generation Z (Neuman et al., 2019), the narrative message alluded to the ability of the AAACS to continue to produce cured meat products that can be a more sustainable food choice.

Information Source

The second independent variable I tested was information source, which I measured at the nominal level with four categories (1 = consumer; 2 = producer; 3 = reporter; and 4 = meat scientist). I selected these four information sources based on recommendations from the literature and the science communication research agenda (NASEM, 2017). I used a consumer as one information source because the science communication research agenda suggests more research to better understand the roles and affective approaches to communicating science through social media platforms and blogs (NASEM, 2017). Participants' peers, or fellow consumers, are the authors of blogs and content posted on social media. I selected a producer as an information source because both rhetoric and evidence point to the need for agriculturalists to share their stories and perspectives (White et al., 2014). I chose a reporter as an information source because the science communication research agenda recognizes that much of the scientific information received by Americans still originates from traditional journalism. The science communication research agenda acknowledges the importance of understanding and evaluating how traditional media outlets affect people's perceptions, understanding, and use of science (NASEM, 2017). Finally, I selected a meat scientist as

an information source because the science communication research agenda suggests research to examine how science communicators who communicate openly about their own values and preferences affects audiences (NASEM, 2017).

Video Characteristics

I used videos as the medium to disseminate eight variations of a message about the AAACS. Videos are one of the most powerful storytelling mediums that can be used to promote products (Schroeder, 2015). Each of the eight videos were approximately two minutes long because previous research indicates that videos between zero and three minutes have the highest engagement (Guo et al., 2014).

I developed each of the eight videos. Developing videos specifically tailored to my study's research questions provided the flexibility to test certain variables while holding other variables constant. Furthermore, limited content has been created to deliver information about the AAACS. Because of this, testing pre-existing messages about this innovation would be challenging and would substantially limit the scope of the study. Video scripts were reviewed by a meat science expert and a communication expert. Many rounds of revisions took place between the experts before the scripts were finalized and the videos created.

Qualtrics randomly assigned participants to watch one of eight videos—a consumer delivering an analytical message, a consumer delivering a narrative message, a producer delivering an analytical message, a producer delivering a narrative message, a reporter delivering an analytical message, a reporter delivering a narrative message, a meat scientist delivering an analytical message, and a meat scientist delivering a

narrative message. Other video elements and message characteristics were held constant including length, titles, actor, and enthusiasm. All videos were uploaded and linked to a personal YouTube account for closed captioning.

Instrument Development

Instrument items were developed or adapted to measure each of the five dependent variables including information recall, trust, source expertise, source credibility, and anticipated consumption behavior. I developed the information recall items and a meat scientist revised them. I measured trust, source expertise, and source credibility using adaptations of two previously developed instruments (Besley et al., 2021; Ohanian, 1990), and I developed anticipated consumption behavior items to measure different levels of consumption. Additionally, I included a screening question to determine the potential participants' age range to ensure the individuals in the sample were older than 18 and part of Generation Z.

The instrument included 22 items (n = 22) measuring five dependent variables—information recall, trust, source expertise, source credibility, and anticipated consumption behavior—and six demographics (Appendix B).

Cognitive Variable

Information Recall. The dependent variable information recall evaluated the cognitive component of an attitude and was measured with four multiple choice questions (n = 4). The information recall items were created and adjusted under the advisement of a meat science expert. The multiple-choice questions evaluated what information participants could recall after watching the video about the AAACS. Both

the analytically framed and narratively framed scripts contained content that answered each of the four multiple choice questions. Each question had five possible options for participants to choose. Participants received a score from 0–4 to measure the dependent variable information recall, with each correct answer earning one point.

The reliability of the pilot information recall questions was measured using Cramer's V. Cohen (1998) suggests that a large correlation is indicated by Cramer's V ≥ .50, a medium correlation by Cramer's V ≥ .30, and a small correlation by a Cramer's V ≥ .10. Item one had a Cramer's V indicating a strong correlation (Cramer's V = .53) (Cohen, 1998). Item two had a Cramer's V indicating a strong correlation (Cramer's V = .54) (Cohen, 1998). Item three had a Cramer's V indicating a strong correlation (Cramer's V = .50) (Cohen, 1998). Lastly, item four had a Cramer's V indicating a medium correlation (Cramer's V = .46) according to Cohen (1998). Table 6 illustrates the final information recall items.

Table 6

Information Recall Items

	Information Recall Items Included in the Final Instrument
Item 1[a]	What is the conventional meat curing method used to cure most meat products?
Item 2[b]	When curing meat using the new alternative meat curing system, what is added to meat?
Item 3[c]	What system does L-arginine activate?
Item 4[d]	When activated, what does the endothelial nitric oxide synthase system produce?

Note. Each item was presented as multiple-choice question with five possible answers. For the final instrument, participants could receive a score from 0–4 by earning one point for each correct answer.

[a]Cramer's V = .53; [b]Cramer's V = .54; [c]Cramer's V = .50; [d]Cramer's V = .46.

Affective Variables

Trust. The instrument included trust, source expertise, and source credibility as the three dependent variables measuring the affective component of an attitude. Trust was measured using five sets of bipolar adjectives (n = 5) measured on semantic differential scales that each described a dimension of trust (1 = negative; 7 = positive). The adjectives presented on semantic differential scales were trustworthy/untrustworthy, reliable/unreliable, dependable/undependable, honest/dishonest, and sincere/insincere (Ohanian, 1990) (Table 7). The trust component of the instrument had internal consistency (George & Mallery, 2003), with a Cronbach's alpha value of .90.

Table 7
Trust Items

	Trust Items Included in the Final Instrument
Item 1	Dependable/Undependable
Item 2	Honest/Dishonest
Item 3	Unreliable/Reliable
Item 4	Sincere/Insincere
Item 5	Trustworthy/Untrustworthy

Note. Each item was measured with a seven-point semantic differential scale using bipolar adjectives (1 = negative; 7 = positive).
Cronbach's alpha = 0.90

Source Expertise and Credibility. After an exploratory factor analysis, the original single dependent variable of source credibility was divided into the two dependent variables of source expertise and source credibility. I measured source expertise with six items (n = 6) and measured source credibility with the remaining three items (n = 3).

The new dependent variable source expertise included the five items from Ohaninan's (1990) instrument (i. e., expert, experienced, knowledgeable, qualified,

skilled) and one item from Besley et al.'s (2021) instrument (i.e., competence). Six sets of bipolar adjectives or phrases (n = 6) were measured on semantic differential scales (1 = negative; 7 = possible). The adjectives or phrases presented on the semantic differential scales were expert/not an expert, experienced/inexperienced, knowledgeable/unknowledgeable, qualified/unqualified, skilled/unskilled, and competent/incompetent (Table 8). The Cronbach's alpha value of the source expertise construct of the final instrument was .94, indicating internal consistency (George & Mallery, 2003).

Table 8
Source Expertise Items

	Source Expertise Items Included in the Final Instrument
Item 1	Expert/Not an Expert
Item 2	Experienced/Inexperienced
Item 3	Knowledgeable/Unknowledgeable
Item 4	Qualified/Unqualified
Item 5	Skilled/Unskilled
Item 6	Competent/Incompetent

Note. Each item was measured with a seven-point semantic differential scale using bipolar adjectives (1 = negative; 7 = positive).
Cronbach's alpha = 0.94

The source credibility construct included the three items (n = 3) from Besley et al.'s (2021) instrument that factored together in an EFA. The three items were integrity, good will, and openness (Besley et al., 2021). The three dimensions were measured using three sets of bipolar adjectives or phrases, each measured on a 7-point semantic differential scale (1 = negative; 7 = positive). The bipolar adjectives or phrases included were has integrity/does not have integrity, has goodwill/does not have goodwill, and

open/not open (Table 9). The source credibility component of the final instrument was internally consistent with a Cronbach's alpha of .87.

Table 9
Source Credibility Items

	Source Credibility Items Included in the Final Instrument
Item 1	Has Integrity/Does Not Have Integrity
Item 2	Has Goodwill/Does Not Have Goodwill
Item 3	Open/Not Open

Note. Each item was measured with a seven-point semantic differential scale using bipolar adjectives (1 = negative; 7 = positive).
Cronbach's alpha = 0.87.

Behavioral Variable

The dependent variable anticipated consumption behavior measured the behavioral component of an attitude. To measure participants' anticipated consumption behavior of products cured with the AAACS, I used six-point Likert scales (Fraenkel & Wallen, 2008) of 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree). Four consumption-oriented questions (*n* = 4) were asked regarding various levels of anticipated consumption behavior of products cured using the AAACS (Table 10). The anticipated consumption behavior construct was internally consistent with a Cronbach's alpha of .84. Besides minor adjustments to the way the instructions were worded and presented, the anticipated consumption behavior items did not change throughout the course of instrument development.

Table 10

Anticipated Consumption Behavior Items

	Anticipated Consumption Behavior Items Included in the Final Instrument
Item 1	I am interested in learning more about meat products cured with this new, amino acid-based alternative curing system.
Item 2	I would consume a meat product cured with this new, amino acid-based alternative curing system.
Item 3	I would purchase a meat product cured with this new, amino acid-based alternative curing system.
Item 4	I would purchase a meat product cured with this new, amino acid-based alternative curing system instead of a conventionally cured meat product.

Note. Measured with six-point Likert scales of 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree.
Cronbach's alpha = .84.

Validity and Reliability

Many strategies were used to establish validity and reliability as well as refine the instrument. An expert panel evaluated the instrument to establish face and content validity (Fraenkel & Wallen, 2008). To establish reliability of the multiple-choice information recall items, I used the test-retest method for testing reliability (Fraenkel & Wallen, 2008). Although the trust, source expertise, and source credibility components of the instrument have been through a rigorous process to establish validity and reliability (Besley et al., 2021; Ohanian, 1990), the entire instrument was piloted to further establish reliability. Finally, I used an exploratory factor analysis to adjust the attitudinal variables measured and the way items fell under each variable. The instrumentation process, which is quite detailed, is presented in Appendix B.

Data Collection Procedure

I recruited participants using the TAMU bulk email system and used a modification of Dillman et al.'s (2014) tailored design method to collect data. The initial

invitation to participate in the study was sent as an email on Tuesday, March 22, 2022, with a total of three follow-up emails being sent. Emails were sent sometime between 9 and 11 a.m. on four consecutive Tuesdays between March 22 and April 12, 2022. The four recruitment emails are attached in Appendix D.

Follow-up emails were sent until at least 30 participants were randomly assigned to each of eight treatment groups. According to Fraenkel and Wallen (2008), a sample should be the largest a researcher can obtain with a reasonable expenditure of time and energy. For experimental and causal-comparative studies, 30 individuals per group is recommended (Fraenkel & Wallen, 2008). Because there was a total of eight groups, I needed a sample size of 240. After the fourth email was sent, a sample size of 266 (after data cleaning) was obtained, with 32-35 individuals assigned to each treatment group. Table 11 summarizes the number of participants completing the instrument during each of the four recruitment periods.

Table 11
Recruitment Email Schedule

Email	Date Sent	*n*
Initial Invitation Email	March 22, 2022	88
1st Follow-Up Email	March 29, 2022	79
2nd Follow-Up Email	April 5, 2022	37
3rd Follow-Up Email	April 12, 2022*	62

Note. The survey was closed one week after the 3rd follow-up email was sent.

Each of the four recruitment emails contained a link to the Qualtrics instrument. After accessing the link, participants were asked to indicate their consent to participate in the study. To preserve confidentiality, no names were associated with the data collected (Fraenkel & Wallen, 2008).

After consenting to participate, participants answered a screening question to ensure they represented Generation Z. They were asked to indicate their age range. Individuals who selected the age range of younger than 18 or the age range of over 30 were directly prompted to the final screen. Qualtrics was programmed to randomly assign all participants indicating that they were in the age range of 18–29 to view one of eight versions of a video about the AAACS. After viewing the video, participants were asked to complete the 22 items (n = 22) that measured five dependent variables. Demographic data was collected at the end of the instrument. Participants provided responses online, through a Qualtrics instrument and did not directly interact with a data collector. These data collection procedures mitigated threats of data collector bias and data collector characteristics.

Data Analysis

Missing Data

Data were cleaned and eliminated if participants did not provide informed consent, did not pass the screening questions, or did not answer questions after viewing the video. Missing data was accounted for by inserting the grand mean for that specific item. As recommended by Mertler and Reinhart (2017), when no other information is available, the mean is the best estimate for the value of a variable. Means were calculated for each item in the instrument. The mean value of an item replaced all missing values within each item. This is a conservative procedure as the grand mean does not change by inserting the mean value for each missing value case. Additionally, guessing is not required so further bias is not introduced (Mertler & Reinhart, 2017).

Data analysis was also conducted using only viable data. There were no differences between data analysis results when missing data was completely deleted and when missing data was replaced with grand means.

Grand means were used to replace missing data for all 22 items in the instrument. Item one of the dependent variables measuring information recall had 15 missing values that I replaced (n = 15), item two had 18 (n = 18), item three had 22 (n = 22), and item four had 27 (n = 27). The dependent variable measuring trust had two missing values that were replaced for item one (n = 2), item two had two (n = 2), item three had one (n = 1), item four had one (n = 1), and item five had one (n = 1). For the dependent variable measuring source expertise, items one through five had seven missing values replaced (n = 7) and item six had 10 (n = 10). For the dependent variable measuring source credibility, each of the three items had seven missing values replaced (n = 7). For the dependent variable measuring anticipated consumption behavior, item one had 12 missing values replaced (n = 12), item two had a total of 13 missing values replaced (n = 13), and items three and four had 12 (n = 12). The raw data is attached in Appendix E, with the cells flagged that had a grand mean inserted.

Two-Way MANOVA

Data were analyzed data with SPSS v.28, using an a priori alpha of .05. I used two-way multivariate analysis of variance (MANOVA) to determine the experimental effects of the two independent variables on the five dependent variables, concurrently (Mertler & Reinhart, 2017). MANOVA can be used for multiple independent variables

because it analyzes the interactions or moderating effects between outcome variables and explores how groups differ as classified by independent variables (Field, 2018).

Advantages of using MANOVA instead of factorial analysis of variance (ANOVA) include the ability to investigate relationships among the dependent variables, rather than studying each dependent variable in isolation (Tabachnick & Fidell, 2019). ANOVA's separate linear models, fitted to each outcome, do not evaluate the relationship between those outcomes (Field, 2018). MANOVA can detect if groups differ along a combination of dimensions rather than just one (Field, 2018). In other words, a MANOVA assesses patterns within the data. This is because MANOVA considers the correlation between outcome variables (Huberty & Morris, 1989). Compared to factorial ANOVA, MONOVA has a greater potential power to detect an effect, reducing the risk of a Type I error (Field, 2018) and increasing statistical power. MANOVA also protects from a familywise error due to multiple tests of related dependent variables (Tabachnick & Fidell, 2019).

MANOVA has four potential test statistics including the Pillai-Bartlett trace, Hotelling-Lawley trace, Wilk's Lambda, and Roy's Largest Root (Field, 2018). I reported all four test statistics, but the Pillai-Bartlett trace was used to determine significance. Box's M is sensitive to sample size and can detect departures from homogeneity and normality (Mertler & Reinhart, 2017). If Box's M is significant, Pillai's trace criterion should be used because it is more robust to departures from the assumption of normal distribution of data (Mertler & Reinhart, 2017). The dataset described herein did not meet the assumption of normal distribution of data. Box's *M*

was significant in my study ($p < .05$). Additionally, the assumption of homogeneity of covariance was not met. Therefore, Pillai's test was deemed the test statistic most appropriate for these data.

To determine if a MANOVA is significant, it should be followed by further analyses (Borgen & Seling, 1978). To gain further insight, as recommended by Field (2018), the statistically significant MANOVAs (including the interaction effect and two main effects) was followed up by a Discriminant Function Analysis (DFA) to break down the linear combination in more detail. A DFA evaluates how groups can best be distinguished, or separated, using predictors. A DFA is theoretically the opposite of MANOVA. MANOVA predicts a set of outcome measures from grouping variables. DFA predicts grouping variables based on outcome measures (Field, 2018).

MANOVA Assumptions

The first assumption of two-way MANOVA is that observations within each sample must be random and must be independent of each other (Mertler & Reinhart, 2017). The study design assured that this assumption was met. Each participant was randomly assigned to one of the eight treatment groups.

The second assumption of two-way MANOVA is that the observations on all dependent variables must follow a multivariate normal distribution in each group (Mertler & Reinhart, 2017). Multivariate normality implies that the sampling distribution of dependent variable means and the linear combination of dependent variables are normally distributed (Tabachnick & Fidell, 2007).

My study's dataset did not meet the assumption of normality. The Kolmogorov-Smirnov and Shapiro-Wilk tests of normality resulted in significant *p* values for each of the dependent variables ($p < .001$), indicating the assumption of multivariate normality was not met. However, it is important to note that a two-way MANOVA is robust to moderate violations of normality if it is caused by skewness rather than outliers (Tabachnick & Fidell, 20019). My dataset likely violates the assumption of normality due to skewness rather than outliers. The normal distribution figures (histogram, normal Q-Q plot, and detrended normal Q-Q plot) for each of the five dependent variables are attached in Appendix F. Additionally, a sample size of 20 in the smallest cell should be sufficient to ensure robustness to violations of multivariate normality (Mertler & Reinhart, 2017). For my study, the sample size of the smallest cell was 32, which ensures robustness to violations of normality.

When data deviates from a normal distribution, transformations of the original data should be considered to address multivariate normality. My dataset was transformed to address multivariate normality, but no changes in the results occurred after the dataset was transformed. See Appendix G for transformed data results.

The third assumption of a two-way MANOVA is that the population covariance matrices for the dependent variables in each group must be equal (Mertler & Reinhart, 2017). The homogeneity of covariance matrices was tested using Box's *M* test (Leech et al., 2015), which was significant ($p < .05$), implying that the assumption of homogeneity of covariance matrices was not met. However, Box's *M* is sensitive to large datasets, thus detecting small departures from homogeneity, and can be sensitive to departures

from the assumption of normality. It is likely that the Box's *M* test was significant because the normality assumption was not met (Mertler & Reinhart, 2017). A transformation of the variables was conducted to address the violation of this two-way MANOVA assumption. However, no changes in the results occurred after the dataset was transformed. The transformed data results are attached in Appendix G.

The fourth assumption of two-way MANOVA is that the relationships among all pairs of dependent variables for each cell must be linear (Mertler & Reinhart, 2017). This assumption was evaluated by examining the bivariate scatterplots. Bivariate scatterplots with an elliptical shape indicate that the linearity assumption was met. The shape of most of the bivariate scatterplots was elliptical. Therefore, the assumption of linearity was met (Mertler & Reinhart, 2017). The bivariate scatterplots are included in Appendix H.

Discriminant Function Analysis

DFA is the best way to follow up a significant MANOVA because it breaks down the linear combination of a MANOVA, can show underlying dimensionality of data, and can determine the contribution variables have to the underlying dimensions (Field, 2018). A univariate ANOVA provides some initial insight but is limited to specifying the contribution of each separate variable to group separation and cannot investigate underlying dimensionality (Borgen & Seling, 1978). Additionally, DFA controls for familywise error (Tabachnick & Fidell, 2019). Yu and Chick (2009) conducted a study comparing the utility of the univariate *F* test to descriptive DFA and

found the two post hoc tests to be congruent but DFA to serve better in determining which outcome variables contributed the most to separating independent variables.

Limitations

Although many proposed objectives of the science communication research agenda will be addressed by this study, some will not be. The research agenda suggests looking at what degree the communication approaches generalize or need to be changed according to the diversity of participants and nature of the topic (NASEM, 2017). Additionally, although my study includes a diverse sample, all participants were students at TAMU. This can present some challenges when attempting to generalize results. Thus, caution is recommended in generalizing the findings from my study to others. However, it is common knowledge that university graduates have higher earning power and become powerful contributors to gross domestic product.

An additional limitation to this study is that due to the use of an experimental design, no control group was included in the study. Because of this, there is not a way to determine what participants attitudes towards the AAACS were before treatment.

Summary

This study was a 2x4 randomized between-groups experiment (Mertler & Reinhart, 2017) on information recall, trust, source expertise, source credibility, and anticipated consumption behavior. The sample consisted of students attending TAMU, randomly assigned to one of eight experimental groups (Fraenkel & Wallen, 2008). I used an online Qualtrics instrument to collect data from participants. Message frame (analytical/narrative) and information source (consumer/producer/reporter/meat

scientist) were independent variables and information recall, trust, source expertise, source credibility, and anticipated consumption behavior were dependent variables.

After answering a screening question to ensure the sample consisted of Generation Z students 18 years or older, participants were randomly assigned to view one of eight videos about the AAACS. The videos were either narratively or analytically framed and the information source or actor in the video was either a consumer, producer, reporter, or meat scientist. After watching the video, participants were asked to recall information about the AAACS, indicate their trust toward the message, indicate the source's expertise and credibility, and indicate their anticipated future consumption of products cured with the AAACS. At the end of the instrument, participants responded to demographic questions.

I used a two-way MANOVA determine the experimental effects of the two independent variables on the five dependent variables, concurrently (Mertler & Reinhart, 2017). DFA was used to follow-up significant MANOVA results to break down the linear combination in more detail (Field, 2018). Data were analyzed with SPSS v.28 with an a priori alpha of .05.

CHAPTER IV

RESULTS

Research Question One

Research question one sought to determine if there was a significant interaction between message frame and information source on the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior?

Table 12 presents the mean and standard deviations for each of the dependent variables for each of the eight treatment groups included in the study. The meat scientist delivering the narratively framed message had the highest mean for information recall (M = 2.52, SD = 1.16) with the consumer delivering the analytically framed message having the lowest mean for information recall (M = 2.13, SD = 1.38). The meat scientist delivering the narratively framed message had the highest mean for trust (M = 5.96, SD = 1.01) with the consumer delivering the analytically framed message having the lowest mean for trust (M = 5.63, SD = .91). The meat scientist delivering the narratively framed message had the highest mean for source expertise (M = 6.13, SD = .93) with the consumer delivering the narratively framed message had the lowest mean for source expertise (M = 5.24, SD = 1.43). The meat scientist delivering the narratively framed message had the highest source credibility mean (M = 6.10, SD = .87) with the reporter delivering the analytically framed message had the lowest source credibility mean (M = 5.59, SD = 1.01). Last, the producer delivering the narratively framed message had the

highest mean for anticipated consumption behavior (*M* = 4.60, *SD* = .89) with the reporter delivering the narratively framed message having the lowest mean for anticipated consumption behavior (*M* = 4.28, *SD* = .78).

Table 12

Mean Comparisons Between Message Frame and Information Source

Test		Information Recall[a]		Trust[b]		Source Expertise[c]		Source Credibility[b]		Anticipated Consumption Behavior[c]	
	n	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Consumer											
Analytical	32	2.13	1.38	5.63	.91	5.36	1.19	5.95	.97	4.28	.70
Narrative	35	2.28	1.22	5.74	1.23	5.24	1.43	5.94	.98	4.53	.87
Producer											
Analytical	32	2.44	1.16	5.92	.91	5.91	1.07	5.81	1.02	4.31	1.01
Narrative	34	2.38	1.29	5.82	1.02	5.65	1.00	6.10	.87	4.60	.89
Reporter											
Analytical	34	2.48	1.19	5.66	.98	5.41	1.11	5.59	1.01	4.49	.74
Narrative	34	2.17	1.15	5.88	.91	5.50	1.11	5.63	1.13	4.28	.78
Meat Scientist											
Analytical	33	2.35	1.00	5.81	1.03	6.04	1.00	5.92	1.05	4.47	1.03
Narrative	32	2.52	1.16	5.96	1.01	6.13	.93	6.15	.88	4.34	1.06

Note. "M" denotes mean and "SD" denotes standard deviation. .

[a]Score ranging from 1–4, based on the number of multiple-choice questions answered correctly.

[b]Sets of bipolar adjectives measured on seven-point semantic differential scales (1 = negative; 7 = positive).

[c]Items measured with six-point Likert scales (1 = strongly disagree; 6 = strongly agree).

I used a two-way MANOVA to determine if there was a significant interaction between message frame and information source for the five dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior. As reported in Table 13, a statistically significant two-way MANOVA effect was not obtained ($p < .61$), Pillai's Trace = .05, F (15, 701.58) = .86.

Table 13

Multivariate Test for Message Frame and Information Source Interaction

Test	*V*	*F*	*df*	*p*	η^2
Pillai's Trace	.05	.86	15	.61	.02
Wilks' Lambda	.95	.86	15	.61	.02
Hoteling's Trace	.05	.86	15	.61	.02
Roy's Largest Root	.03	1.74	5	.13	.03

Research Question Two

The second research question sought to determine if there are significant differences in the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for message frame (analytical/narrative). Source credibility had the highest mean for analytical message frame (M = 5.82, SD = 1.01) with information recall having the lowest mean (M = 2.35, SD = 1.18). Source credibility had the highest mean for narrative message frame (M = 5.95, SD = .98) with information recall having the lowest mean (M = 2.33, SD = 1.20). The analytical message frame had a higher marginal mean for information recall (N = 2.35, SD = 1.18) and for source expertise (M = 5.68; SD = 1.12). The narrative message frame had a higher marginal mean for trust (M = 5.85, SD = 1.05), source credibility (M = 5.95, SD = .98), and anticipated consumption behavior (M = 4.44, SD = .91). The marginal means are reported in Table 14.

Table 14

Descriptive Statistics for Message Frame (n = 266)

Dependent Variable	Analytical (*n* = 131)		Narrative (*n* = 135)	
	M	*SD*	*M*	*SD*
Information Recall[a]	2.35	1.18	2.33	1.20
Trust[b]	5.75	0.96	5.85	1.05
Source Expertise[b]	5.68	1.12	5.62	1.17
Source Credibility[b]	5.82	1.01	5.95	0.98
Anticipated Consumption Behavior[c]	4.39	0.88	4.44	0.91

Note. "M" denotes mean. "SD" denotes standard deviation.

[a]Score ranging from 1–4, based on the number of multiple-choice questions answered correctly.

[b]Items measured with seven-point semantic differential scales, using bipolar adjectives (1 = negative; 7 = positive).

[c]Items measured with six-point Likert scales (1 = strongly disagree; 6 = strongly agree).

A MANOVA for the main effect for message frame was not statistically significant ($p = .54$), Pillai's Trace = .02, F (5, 254) = .81, indicating that there were not significant differences in the combined dependent variables for message frame (Table 15).

Table 15

Multivariate Test for Message Frame (n = 266)

Test	*V*	*F*	*df*	*p*	η^2
Pillai's Trace	.02	.81	5	.54	.02
Wilks' Lambda	.98	.81	5	.54	.02
Hoteling's Trace	.02	.81	5	.54	.02
Roy's Largest Root	.02	.81	5	.54	.02

Research Question Three

Research question three sought to determine if there are significant differences in the combined dependent variables of information recall, trust, source expertise, source

credibility, and anticipated consumption behavior for information source (i.e., consumer, producer, reporter, and meat scientist).

As reported in Table 16, the information source with the highest mean score for information recall was the meat scientist (M = 2.43, SD = 1.08) and the lowest mean score was the consumer (M = 2.21, SD = 1.29). The information source with the highest mean score for trust was the meat scientist (M = 2.43, SD = 1.08) with lowest mean score being the consumer (M = 5.69, SD = 1.08). The information source with the highest mean score for source expertise was the meat scientist (M = 6.08, SD = .96) with the lowest mean score being the consumer (M = 5.30, SD = 1.31). The information source with the highest mean for source credibility was the meat scientist (M = 6.03, SD = .97) with the lowest mean score being the reporter (M = 5.61, SD = 1.06). Last, the information source with the highest mean for anticipated consumption behavior was the producer (M = 4.46, SD = .96) with the lowest mean being the reporter (M = 4.38, SD = .77).

Table 16

Descriptive Statistics for Information Source

Dependent Variable	Consumer (*n* = 67)		Producer (*n* = 66)		Reporter (*n* = 68)		Meat Scientist (*n* = 65)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Information Recall[a]	2.21	1.29	2.41	1.22	2.33	1.17	2.43	1.08
Trust[b]	5.69	1.08	5.87	0.97	5.77	0.95	5.89	1.03
Source Expertise[b]	5.30	1.31	5.78	1.04	5.45	1.10	6.08	.96
Source Credibility[b]	5.95	.97	5.96	.95	5.61	1.06	6.03	.97
Anticipated Consumption Behavior[c]	4.41	.80	4.46	.96	4.38	.77	4.41	1.04

Note. "M" denotes mean. *"SD"* denotes standard deviation.

[a]Score ranging from 1–4, based on the number of multiple-choice questions answered correctly

[b]Items measured with seven-point semantic differential scales, using bipolar adjectives and phrases (1 = negative; 7 = positive).

[c]Items measured with six-point Likert scales (1 = strongly disagree; 6 = strongly agree).

I used a final one-way MANOVA to determine the main effect of information source on the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for information source (consumer/producer/reporter/meat scientist). A statistically significant MANOVA effect was obtained ($p < .001$), Pillai's Trace = .15, F (15, 701.58) = 2.67. The partial effect size is .05 ($\eta^2 = .05$), indicating a small effect (Cohen, 1998). A partial effect of $\eta^2 < .01$ indicates a small effect, $\eta^2 < .06$ indicates a medium effect, and $\eta^2 < .14$ indicates a large effect (Cohen, 1998). Table 17 includes the results of the one-way MANOVA for information source.

Table 17

Multivariate Tests for Information Source (n = 266)

Test	*V*	*F*	*df*	*p*	η^2
Pillai's Trace	.15	2.63	15	.001	.05
Wilks' Lambda	.86	2.67	15	.001	.05
Hoteling's Trace	.16	2.70	15	.001	.05
Roy's Largest Root	.12	6.05	5	.001	.11

Field (2018) recommends following up a significant MANOVA with DFA. I used a DFA to determine which weightings of the attitudinal variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior best discriminated between the four sources of information. As shown in Table 18, DFA revealed function 1 through 3 as significant, Wilk's lambda $\lambda = .86$, $\chi^2 (15) = 39.45$, $p < .001$, $R_c^2 = .10$. Therefore, the discriminant function explained 10.24% of the variance among information source (consumer, producer, reporter, and meat scientist).

Table 18

DFA for Combined Dependent Variables

Variables					Structure Matrix	Standardized Canonical Coefficient
Information Recall					.21	.31
Trust					.22	-.51
Source Expertise					.79	-1.42
Source Credibility					.21	.33
Anticipated Consumption Behavior					.01	.31
Function	λ	χ 2	*df*	*p*	Eigenvalue	Canonical Correlation
1 through 3	.86	39.45	15	<.001	.12	.32
2 through 3	.96	10.61	8	.23	.04	.20
3	1.00	.37	3	.95	.00	.04

Note: $R_c^2 = .10$.

Both an inspection of the structure matrix and canonical coefficient table confirmed the importance of source expertise. Source expertise had the largest value for

structure matrix (.79). Variables with a structure matrix value larger than .3 are considered most meaningful in the discriminant function. Based on this rule of thumb, source expertise is the only discriminating variable considered in the discriminant function. Additionally, source expertise had the largest canonical coefficient (-1.42). Variables with standardized canonical coefficients larger than the absolute value of half of the largest standardized canonical coefficient (-1.42/2=|-.71|) can be included in the discriminant function. Based on this rule of thumb, the cut-off value .71 was established and source expertise was the only identifiable discriminating variable for information source.

Summary

I used a two-way MANOVA to determine the experimental effects of the two independent variables on the five dependent variables, concurrently (Mertler & Reinhart, 2017). There was not a significant interaction effect on the combined set of dependent variables, and a significant main effect for frame was not detected. However, a significant main effect for information source was detected. The follow-up DFA revealed only one underlying factor and that source expertise was the most powerful discriminating variable for information source.

CHAPTER V

CONCLUSIONS

My thesis contributes to the knowledge base regarding message framing and information source when communicating about the AAACS. Based on three defined research questions, my thesis provides three primary contributions: (a) no significant interaction between message frame and information source was found, (b) a significant difference for the combined dependent variable of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for message frame was not found, and (c) a significant difference of the combined dependent variable was found for information source. These contributions provide important insight into how to effectively communicate information about the AAACS.

Discussion

Research Question One

Research question one asked if there was significant interaction between message frame and information source on the combined dependent variable of information recall, trust, source expertise, source credibility, and anticipated consumption behavior. There was not a significant interaction effect between message frame and information source. This indicates that the two independent variables are orthogonal in nature, and thus are independent of one another. When information about the AAACS is processed through the peripheral processing route, the peripheral cues of information source and message frame will independently impact information processing. Because of this, generalizations

can be made without a caveat of how one independent variable is moderated or influenced by a level of the other independent variable on the combined dependent variable set. If replications of this research hold that the independent variables are unrelated on this set of dependent variables, this finding will simplify the development of future videos and other communication content featuring the AAACS innovation.

The interaction of message frame and information source have not been investigated in the context of agricultural communications. An agricultural communications framing study by Yang and Hobbs (2020) used different information sources to deliver different message frames, but did not evaluate information source and message frames, independently. The results of this study indicate that message frame and information source must be treated as independent variables and do not interact with each other. It is important to remain cautious when interpreting the results of framing studies that did not analyze message frame and information source as two independent variables.

Research Question Two

Research question two asked if there were significant differences in the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for message frame (analytical/narrative). There was not a significant difference between the narrative and analytical message frame on the combined dependent variable set.

These results were not consistent with previous studies investigating how message frame effects the cognitive component of an attitude (Dillard et al., 2017;

Glaser et al., 2009; Gordon et al., 2018; Graesser & Ottati, 1995; Seo et al., 2018; White et al., 2014; Williams et al., 2010b; Zabrucky & Moore, 1999). Additionally, these results were not consistent with previous literature indicating that narrative message frame positively impacts affective and behavioral components of an attitude (Dahlstrom, 2014; Dillard et al., 2017; Gordon et al., 2018; Randolph et al., 2021; Seo et al., 2018; Williams et al., 2010b).

Furthermore, the results of my study were not consistent with studies investigating message framing in the context of agricultural communications. Randolph et al. (2021) found that using narrative framing results in more engagement with information and Yang and Hobbs (2020) found that participants perceived analytical messages as more trustworthy and from a more credible source while narrative frames were easier to understand and reduced negative perceptions of agriculture and food technologies. Although my study was also about an agricultural innovation, no differences were found between message frames.

Although message framing (Bateson, 1972) has been found to be an important peripheral cue in previous communication studies, the results of my study indicate that message frame is not an important peripheral cue when individuals passively process information about the AAACS through the peripheral processing route (Petty & Cacioppo, 1986). My study's results may be inconsistent with previous framing research because the studies cited above failed to look at the combined set of dependent variables that were included in this current study. This combined set of dependent variables included all three components of an attitude but did not differ between message frames.

It is anticipated that the results of my study provide more depth to the literature because the effects of message framing are too complex to be measured by a single outcome variable. Many previous framing studies have looked at only one outcome variable or used analysis methods that look at multiple outcome variables, independently. These studies have not looked at interaction between multiple independent variables or used a combined dependent variable set.

A few other factors probably caused my study to differ from previous framing studies. There are likely differences in the communication strategy and the criteria used to develop narrative and analytical message frames between my study and previous framing studies. In addition, results from my study may have differed from previous framing studies because participants for this study only included members of Generation Z that are enrolled in TAMU. Their intelligence and academic environment could significantly influence their decision making.

Additionally, the results of my study were likely inconsistent with the results of the study conducted by Yang and Hobbs (2020) because treatment groups in Yang and Hobbs (2020) study differed on both message frame and information source. Bloggers and journalists delivered the narratively framed message. Government agencies and scientists delivered the analytical message (Yang & Hobbs, 2020). Because of this, it can be difficult to parse out whether the message frame or information source impacted participants' attitudes toward the message. The results of my study indicate that source may have caused differences, rather than message frame.

Research Question Three

Research question three analyzed if there were significant differences between the combined dependent variables of information recall, trust, source expertise, source credibility, and anticipated consumption behavior for information source (producer, consumer, reporter, or meat scientist). I found significant differences in the combined dependent variable for information source. Because this MANOVA test statistic was significant, I followed up with DFA, which identified only one underlying factor, explaining 10.24% of the variance of the factor. Source expertise was the most influential contributor to this factor.

A descriptive inspection of the marginal means reveals that participants experienced higher levels of information recall, greater levels of trust, and higher levels of source expertise and source credibility from messages delivered by the meat scientist when compared to messages delivered by the consumer, producer, or reporter. There were also higher levels of anticipated consumption behavior when the producer was the source of information.

The findings from my study are consistent with previous literature that suggests those considered experts in the field are likely recognized as having higher expertise and are listened to more closely (Erdem & Swait, 2004). Source credibility theorem further posits that messages should be delivered by those with expertise in the specific content domain (Hovland et al., 1953). This is also consistent with Sapp and Downing-Matibag's (2009) study that found trust is not developed through statements from risk assessors but through the actions of the individuals who will be held responsible for any risk. These

assertations were confirmed by the fact that the meat scientist was perceived as having higher expertise than a consumer or reporter lacking expertise in the content domain.

The results of my study were consistent with previous research about information source (CFI, 2009; Sapp & Downing-Matibag, 2009; Yang & Hobbs, 2020). The significant difference between the combined dependent variable support Yang and Hobbs (2020) conclusion that the acceptance of scientific information not only depends on the way information is presented, but on who is presenting that information. It also aligns with the CFI (2009) proposal that influential others are one of three components contributing to trust. Influential others include family, friends, and credentialed experts who communicate information (CFI, 2009).

Additionally, my study provided further insight into the CFI's (2009) trust model, which includes competence as a component contributing to trust. The competence of information sources was perceived by participants as higher if they were directly involved in the production of the AAACS

Finally, the results of my study were consistent with the CFI's (2009) claim that confidence has larger impact on trust than competence does. Confidence is the demonstration that one shares similar values toward people, animals, and the environment. Communicating shared values is three to five times more important than sharing information (Sapp et al., 2009), and trustworthy communicators generate the most opinion change, regardless of whether they are perceived as an expert or not (McGinnies & Ward, 1980). Using an influential other, or information source, directly involved in the production of AAACS improved perceptions of competence, or source

expertise. This is evident because source expertise was considered in the discriminant function. However, the DFA results did not include credibility in the function. As predicted by the CFI (2009), this likely contributed to the reason trust and anticipated consumption behavior were also not included in the discriminant function.

The results of my study provide helpful insight about applying the ELM to successful communication about the AAACS. Information about agricultural innovations will be passively processed through the peripheral processing route because it is new information (Petty & Cacioppo, 1986). Successful processing through the peripheral processing route relies on peripheral cues rather than content (Petty & Cacioppo, 1986). Therefore, effective peripheral cues should be the focus of strategic communication efforts. The results of my study indicate that between information source and message frame, information source is the peripheral cue that impacts attitudes toward the AAACS. Additionally, the results indicate no interaction between these peripheral cues.

Finally, the results of my study indicate the potential misinterpretation of previous framing study results. For example, Yang and Hobbs (2020) conducted a framing study in which two independent variables were present in each treatment group (frame and information source). Different sources delivered the different message frames. Because of the study design, it is impossible to determine the effects of each independent variable and their interaction. The findings of Yang and Hobbs (2020) study may have been consistent with the findings in my study if other independent variables were controlled or a factorial design and factorial MANOVA was used to analyze data.

Recommendations

Research

Based on the results of my study, I recommend the use of more granular tools such as continuous response measures, eye tracking, and psychophysiology to understand the effects of message framing and information source on attitudes. These tools can provide data to better understand participants' responses during video consumption, rather than after. Measuring data this way can reveal real-time cognitive, affective, and behavioral responses that can be analyzed on a frame-by-frame basis.

Additionally, I recommend continued framing research in the context of communicating about agricultural innovations. Message framing (Bateson, 1972) has been a framework to guide a variety of communication research studies but has not been consistently applied in the context of agricultural communications. My recommendation is consistent with the science communication research agenda's suggestion for continued research regarding the effective framing or reframing of issues, how much framing matters, and when framing is best done (NASEM, 2017). The criteria used to develop two message frame treatment groups did not produce a significant difference in attitudes. Perhaps, however, following my study up with structural equation modeling would result in deeper understanding of the complex relationships among and between this set of independent and dependent variables I studies. Because the criteria used in previous studies investigating message frames has produced differences in attitudes between narrative and analytical message frames (Dahlstrom 2014; Dillard et al., 2017; Gordon et al., 2018; Graesser & Ottati, 1995; Randolph et al., 2021; Seo et al., 2018; Williams et

al., 2010b), future research should investigate what specific message frame characteristics contribute to differences in attitudes.

Additionally, continued research about food innovations such as the AAACS, should incorporate the big-picture idealism currently being applied to other research contexts. In climate change research, Representative Concentration Pathways are used to assess how outputs harmonize across various models and scenarios to ensure consistency with historical observations, while also evaluating scenario trends (Vuuren et al., 2011). Because agriculture and food systems face such complex challenges, there is a need for long-term, informed decision making to provide a foundation for continued research (Rosenzweig et al., 2021). To do this, Representative Agricultural Pathways have been developed for the purpose of modeling and projecting agricultural systems in the present and future by integrating global economic model data to explore the impacts of adaption options (Rosenzwieg et al., 2021). Perhaps agricultural communicators should apply this same concept to agricultural communication efforts. Representative Communication Pathways could provide insight regarding the development of communication strategies for the purpose of increasing acceptance that is consistent with literature and based on important communication models and theories including the ELM (Petty & Cacioppo, 1986), message framing (Bateson, 1972), the trust model (CFI, 2009), etc. Representative communication pathways, in the context of communicating about food innovations, may provide a helpful foundation to understand how communication strategies vary for emerging foods. Research should be done to understand if pathways differ based on animal-based products, vegetable-based products, cereal grain products,

or laboratory constructed products. Perhaps the time has come for conceptualizing the big-picture idealism of Representative Concentration Pathways, Representative Agricultural Pathways, and Representative Communication Pathways to understand how communication strategies are consistent, differ, and might impact future research and development for consumer acceptance.

I recommend future experimental factorial research designs to investigate message frames. The science communication research agenda recommends using randomized controlled field experiments to evaluate how specific communication approaches change people's understanding, perception, or use of science (NASEM, 2017). Using randomized controlled field experiments will allow specific characteristics of message frames to be evaluated. Additionally, I recommend using factorial designs with independent variables outside of message frame. These factorial designs should be analyzed using factorial MANOVA. A factorial MANOVA allows the effect of multiple variables to be analyzed, and their interaction to be evaluated. Continued framing research using this design provides insight about how message frame or other peripheral cues in a message impact attitudinal difference.

Additionally, I recommend following-up the significant one-way MANOVA for information source with univariate analysis of variance. It appears that there could be significant differences between information source on some of the dependent variables, independently. A univariate ANOVA may provide further insight about the most effective information source to use depending on the primary goal of communication content.

Additionally, I recommend research about the application of message framing strategies outside of traditional communication contexts. The interdisciplinary collaboration that took place during my study brought to light the potential to apply communication strategies, such as narrative message framing, into the curriculum design of meat sciences courses. In the same way the literature indicates benefits to strategic message framing when communicating agricultural innovations to the public, classroom performance may benefit from teaching complex science and agricultural topics using strategic framing strategies.

Continued research should also take place to understand the different identities of information sources that positively impact components of consumer attitudes. My study concluded that the identity of an information source can impact consumer attitudes, even when all other demographic characteristics are held constant. However, my study only evaluated four information source identities. It is critical to continue to evaluate different information source identities beyond a consumer, producer, reporter, and meat scientist. Research evaluating information source demographic characteristics (i.e., gender, race, age, education level) is also need. My study focuses on information source identity and controlled for demographic variables by using the same actor. However, research understanding how information source demographic characteristics impact attitudes toward messages could be valuable.

Furthermore, I recommend continued research to explore characteristics of information sources that produce differences in credibility and trust. The results of the DFA only indicated source expertise as significantly contributing to the discriminant

function. However, credibility and trust have a more profound impact on the effectiveness of communication efforts (Sapp et al., 2009). Better developing confidence (CFI, 2009), or evidence of shared values, will likely improve the adoption of the AAACS.

Further research should also be conducted to better understand interactions between message frame and information source. My study attempted to determine if differences in attitudes can be attributed to the way a message is presented or who presents the message. However, there was no investigation of the point that narrative elements of a message may be perceived as inauthentic coming from a meat scientist or at what point do analytical elements of message no longer appear to be genuine when delivered by a consumer, reporter, etc. Further research is recommended to understand the message characteristics that different information sources can deliver in a well-perceived, genuine, and natural way.

Additionally, future research should replicate the study using a Generation Z spokesperson or influencer. Although college students generally come from a higher socio-economic demographic, they are often cash strapped and may not have discretionary income to purchase more expensive products such as meat cured with the AAACS. It was surprising that they were not more highly influenced by the affective treatment of a narrative message frame. It could be a possibility that the actor selected to deliver the different messages was too mature or different to connect with a Generation Z demographic. This further confirms the conclusion that developing the information

source and character to connect with an audience may be more important than the message characteristics.

I also recommend applying the listen, ask, share model (CFI, 2009) to future communication research in the context of food and food production innovations such as the AAACS. Future studies should be designed to understand the concerns, priorities, and values of consumers, which would fulfill the listen component of the model (CFI, 2009). In the next phase of understanding the target audience, research should be done to ask consumers for more information about what has already been learned about them. It should be apparent to consumers that agriculturalists would like to learn more about their opinions and perspectives (CFI, 2009). Additionally, learning about consumers clarifies how to best communicate information. Communication and marketing efforts should illustrate, or share, value alignment with consumers, which can be done by sharing how the values of an information source (such as a meat scientist, or someone directly involved with the production of the AAACS) aligns with the values of the target audience.

Finally, after introducing the AAACS to the market, real market research must be conducted. Although participants can indicate what they would expect their consumption behavior to be, nothing is more accurate than actual consumption behavior. Real market research will provide accurate insight into what peripheral cues are most effective in improving attitudes and encouraging consumption of the AAACS.

Practice

When the AAACS comes on market and is publicly available, marketing and communication specialists should not prioritize message frame as a peripheral cue to effectively communicate, market, and sell the product. Message frame did not have an impact on the combined dependent variable of information recall, trust, source expertise, source credibility, and anticipated consumption behavior. Strategically selecting the source of information that delivers the message should be prioritized, instead, because the information source did significantly impact the combined dependent variable. Also, communication practitioners who are preparing and disseminating information about the AAACS should focus on conveying shared values through the information source, rather than the message frame. My study indicated that, in the context of communicating about the AAACS, changing the source of information had significant impact on attitudes, while changing the message frame did not.

Furthermore, when communicating about agricultural innovations, the information source should be directly involved with the production of the agricultural innovation. The results of my study indicated that a source directly involved with the innovation will produce higher information recall, trust, source expertise, source credibility, and anticipated consumption behavior. Thus, practitioners should prioritize dedicating resources to building the information source's credibility and should convey to audiences that the information source has values that align with their own. If audiences can relate and connect to experts, their communication efforts will be three to five times more effective (Sapp et al., 2009).

Using an information source with higher expertise is not enough to build consumer trust. Besley et al. (2021) concluded that a scientist can portray competence, but not warmth, benevolence, or other important characteristics contributing to trust. Rather than attempting to connect to values through specific messaging strategies, communicators should identify opportunities to illustrate that the information source possesses those values. This recommendation aligns with Besley et al.'s (2021) hope to shift the objectives of science communicators beyond promoting knowledge to objectives such as shaping perceptions of scientists. One way to do this is by establishing clear shared values between the scientists communicating about innovations.

Finally, agricultural communication practitioners should prioritize resources to teach scientists and agriculturalists how to communicate about their work and connect to their target audience. The results of this study indicate that meat scientists will contribute to higher information recall, trust, source expertise, and source credibility when communicating about the AAACS. Additionally, it is unreasonable to expect communication experts to grasp and accurately convey all aspects of the complex topics they may have to communicate. It may be more manageable and effective to have agricultural communicators train scientists to effectively communicate their own work and connect with their audiences, than communicate about so many complex topics, themselves.

The findings from this study underscore the need to develop graduate students, particularly Ph.D. students, with expertise to be their own spokesperson. Programs such as the USDA-sponsored Texas A&M University System Science Influencers (Science

Influencers, 2022) hold great promise in developing the next generation of scientists as knowledge influencers.

Outside of university programs, many scientists have already began working with science communication trainers to develop communication skills (Besley et al., 2016). However, communication trainers often focus on knowledge building (Besley et al., 2016). This is not effective because literature suggest that increasing knowledge does not change attitudes about a topic (Bauer et al., 2007; Besley et al., 2021). Communication practitioners should expand these training resources beyond teaching scientists to communicate in a way that builds knowledge. They should develop curriculum focused on teaching effective communication strategies to scientists and agriculturalists, which will continue to enable experts to frame and disseminate their work in a way that the public not only understands but can also connect to their daily lives.

Theory

The ELM informs how individuals process information. I recommend further research to expand the ELM so that communicators better understand what peripheral cues will change information from being passively processed through the peripheral processing route to actively processed through the central processing route (Petty & Cacioppo, 1986).

Additionally, I recommend research to expand the theoretical framework of message framing (Bateson, 1972). Although there has been research suggesting the importance of message framing, this theoretical framework does not inform what specific framing strategies positively impact attitudes. Incorporating the framework of

message framing with the ELM or other theoretical frameworks that guide communication research could provide important information about effective communication strategies.

Summary

Communicating about agricultural innovations such as the AAACS is difficult even though the public must integrate scientific information with their values to make daily decisions (NASEM, 2017). Science-based topics are polarizing in nature (Baker et al., 2021) and consumers are inundated with information (Fischer et al., 2020). The growing gap between agricultural production and consumption (White et al., 2014) and decades of consumer concern around the health impacts of curing meat (Sindelar & Milkowski, 2012), paired with misguidance to reduce red meat and processed meat consumption (Teicholz, 2020) present unique challenges for effectively communicating about a meat curing innovation.

My study was designed to address the science communication research agenda's recommendation to understand the best strategies for communicating contentious issues when there is distrust in science (NASEM, 2017). The process of selecting, organizing, and interpreting information about a new product plays an important role in acceptance, likeliness to purchase, future consumption, and industry competitiveness (Grunert et al., 2011). The results from my study can help us to better understand consumer attitudes toward the AAACS and its success on the market.

Two peripheral cues in a message about the AAACS were manipulated to evaluate their impact on the effective passive processing of information about the

AAACS. The results of my study indicate that when communicating about the AAACS innovation, shared values should be illustrated through the information source delivering the message, rather than through message framing strategies.

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APPENDIX A

VIDEO SCRIPTS

Analytical Frame Script

Cured meat products include, but are not limited to, sausages, bacon, hams, jerky, dried meat products, and fermented/acidulated products. Currently, the primary method for curing meat is by the direct addition of sodium nitrite. Sodium nitrite is a highly reactive crystalline salt functioning as an oxidizing, reducing, or nitrosylating agent. When added to meat, it serves as an antimicrobial and antioxidant, contributing to a longer shelf life. Sodium nitrite generates nitric oxide which, when bound to muscle myoglobin, produces the cured pink color.

The indirect addition of sodium nitrite, through high nitrite sources like vegetable powder, have been explored as alternatives to conventional meat curing. However, no single ingredient exists that replaces the color, flavor, shelf life, and safety of curing meat with sodium nitrite.

Previous research trials indicate that an amino acid-based alternative meat curing system can produce cured meat color and provides an antimicrobial and antioxidant effect similar to conventional curing. The addition of L-arginine, an amino acid found in muscle cells, can activate the endothelial nitric oxide synthase (eNOS) system which generates nitric oxide and residual nitrite.

Meat scientists investigated the feasibility of adding L-arginine to post rigor skeletal muscle, or meat, and evaluated its impact on the eNOS system's ability to generate nitric oxide and residual nitrite. Results indicated that L-arginine concentrations of 1000 to 4000 ppm for beef, 1000 to 3000 ppm for pork, and 1000 to 2000 ppm for poultry generated residual nitrite values comparable to sodium nitrite treated beef, pork,

and poultry samples. This indicates that an amino acid-based alternative curing system has the potential to replace synthetic sodium nitrite used in conventional curing and the indirect addition of sodium nitrite in alternative meat curing systems.

Narrative Frame Script

Sodium nitrite keeps the bacon that complements our sunny side up eggs sizzling, our holiday hams pink and juicy, and our grilled hotdogs just right at the Texas A&M tailgates. Most meat products are cured by the direct addition of sodium nitrite, which produces the distinctive cured color, satisfying flavor, and long shelf-life of our favorite cured meat products.

However, people are worried about their health when consuming conventionally cured meat. Concerns around synthetic nitrite, paired with worry about carcinogenic compounds, contribute to demand for alternative meat curing systems. Although scientists have explored alternatives like the indirect addition of sodium nitrite, through high nitrite sources like vegetable powder, no single ingredient exists to replace the color, flavor, shelf life, or safety of conventional curing.

But, thanks to the hard work and dedication of meat scientists at Texas A&M, cured meat products like the pepperoni on your pizza or bologna in your sandwich, could potentially be cured without the direct, or indirect, addition of sodium nitrite. The possibility exists to add L-Arginine to meat products, activating the endothelial nitric oxide synthase system, naturally found in meat, to produce nitric oxide and residual nitrite. These are the same compounds our body forms when we eat our vegetables, like our parents always told us to.

This amino acid-based alternative meat curing system could provide us with a more natural alternatively cured meat product. There's potential to capitalize on an enzyme already found in meat, using an amino acid we need, to produce the same shelf-

life that keeps our summer sausage good all summer long, the familiar array of colors on a charcuterie board at an elegant wine night, and tasty flavors and unique textures we appreciate about cured meat classics eaten at sporting events, holiday dinners, and backyard barbecues.

APPENDIX B

INSTRUMENT DEVELOPMENT

Initially, 23 (n = 23) items were used to measure four dependent variables including information recall, trust, source credibility, and anticipated consumption behavior. However, throughout the course of instrument development, the dependent variables and the items measuring the variables evolved. I selected the initial four dependent variables based on the tripartite classification of attitudes, which breaks attitudes into three components—cognitive, affective, and behavioral (Ostrom, 1969)—and recommendations from the science communication research agenda (NASEM, 2017). Information recall items measured the cognitive component of an attitude, trust and source credibility items were initially selected to measure the affective component of an attitude, and anticipated consumption behavior items measured the behavioral component of an attitude.

Cognitive

The dependent variable information recall measured the cognitive component of an attitude. Initially, I developed five items (n = 5) to measure information recall. Information recall items were multiple choice questions with five possible answers. I developed information recall items with the intention that the answer to each multiple-choice question would be found in the analytical and narrative message scripts. A meat science expert instrumental in research about the AAACS reviewed and revised the information recall items.

Participants received one point for each multiple-choice question they answered correctly. Information recall scores could initially range from 0–5. Qualtrics randomized the viewing order of the five possible answers to reduce bias.

Affective

In the pilot instrument, I used trust as source credibility as the dependent variables measuring the affective component of an attitude. The pilot instrument measured trust with five items from a scale developed by Ohanian (1990). The dependent variable source credibility was measured with a combination of five items from the instrument developed by Ohanian (1990) and an additional four items from an instrument developed by Besley et al. (2021). Seven-point semantic differential scales with bipolar adjectives or phrases (1 = negative; 7 = positive) measured the trust and source credibility dependent variables.

Ohanian (1990) Instrument. Ohanian (1990) developed and rigorously tested an instrument to measure perceptions of celebrity endorsers' trustworthiness, expertise, and attractiveness. Ohanian (1990) followed psychometric scale-development procedures to develop the instrument. A large pool of items was tested to determine the reliability and validity of the scale (Ohanian, 1990).

Although the scale was originally developed to measure celebrity endorsers' perceived trustworthiness, expertise, and attractiveness, it has been used in a variety of other research contexts. Variations of Ohanian's (1990) instrument have been applied to the context of an emerging economy (Gaur et al., 2012) to evaluate an online non-profit organization's communication (Corina, 2006) to investigate how message trust in online word-of-mouth influences consumer behavior in the context of food blogs (Ho & Chien, 2010), and evaluate how trust changes throughout a video about agriculturalists (LaGrande et al., 2021).

In the initial phases of instrument development, Ohanian (1990) reviewed literature in the areas of psychology, mass communication, and advertising to identify words, phrases, or adjectives that have been used to measure traits associated with credible sources. Ohanian (1990) screened out extreme words and words denoting temporary states. Ohanian (1990) tested the remaining words with a group of college students. If 25% or more college students indicated the word as unfamiliar, it was culled. Finally, Ohanian (1990) presented college students with the definition of trust, expertise, and attractiveness and asked them to indicate if items belonged to any of those dimensions. Ohanian (1990) retained items with 75% or more agreement.

To assess the structure of the scale and purify it, I ran an exploratory factor analysis (EFA). Ohanian (1990) used the EFA to reduce the list. Then, the remaining items were tested for reliability. Those with the lowest item-to-total correlation were deleted. Next, Ohanian (1990) tested the scale's reliability and validity with a confirmatory factor analysis. Cronbach's alpha values were used to determine the internal consistency of each construct. Cronbach's alpha values can be interpreted as ≥ .90 is excellent, ≥ .80 is good, ≥ .70 is acceptable, ≥ .60 is questionable, ≥ .50 is poor, and ≤ .50 is unacceptable (George & Mallery, 2003).

After rigorously testing the instrument, the five items used to measure the trust dimension of Ohanian's (1990) instrument included trustworthiness, reliability, dependability, honesty, and sincerity. The trust construct had a Cronbach's alpha of .90, indicating internal consistency. The five items included by Ohanian (1990) in the expertise dimension of the instrument included expert, experienced, knowledgeable,

qualified, and skilled. The expertise construct had a Cronbach's alpha of .89, indicating internal consistency. Finally, Ohanian (1990) included attractive, classy, beautiful, elegant, and sexy as the five items measuring attractiveness. The attractiveness dimension had a Cronbach's alpha of .89, indicating good internal consistency. Ohanian (1990) then used a nomological validity test to validate the final instrument.

I only included the trust and expertise dimensions of Ohanian's (1990) instrument in my study's pilot instrument. I did not use the attractiveness dimension because the actor for each source of information remained consistent in all eight test conditions. Additionally, this construct did not address any of the three overarching research questions. The five-item trust dimension of Ohanian's (1990) instrument was included in the pilot instrument of my study to measure the dependent variable of trust. The five-item expertise dimension from Ohanian's (1990) instrument was combined with four items from Besley et al.'s (2021) instrument to measure source credibility.

Besley et al.'s (2021). In the initial instrument, the five items measuring source expertise from Ohanian's (1990) instrument were combined with four items used to measure public perceptions of scientists, developed though the examination of existing scales and a national survey. Top journals in science, environmental, and risk communication including *Public Understanding of Science, Science Communication, Risk Analysis, International Journal of Science Education Part B,* and *Environmental Communications* were examined for all scales measuring trust, credibility, and fairness in the last five years. Additionally, highly cited scales from other disciplines were also included. Initially, 88 measures from 40 articles were collected. Thirty items were

eliminated because they were repetitive or problematic in some way. Then, Besley et al. (2021) delivered a national survey with 58 trust-related concepts. The survey was disseminated using Qualtrics. A four-factor solution was run twice and variables with overlap were eliminated. Besley et al.'s (2021) study indicates that using a unidimensional measure of trust is an oversimplification of the dimension.

The four factors Besley et al.'s (2021) found were added to Ohanian's (1990) five items to incorporate a more holistic measurement of source credibility. These additional four items were competence, integrity, good will, and openness (Besley et al., 2021). A total of nine items were included in the pilot instrument to measure source credibility including expert, experienced, knowledgeable, qualified, skilled (Ohanian, 1990), competent, has integrity, has good will, and open (Besley et al., 2021).

Behavioral

The dependent variable anticipated consumption behavior measured the behavioral component of an attitude. Four items (n = 4) were developed to measure anticipated consumption behavior at varying levels. Six-point Likert scales measured each of the four anticipated consumption behavior items (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree). Anticipated consumption behavior items asked about participants' interest in learning more about products cured by the AAACS, consuming products cured by the AAACS, purchasing products cured by the AAACS, and purchasing products cured by the AAACS instead of conventionally cured meat products.

Instrument Validity and Reliability

Many strategies were used to establish reliability and validity of the instrument. An expert panel evaluated the instrument to establish face and content validity (Fraenkel & Wallen, 2008). To establish reliability of the multiple-choice information recall items, the test-retest method for testing reliability was used (Fraenkel & Wallen, 2008). Although the trust and source credibility components of the instrument have been through a rigorous process to establish reliability and validity (Ohanian, 1990; Besley et al., 2021), the entire instrument was also piloted to establish reliability. Finally, an exploratory factor analysis was used to adjust the attitudinal variables measured and the way items factored onto each construct. Table 19 provides a summary of adjustments made to the instrument throughout the different phases of instrument development.

Table 19

Summary of Instrument Development Phases

Phase	Adjustment
Expert Panel	The wording and presentation of instructions and items were adjusted.
Test-Retest	One information recall item deleted
Pilot Instrument	No adjustments made.
Exploratory Factor Analysis	Source credibility items were split into two dependent variables including source credibility and source expertise.

Validity

A panel of five content experts (n = 5) evaluated the trust, source credibility, and anticipated consumption behavior constructs of the pilot instrument to establish face and content validity. I provided each panelist with the instrument and asked for feedback to improve it. I gave panelists six questions to guide their critique. The questions included whether there were any ambiguities or misunderstandings, if items were confusing, if

items could result in hostility or embarrassment, if there were any problems with leading, if there was bias due to question order, and whether the questions were clear.

Based of feedback from the expert panel, I made some minor adjustments to the wording and presentation of the instructions and items. However, no changes were made to the constructs or items within the instrument. Additionally, no changes were made to the measurement of items.

Reliability

Test-Retest. To establish the reliability of the information recall items, the test-retest method was used. The test-retest method requires an initial test be administered to a group of individuals. Then, after a certain amount of time has elapsed, the same test must be administered to the same group of individuals (Fraenkel & Wallen, 2008). Twenty TAMU students (n = 20) from agricultural communications and journalism courses were administered the original five multiple choice questions measuring information recall. After 10 days had elapsed, the same 20 students were administered the same five questions.

The reliability of the pilot information recall questions was measured using Cramer's V. Phi, which measures the strength of an association between two categorical variables in a 2x2 contingency table (Akoglu, 2018). When both variables have only two categories, phi and Cramer's V are identical. When variables have more than two categories, Cramer's V is most useful because it can attain its maximum of one (Field, 2018), without negative values (Akoglu, 2018). Cramer's V is like Pearson's correlation coefficient. Values close to zero mean no association and values larger than .25 have a

very strong relationship (Akoglu, 2018). The reliability of the pilot information recall questions was measured using Cramer's V. Cohen (1998) suggests that a large correlation is indicated by Cramer's V ≥ .50, a medium correlation by Cramer's V ≥ .30, and a small correlation by a Cramer's V ≥ .10.

After using Cramer's V to determine the reliability of information recall questions and evaluating the content of the videos, four of the five original information recall multiple choice questions were retained for use in the final instrument. When pre-test and post-test answers were compared, question two (Where is the endothelial nitric oxide synthase system located?) had the lowest Cramer's V value of the five questions (Cramer's V = .39). While this value still indicates a strong correlation according to Akoglu (2018), it is only a medium correlation according to Cohen (1998). After consulting the meat scientist expert, I concluded that the video scripts did not provide adequate information for participants to answer question two. Question two was not a valid measure of information recall and I eliminated it as an item to measure information recall.

All other information recall items from the pilot instrument were kept for the final instrument. Question one (What is the conventional meat curing method used to cure most meat products?) had a Cramer's V indicating a strong correlation (Cramer's V = .53) (Cohen, 1998). Question three (When curing meat using the new alternative meat curing system, what is added to meat?) had a Cramer's V indicating a strong correlation (Cramer's V = .54) (Cohen, 1998). Question four (What system does L-arginine activate?) had a Cramer's V indicating a strong correlation (Cramer's V = .50) (Cohen,

1998). Question five (When activated, what does the endothelial nitric oxide synthase system produce?) had a Cramer's V indicating a medium correlation (Cramer's V = .46) according to Cohen (1998) and strong correlation according to Akoglu (2018).

Pilot Instrument. A pilot version of the instrument was disseminated to TAMU students enrolled in agricultural communications and journalism courses to test the internal consistency of trust, source credibility, and anticipated consumption behavior items. A total of 50 students (n = 50) completed the pilot instrument. Cronbach's alpha values were used to determine the internal consistency of the pilot instrument.

All items included in the pilot instrument had good or excellent internal consistency (George & Mallery, 2003). The Cronbach's alpha value of the trust construct of the pilot instrument was .80, indicating good internal consistency. Trust items and the way they were measured did not change between the pilot and final instrument. The source credibility construct of the pilot instrument included nine items and had excellent internal consistency (George & Mallery, 2003). The Cronbach's alpha value was .93. The source credibility items and the way they were measured did not change between the pilot and final instrument. Finally, no adjustments were made to the anticipated consumption behavior construct for the final instrument. The anticipated consumption behavior construct had a Cronbach's alpha value of .80, indicating good internal consistency (George & Mallery, 2003).

Refining the Instrument

After I made the above-mentioned adjustments, the final instrument was disseminated through the TAMU bulk email system. Because items from two different

instruments were combined, an exploratory factor analysis assessed the underlying latent constructs to ensure construct validity (Field, 2018) after data collection ended. Additionally, during initial data analysis, there was an issue with multicollinearity due to a correlation between trust and source credibility (r = .72). The exploratory factor analysis was conducted to determine how the variables of trust and source credibility could be combined or broken apart.

The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were used to confirm that data met the criteria for performing an EFA (Williams et al., 2010a). KMO was used to assess the adequacy of the sample size needed to conduct an EFA (Kaiser, 1960). A KMO value above .5 indicates sample adequacy (Williams et al., 2010a). The KMO measure of sample adequacy was .94, which confirms that the data meets the criteria for performing an EFA. Bartlett's test of sphericity was used to examine the degree of interrelationships among factors (Bartlett, 1950). Bartlett's test of sphericity must have a significance level of $p < .05$ for an adequate degree of interrelationships among factors (Williams et al., 2010a). In this case, interrelationships among factors were appropriate for EFA because $p < .001$.

Principal axis factoring for the EFA was used to extract factors (Field, 2018). Eigenvalues were used to determine the number of extracted factors (Tabachnick & Fidell, 2019). Eigenvalues, an estimate of variance explained by a factor, were used to determine the number of extracted factors, were used to determine the number of extracted factors (Tabachnick & Fidell, 2019). An eigenvalue cut-off greater than 1.0 indicates greater-than-average variance (Ferguson & Cox, 1993).

Factor rotation is a method to interpret a factor structure by maximizing the loading of variables with strong associations and minimizing the loading of variables with weaker associations (Costello & Osborne, 2005). Oblique rotation allows researchers to explore correlations among factors under the assumption that extracted factors are not completely independent (Preacher & MacCallum, 2003). I used the oblique rotation due to assumed correlations among factors.

I hypothesized two factors for the 14 items used to measure the affective component of an attitude. I anticipated trust would be one factor and five items would load onto it. I expected source credibility to be the second factor and have nine items load onto it. However, items loaded onto three different factors in the EFA.

The three-factor structure demonstrated very good factor loading. The three factors accounted for 76.72% of total variance. Factor one consisted of five items with factor loadings ranging from .72 to .91. Factor one accounted for 59.19% of total variance, which was the most variance accounted for by one factor. Factor two had six items with factor loading from -.52 to -.99. Factor two accounted for 9.18% of total variance. Factor three consisted of three items with factor loadings ranging from .69 to .89. Factor three accounted for 8.35% of total variance. Table 20 illustrates the factor loading structure matrix after oblique rotation.

Table 20

Exploratory Factor Analysis (n = 266)

Item	Factor		
	Trust[a]	Source Expertise[b]	Source Credibility[c]
Reliability	.91		
Dependability	.90		
Trustworthiness	.83		
Honesty	.80		
Sincerity	.72		
Expertise		-.99	
Experience		-.92	
How Qualified		-.89	
Knowledgeable		-.80	
Skill		-.75	
Competence		-.52	
Goodwill			.89
Openness			.89
Integrity			.69

Note. Each item was measured with a seven-point semantic differential scale, using bipolar adjectives (1 = negative; 7 = positive).

[a]Cronbach's alpha = .90; [b]Cronbach's alpha = .94; [c]Cronbach's alpha = .87.

Each extracted factor was labelled based on an analysis of the items that loaded onto it. Based on the results of the EFA, the two dependent variables measuring the affective component of an attitude were adjusted to three dependent variables. The two dependent variables measuring the affective component of an attitude became three dependent variables and included trust, source expertise, and source credibility. Cronbach's alpha was then used to examine the overall internal consistency of the new factors (Cronbach & Meehl, 1995).

A factor correlation matrix of the three new factors revealed that trust and source expertise have a bivariate relationship of r = -.65. Trust and source credibility have a

relationship of r = .54. Source expertise and source credibility have a relationship of r = -.52.

Final Instrument

I included one screening question in the final instrument to determine the potential participants' age range to ensure the individuals in the sample were older than 18 and part of Generation Z.

The instrument included 22 items (n = 22) measuring five dependent variables. The instrument measured the dependent variables—information recall, trust, source expertise, source credibility, and anticipated consumption behavior—and six demographics (Appendix C).

Cognitive Items

Information Recall. The dependent variable information recall evaluated the cognitive component of an attitude, and it was measured with four multiple choice questions (n = 4). The information recall items were created and adjusted under the advisement of a meat science expert. The multiple-choice questions tested what information participants could recall after watching the video about the AAACS. Both the analytically framed and narratively framed script contained content that answered each of the four multiple choice questions. Each question had five possible options for participants to choose. Participants received a score from 0–4 to measure the dependent variable information recall (Table 21).

Table 21
Information Recall Item Development Phases

	Test-Retest Information Recall Items	Final Instrument Information Recall Items
Item 1	What is the conventional meat curing method used to cure most meat products?	What is the conventional meat curing method used to cure most meat products?
Item 2	Where is the endothelial nitric oxide synthase system located?	When curing meat using the new alternative meat curing system, what is added to meat?
Item 3	When curing meat using the new alternative meat curing system, what is added to meat?	What system does L-arginine activate?
Item 4	What system does L-arginine activate?	When activated, what does the endothelial nitric oxide synthase system produce?
Item 5	When activated, what does the endothelial nitric oxide synthase system produce?	

Note. Each item was presented as multiple-choice question with five possible answers. For the final instrument, participants could receive a score from 0–4 by earning one point for each correct answer.
[a]Cramer's V = .53; [b]Cramer's V = .54; [c]Cramer's V = .50; [d]Cramer's V = .46.

Affective Items

Trust. The instrument included trust, source expertise, and source credibility as the three dependent variables measuring the affective component of an attitude. Trust was measured using five semantic differential scales with bipolar adjectives (n = 5). Participants selected one of seven points on a differential scale between two bipolar adjectives that described a dimension of trust (1 = negative; 7 = positive). The adjectives presented on semantic differential scales were trustworthy/untrustworthy, reliable/unreliable, dependable/undependable, honest/dishonest, and sincere/insincere

(Ohanian, 1990). The trust component of the final instrument had internal consistency (George & Mallery, 2003), with a Cronbach's alpha value of .90.

Source Expertise and Credibility. After the exploratory factor analysis, the original single dependent variable source credibility was divided into the two dependent variables including source expertise and source credibility. I measured source expertise with six items (n = 6) and measured source credibility with the remaining three items (n = 3).

The new dependent variable source expertise included the five items from Ohaninan's (1990) instrument (i.e., expert, experienced, knowledgeable, qualified, skilled) and one item from Besley et al.'s (2021) instrument (i.e., competence). Each of the six items were presented as a semantic differential scale using bipolar adjectives or phrases and seven possible selection points (1 = negative; 7 = positive). The adjectives or phrases presented on the semantic differential scales were expert/not an expert, experienced/inexperienced, knowledgeable/unknowledgeable, qualified/unqualified, skilled/unskilled, and competent/incompetent. The Cronbach's alpha value of the source expertise construct of the final instrument was .94, indicating internal consistency (George & Mallery, 2003).

The source credibility construct included the three items (n = 3) from Besley et al.'s (2021) instrument that factored together in the EFA. The three items were integrity, good will, and openness (Besley et al., 2021). The three dimensions were measured using semantic differential scales with bipolar adjectives or phrases and seven possible selection points (1 = negative; 7 = positive). The bipolar adjectives and phrases

presented as semantic differential scales were has integrity/does not have integrity, has goodwill/does not have goodwill, and open/not open. The source credibility component was internally consistency with a Cronbach's alpha value of .87. Table 22 shows how the affective dependent variables and the items measuring them evolved over the course of instrument development.

Table 22
Affective Item Development Phases

Dependent Variable	Before EFA	Final Instrument After EFA
Trust[a]	Dependability	Dependability
	Honesty	Honesty
	Reliability	Reliability
	Sincerity	Sincerity
	Trustworthiness	Trustworthiness
Source Expertise[b]		Expertise
		Experience
		Knowledge
		Qualification
		Skill
		Competence
Source Credibility[c]	Expertise	Integrity
	Experience	Goodwill
	Knowledge	Openness
	Qualification	
	Skill	
	Competence	
	Integrity	
	Goodwill	
	Openness	

Note. Each item was measured with a seven-point semantic differential scale using bipolar adjectives (1 = negative; 7 = positive).
[a]Cronbach's alpha for the construct in the final instrument =.90; [b]Cronbach's alpha for the construct in the final instrument = .74; [c]Cronbach's alpha for the construct in the final instrument = .87.

Behavioral Items

The dependent variable anticipated consumption behavior measured the behavioral component of an attitude. To measure participants' anticipated consumption behavior of products cured with the AAACS, I used six-point Likert scales (Fraenkel & Wallen, 2008) of 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree. Four consumption-oriented questions (*n* = 4) were asked regarding various levels of anticipated consumption behavior. The anticipated consumption behavior construct of the final instrument was internally consistent with a Cronbach's alpha of .84. Besides minor adjustments to the way the instructions were worded and presented, the anticipated consumption behavior items did not change throughout the course of instrument development. Table 23 includes the items measuring anticipated consumption behavior.

Table 23
Anticipated Consumption Behavior Items

	Final Instrument
Item 1	I am <u>interested in learning more about</u> meat products cured with this new, amino acid-based alternative curing system.
Item 2	I would <u>consume</u> a meat product cured with this new, amino acid-based alternative curing system.
Item 3	I would <u>purchase</u> a meat product cured with this new, amino acid-based alternative curing system.
Item 4	I would purchase a meat product cured with this new, amino acid-based alternative curing system <u>instead of</u> a conventionally cured meat product.

Note. Measured with six-point Likert scales of 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree.

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APPENDIX C

FINAL INSTRUMENT

Effects of Framing & Information Source on Information Recall, Trust, Perceived Source Expertise, & Anticipated Consumption Behavior of an AAACS

Texas A&M University Human Research Protection Program
INFORMED Consent Document

What should you know about the research study?

- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.

Who can I talk to?

If you have questions, concerns, or complaints, or think the research has hurt you, talk to Amber Chambers at (979) 458-2304 or amberchambers@tamu.edu.

Why is this research being done?

Communicating about agricultural innovations is challenging. This research is being done to better understand what message frames and information sources positively impact cognitive, affective, and behavioral components of attitudes toward agricultural innovations.

How long will the research last?

It will take about 10-15 minutes to watch a short video and complete the questionnaire. You will need to complete the survey in one sitting as you will not be able to return to the survey at a later time.

What happens if I say "Yes, I want to be in this research"?

- If you decide to participate, you will click "Continue" and continue on to the questionnaire.
- After answering a screening question, you may be asked to watch a 2 minute video about an alternative meat curing system.
- After watching the short video, you will answer the remaining questions in the questionnaire.

What happens if I do not want to be in this research?

You can leave the research at any time and it will not be held against you. No direct personal identifiers will be collected at any point during data collection. You will not be asked to explain the reason for your withdrawal.

What happens to the information collected for the research?
No direct personal identifiers will be collected. Results from this research study will be disseminated at research conferences and submitted for publication in a peer reviewew journal. However, no one will be able to identify you. Additional details can be found in the informed consent document.

The HRPP determined on March 08, 2022 that this research meets the criteria for Exemption in accordance with 45 CFR 46.104.

IRB Number: IRB2022-0014M
IRB Approval Date: 03/08/2022
IRB Expiration Date: 03/08/2025

○ Continue

○ I Do Not Wish to Continue

What is your age?

○ Under 18

○ 18-29

○ 30+

Please watch this short video about an alternative meat curing system that meat scientists at Texas A&M University have been working on.

*Respondents randomly assigned to watch one of the eight videos about an amino acid-based alternative meat curing innovation.

- Consumer delivering an analytically framed message
- Consumer delivering a narratively framed message
- Producer delivering an analytically framed message
- Producer delivering a narratively framed message
- Reporter delivering an analytically framed message
- Reporter delivering a narratively framed message
- Meat scientist delivering an analytically framed message
- Meat scientist delivering a narratively framed message

For the following five questions, please indicate the degree to which the adjectives describe the message you just watched.

	Undependable						Dependable
	○	○	○	○	○	○	○
	Dishonest						Honest
	○	○	○	○	○	○	○
	Unreliable						Reliable
	○	○	○	○	○	○	○
	Insincere						Sincere
	○	○	○	○	○	○	○
	Untrustworthy						Trustworthy
	○	○	○	○	○	○	○

For the following nine questions, please indicate the degree to which the adjectives or statements best describe your perception of the speaker's credibility.

	Not an Expert						An Expert
	○	○	○	○	○	○	○

	Inexperienced						Experienced
	○	○	○	○	○	○	○

	Unknowledgeable						Knowledgeable
	○	○	○	○	○	○	○

	Unqualified						Qualified
	○	○	○	○	○	○	○

	Unskilled						Skilled
	○	○	○	○	○	○	○

	Incompetent						Competent
	○	○	○	○	○	○	○

	Does Not Have Integrity						Has Integrity
	○	○	○	○	○	○	○

	Does Not Have Goodwill						Has Goodwill
	○	○	○	○	○	○	○

	Not Open						Open
	○	○	○	○	○	○	○

As a consumer, please indicate how strongly you agree or disagree with the following four statements regarding your consumption intentions.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I am interested in learning more about meat products cured with this new, amino acid-based alternative curing system.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I would consume a meat product cured with this new, amino acid-based alternative curing system.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I would purchase a meat product cured with this new, amino acid-based alternative curing system.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I would purchase a meat product cured with this new, amino acid-based alternative curing system instead of a conventionally cured meat product.	○	○	○	○	○	○

Please answer the following four questions about the content of the video you watched.

What is the conventional meat curing method used to cure most meat products?

- ○ The direct addition of vegetable powder
- ○ The direct addition of sodium nitrite
- ○ The indirect addition of amino acids
- ○ Endothelial injection
- ○ The indirect addition of nitric oxide

When curing meat using the new alternative meat curing system, what is added to meat?

- ○ Sodium nitrite
- ○ L-arginine
- ○ Asparagine
- ○ Vegetable powder
- ○ Glycine

What system does L-arginine activate?

- Nitrosylation system
- Digestive system
- Endothelial nitric oxide synthase system
- L-arginine system
- Adenosine triphosphate system

When activated, what does the endothelial nitric oxide synthase system produce?

- Organoleptic properties
- Nitric oxide and residual nitrite
- Amino acids
- Endothelial cells
- L-arginine

Please answer the following six demographic questions.

Meat curing is a method of preservation by treating meat with salt and sodium nitrite to inhibit the growth of pathogenic organisms. Meat curing often generates the internal pink color and enhances flavor.

Cured meat products include, but are not limited to, sausages, bacon, salami, pastrami, prosciutto, pepperoni, hams, jerky/dried meat products, and fermented/acidulated products.

How often do you consume cured meat products?

- Not at all
- Yearly

- ○ A few times a year
- ○ Monthly
- ○ A few times a month
  - ○ Once a week
- ○ A few times a week
- ○ Daily
- ○ Unsure

Which best describes you?

- ○ Undergraduate Student
- ○ Graduate Student
- ○ Other

Which college(s) do you belong to?

- ☐ College of Agriculture and Life Sciences
- ☐ College of Architecture
- ☐ Mays Business School
- ☐ College of Dentistry
- ☐ College of Education & Human Development
- ☐ College of Engineering

- [ ] School of Engineering Medicine
- [ ] College of Geosciences
- [ ] Bush School of Government & Public Service
- [ ] School of Law
- [ ] College of Liberal Arts
- [ ] College of Nursing
- [ ] Irma Lerma Rangel College of Pharmacy
- [ ] School of Public Health
- [ ] College of Science
- [ ] College of Veterinary Medicine & Biomedical Sciences
- [ ] Transition Academic Programs

How do you currently describe your gender identity?

- [ ] Male
- [ ] Female
- [ ] Nonbinary
- [ ] Additional Gender Category
- [ ] Prefer Not to Answer

Please specify additional gender category:

_____

Which categories best describe you? Select all that apply:

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic, Latino, or Spanish Origin
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Some other race, ethnicity, or origin
- ☐ I prefer not to answer

Please specify other race, ethnicity, or origin:

_____

Which is your home country?

▼ Afghanistan ... Zimbabwe

APPENDIX D

RECRUITMENT EMAILS

Initial Invitation Email

Howdy!

I am writing to ask for your help with a research study about an agricultural innovation developed right here at Texas A&M! As an Aggie, you are part of the population that has been selected for this research. The Texas A&M Agricultural Leadership, Education, and Communications (ALEC) Department has been collaborating with the Department of Animal Science to investigate how to effectively communicate about a new, alternative meat curing system. The goal of this study is to better understand effective strategies to communicate about agricultural innovations.

The survey is short. It usually takes about ten minutes to complete. You will watch a two-minute video and complete a short questionnaire. To begin the survey, use this link:

https://tamuag.az1.qualtrics.com/jfe/form/SV_daODd0UHpDnVEFg

No personally identifiable information will be collected from you and the survey is confidential. Your participation is voluntary. Should you have questions or comments, please contact me at (979) 458-2304 or amberchambers@tamu.edu .

This study will be in partial fulfillment of the requirements for me to earn a M.S. in Agricultural Leadership, Education, and Communications. Your participation will help me graduate!

I really appreciate your help with this study. Thanks & Gig 'Em!

IRB Number: IRB2022-0014M
IRB Approval Date: 03/08/2022
IRB Expiration Date: 03/08/2025

First Follow-Up Email

Howdy!

Last week, we sent an e-mail to you asking for your participation in a study regarding effective communication strategies about an alternative meat curing system that is being explored by Texas A&M meat scientists.

If you have already completed the survey, thank you! If you haven't completed the survey, you can access it through this link:

https://tamuag.az1.qualtrics.com/jfe/form/SV_daODd0UHpDnVEFg

This study is a collaborative effort between Texas A&M University's Animal Science and Agricultural Leadership, Education, and Communications (ALEC) departments. In a time when people are seeking accurate information about their food, we feel research about the effective communication of agricultural and food innovations is critical.

Your response is voluntary, and we appreciate you considering our request!

Thanks & Gig 'Em!

IRB Number: IRB2022-0014M
IRB Approval Date: 03/08/2022
IRB Expiration Date: 03/08/2025

Second Follow-Up Email

Howdy!

Recently, we sent you an e-mail asking you to complete a survey about a new meat curing innovation being explored by Texas A&M meat scientists. If you have already completed this survey, thank you! We truly appreciate your help.

If you have not taken the survey, it should only take about ten minutes to complete. Simply click on the link below to begin.

https://tamuag.az1.qualtrics.com/jfe/form/SV_daODd0UHpDnVEFg

This study will provide insight about how to effectively communicate agricultural innovations to the public. Additionally, I will be using the data to write my thesis in partial fulfillment of the degree requirements for a M.S. in Agricultural Leadership, Education, and Communications (ALEC). Your participation will help me graduate!

If you have questions or comments, please contact me at (979) 458-2304 or amberchambers@tamu.edu.

Thank you for your help! Gig 'em.

IRB Number: IRB2022-0014M
IRB Approval Date: 03/08/2022
IRB Expiration Date: 03/08/2025

Third Follow-Up Email

Howdy!

A few weeks ago, we contacted you asking for help with a study investigating effective communication strategies of a new, alternative meat curing system. We are reaching out again because the more response we get, the better our results will be. If you have already completed the survey, thank you! If you have not, we need your help to ensure the most beneficial results possible.

To complete the survey, click on the link below:

https://tamuag.az1.qualtrics.com/jfe/form/SV_daODd0UHpDnVEFg

Responses to the survey are confidential and no personally identifiable information will be collected about you. If you have any questions about the survey or study, please contact me at (979) 458-2304 or amberchambers@tamu.edu. This survey provides important insight regarding effective communication strategies about agriculture innovations.

Thanks for considering our request during this very busy time of year.

Gig 'em!

IRB Number: IRB2022-0014M
IRB Approval Date: 03/08/2022
IRB Expiration Date: 03/08/2025

APPENDIX E

RAW DATA AND MEAN SUBSTITUTION

Raw Data and Mean Substitution Flags

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD
1	1	5.00	6.00	6.00	7.00	6.00	6.00	5.00	7.00	6.00	7.00	7.00	7.00	6.50	6.00	5.00	5.00	5.33	3.00	5.00	5.00	5.00	4.50	1.00	0.00	0.00	0.00	1.00
3	2	5.00	7.00	7.00	7.00	6.00	6.40	6.00	5.00	7.00	6.00	6.00	7.00	6.17	5.00	7.00	7.00	6.33	4.00	6.00	6.00	4.00	5.00	1.00	0.00	1.00	0.00	2.00
1	2	4.00	6.00	6.00	6.00	6.00	5.60	6.00	7.00	7.00	6.00	7.00	7.00	6.67	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	1.00	3.00
2	2	4.00	4.00	4.00	4.00	4.00	4.00	5.00	5.00	5.00	4.00	5.00	5.00	4.83	5.00	6.00	6.00	5.67	5.00	4.00	4.00	4.00	4.25	1.00	1.00	1.00	1.00	4.00
3	1	5.00	5.00	5.00	5.00	5.00	5.00	4.00	3.00	4.00	4.00	3.00	5.00	3.83	5.00	4.00	3.00	4.00	6.00	4.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	7.00	7.00	6.67	7.00	7.00	7.00	7.00	5.00	5.00	4.00	5.00	4.75	1.00	1.00	1.00	1.00	4.00
4	1	7.00	6.00	7.00	5.00	6.00	6.20	5.00	5.00	6.00	6.00	5.00	5.00	5.33	7.00	7.00	6.00	6.67	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	0.00	3.00
1	1	6.00	6.00	5.00	6.00	4.00	5.40	2.00	3.00	3.00	4.00	4.00	7.00	3.83	7.00	7.00	7.00	7.00	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	0.00	3.00
4	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	5.00	5.00	5.00	5.25	1.00	1.00	0.00	0.00	2.00
1	2	5.00	5.00	5.00	3.00	4.00	4.40	2.00	3.00	5.00	3.00	4.00	5.00	3.67	4.00	5.00	5.00	4.67	4.00	4.00	3.00	2.00	3.25	1.00	1.00	0.00	1.00	3.00
4	2	6.00	6.00	7.00	7.00	6.00	6.40	4.00	5.00	6.00	5.00	6.00	6.00	5.33	6.00	6.00	5.00	5.67	6.00	5.00	5.00	5.00	5.25	1.00	1.00	0.00	1.00	3.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	5.00	6.00	4.00	7.00	5.50	7.00	7.00	7.00	7.00	5.00	6.00	6.00	5.00	5.50	1.00	1.00	1.00	1.00	4.00
2	1	5.00	5.00	4.00	2.00	5.00	4.20	4.00	6.00	5.00	4.00	5.00	4.00	4.67	5.00	5.00	6.00	5.33	4.00	6.00	5.00	3.00	4.50	1.00	1.00	1.00	1.00	4.00
3	1	5.00	6.00	6.00	6.00	5.00	5.60	3.00	2.00	5.00	6.00	7.00	7.00	5.00	5.00	4.00	6.00	5.00	6.00	5.00	6.00	4.00	5.25	0.00	0.00	0.00	0.00	0.00
3	2	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	6.00	6.00	7.00	6.33	7.00	7.00	7.00	7.00	5.00	6.00	6.00	6.00	5.75	1.00	1.00	1.00	1.00	4.00
4	1	5.00	5.00	4.00	5.00	5.00	4.80	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	6.33	5.00	4.00	4.00	4.00	4.25	1.00	0.00	0.00	1.00	2.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	4.00	5.50	1.00	1.00	0.00	0.00	2.00
4	2	4.00	5.00	5.00	6.00	5.00	5.00	5.00	5.00	6.00	5.00	5.00	5.00	5.17	5.00	4.00	6.00	5.00	4.00	4.00	5.00	3.00	4.00	0.00	1.00	0.00	1.00	2.00
1	1	5.00	4.00	5.00	3.00	4.00	4.20	4.00	6.00	6.00	5.00	5.00	5.00	5.17	3.00	6.00	6.00	5.00	4.00	4.00	4.00	5.00	4.25	0.00	0.00	0.00	0.00	0.00
2	1	5.00	5.00	4.00	6.00	4.00	4.80	6.00	5.00	5.00	5.00	5.00	6.00	5.33	5.00	5.00	6.00	5.33	5.00	5.00	4.00	4.00	4.50	1.00	0.00	0.00	0.00	1.00
1	1	4.00	6.00	6.00	6.00	6.00	5.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	4.00	5.67	5.00	4.00	4.00	3.00	4.00	0.00	0.00	1.00	1.00	2.00
1	2	7.00	7.00	6.00	7.00	7.00	6.80	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	5.00	5.00	5.25	1.00	1.00	1.00	1.00	4.00
3	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.33	4.00	4.00	4.00	4.00	4.00	1.00	0.00	0.00	0.00	1.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	5.00	5.00	5.00	4.75	0.00	0.00	0.56	0.00	0.56
4	1	6.00	5.00	6.00	6.00	7.00	6.00	6.00	6.00	7.00	6.00	7.00	7.00	6.50	6.00	7.00	7.00	6.67	4.00	5.00	5.00	5.00	4.75	0.00	0.00	0.00	1.00	1.00
2	1	6.00	6.00	7.00	6.00	7.00	6.40	6.00	6.00	6.00	7.00	6.00	7.00	6.33	7.00	7.00	5.00	6.33	5.00	4.00	2.00	3.00	3.50	0.00	0.00	1.00	0.00	1.00

3	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	6.00	7.00	7.00	7.00	6.17	6.00	7.00	7.00	6.67	5.00	5.00	5.00	4.00	4.75	1.00	1.00	1.00	1.00	4.00
1	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
3	2	6.00	6.00	6.00	6.00	6.00	6.00	4.00	5.00	5.00	4.00	6.00	7.00	5.17	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	1.00	1.00	1.00	0.00	3.00
2	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	7.00	6.00	5.00	7.00	7.00	6.17	6.00	5.00	5.00	5.33	5.00	3.00	4.00	4.00	4.00	1.00	1.00	1.00	1.00	4.00
3	1	6.00	7.00	5.00	7.00	5.00	6.00	4.00	5.00	6.00	5.00	5.00	6.00	5.17	7.00	7.00	7.00	7.00	5.00	6.00	6.00	5.00	5.50	0.00	0.00	1.00	0.00	1.00
3	1	3.00	6.00	3.00	3.00	3.00	3.60	1.00	1.00	2.00	2.00	4.00	4.00	2.33	3.00	3.00	3.00	3.00	4.00	6.00	6.00	4.00	5.00	1.00	1.00	1.00	0.00	3.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	4.00	4.00	4.00	3.00	3.75	1.00	0.00	1.00	0.00	2.00
2	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
3	2	5.00	3.00	4.00	5.00	5.00	4.40	3.00	3.00	5.00	5.00	2.00	4.00	3.67	5.00	5.00	4.00	4.67	3.00	3.00	4.00	5.00	3.75	0.00	0.00	0.00	1.00	1.00
1	2	5.00	6.00	6.00	7.00	7.00	6.20	6.00	7.00	7.00	6.00	6.00	6.00	6.33	6.00	7.00	7.00	6.67	4.00	4.00	4.00	4.00	4.00	1.00	0.00	0.00	0.00	1.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	4.00	4.75	1.00	1.00	0.00	0.00	2.00
1	1	6.00	6.00	6.00	5.00	7.00	6.00	5.00	5.00	5.00	6.00	6.00	6.00	5.50	6.00	6.00	6.00	6.00	5.00	4.00	3.00	3.00	3.75	0.00	0.00	1.00	0.00	1.00
2	2	5.00	6.00	5.00	7.00	6.00	5.80	4.00	5.00	6.00	4.00	4.00	5.00	4.67	4.00	7.00	6.00	5.67	4.00	6.00	4.00	3.00	4.25	1.00	1.00	1.00	0.00	3.00
3	1	6.00	7.00	5.00	4.00	4.00	5.20	3.00	7.00	5.00	7.00	6.00	7.00	5.83	4.00	4.00	7.00	5.00	2.00	5.00	4.00	4.00	3.75	1.00	1.00	0.00	1.00	3.00
2	1	4.00	7.00	5.00	5.00	5.00	5.20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	1.00	0.00	1.00	0.00	2.00
4	2	4.00	6.00	4.00	5.00	5.00	4.80	5.00	6.00	6.00	5.00	6.00	7.00	5.83	7.00	7.00	5.00	6.33	4.00	4.00	4.00	5.00	4.25	1.00	1.00	0.00	0.00	2.00
4	1	6.00	6.00	7.00	7.00	7.00	6.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.67	6.00	5.00	5.00	4.00	5.00	1.00	0.00	1.00	0.00	2.00
1	2	1.00	4.00	2.00	4.00	3.00	2.80	3.00	3.00	4.00	3.00	4.00	4.00	3.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	3.75	1.00	1.00	1.00	1.00	4.00
4	2	3.00	3.00	4.00	3.00	2.00	3.00	5.00	3.00	2.00	3.00	4.00	5.00	3.67	5.00	4.00	5.00	4.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	4.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	5.00	7.00	6.00	6.00	7.00	6.00	6.33	4.00	5.00	5.00	5.00	4.75	1.00	0.00	0.00	1.00	2.00
2	1	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00	6.00	6.03	6.01	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	0.00	3.00
4	1	5.00	7.00	6.00	5.00	6.00	5.80	6.00	7.00	7.00	6.00	5.00	6.00	6.17	6.00	6.00	6.00	6.00	4.00	6.00	6.00	6.00	5.50	1.00	1.00	1.00	1.00	4.00
2	2	4.00	4.00	2.00	4.00	5.00	3.80	2.00	4.00	4.00	3.00	5.00	5.00	3.83	5.00	5.00	4.00	4.67	3.00	2.00	4.00	1.00	2.50	1.00	0.00	0.00	0.00	1.00
1	1	4.00	4.00	4.00	5.00	4.00	4.20	3.00	5.00	5.00	4.00	4.00	5.00	4.33	4.00	4.00	4.00	4.00	5.00	3.00	3.00	3.00	3.50	1.00	1.00	1.00	1.00	4.00
3	1	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	7.00	5.00	6.00	7.00	6.00	6.00	5.00	4.00	5.00	4.00	3.00	3.00	3.00	3.25	1.00	1.00	0.00	1.00	3.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	0.00	3.00
4	1	5.65	5.91	5.73	5.9	5.83	5.80	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	1.00	4.00
3	2	6.00	6.00	6.00	7.00	6.00	6.20	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	4.00	4.00	4.00	3.00	3.75	1.00	1.00	1.00	0.00	3.00

3	1	6.00	6.00	4.00	5.00	3.00	4.80	1.00	5.00	5.00	4.00	6.00	7.00	4.67	7.00	7.00	5.00	6.33	4.00	2.00	2.00	2.00	2.50	0.00	1.00	1.00	0.00	2.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	5.00	5.00	2.00	4.00	1.00	1.00	1.00	0.00	3.00
2	2	4.00	3.00	4.00	4.00	4.00	3.80	3.00	3.00	4.00	4.00	4.00	5.00	3.83	5.00	4.00	6.00	5.00	6.00	6.00	6.00	5.00	5.75	1.00	1.00	0.00	1.00	3.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	3.00	4.00	5.00	4.00	4.00	3.00	3.83	5.00	5.00	5.00	5.00	4.00	5.00	4.00	4.00	4.25	0.00	0.00	0.00	1.00	1.00
2	1	6.00	6.00	6.00	6.00	7.00	6.20	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	6.00	5.33	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	0.00	3.00
4	1	4.00	4.00	4.00	4.00	4.00	4.00	6.00	6.00	7.00	6.00	6.00	6.00	6.17	6.00	6.00	6.00	6.00	1.00	3.00	3.00	5.00	3.00	0.00	1.00	0.00	0.00	1.00
3	2	5.00	6.00	6.00	7.00	6.00	6.00	3.00	3.00	3.00	3.00	6.00	6.00	4.00	4.00	4.00	6.00	4.67	4.00	5.00	5.00	5.00	4.75	1.00	1.00	1.00	1.00	4.00
4	2	6.00	7.00	5.00	7.00	7.00	6.40	5.00	6.00	7.00	7.00	5.00	7.00	6.17	7.00	7.00	6.00	6.67	3.00	5.00	5.00	4.00	4.25	1.00	0.00	1.00	1.00	3.00
1	1	6.00	5.00	6.00	6.00	7.00	6.00	5.00	6.00	6.00	6.00	6.00	6.00	5.83	6.00	6.00	6.00	6.00	2.00	4.00	5.00	5.00	4.00	0.00	0.00	0.00	0.00	0.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	0.00	3.00
2	1	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	4.00	4.00	5.00	4.50	1.00	0.00	0.00	0.00	1.00
3	1	6.00	6.00	6.00	5.00	5.00	5.60	4.00	5.00	5.00	4.00	5.00	5.00	4.67	5.00	5.00	5.00	5.00	5.00	5.00	4.00	4.00	4.50	1.00	1.00	0.00	1.00	3.00
2	2	6.00	5.00	5.00	6.00	5.00	5.40	5.00	5.00	4.00	5.00	4.00	6.00	4.83	5.00	6.00	4.00	5.00	4.00	3.00	3.00	3.00	3.25	1.00	0.00	1.00	0.00	2.00
3	2	6.00	5.00	5.00	5.00	5.00	5.20	5.00	5.00	4.00	4.00	4.00	4.00	4.33	4.00	4.00	3.00	3.67	5.00	3.00	3.00	3.00	3.50	0.00	0.00	0.00	1.00	1.00
4	1	7.00	7.00	6.00	7.00	6.00	6.60	6.00	6.00	7.00	6.00	6.00	7.00	6.33	5.00	5.00	6.00	5.33	2.00	1.00	1.00	3.00	1.75	1.00	1.00	1.00	0.00	3.00
1	2	5.00	5.00	6.00	7.00	6.00	5.80	5.00	6.00	7.00	5.00	6.00	6.00	5.83	6.00	6.00	6.00	6.00	5.00	5.00	4.00	2.00	4.00	0.00	0.00	1.00	0.00	1.00
2	1	5.00	7.00	6.00	7.00	7.00	6.40	6.00	6.00	6.00	7.00	7.00	7.00	6.50	6.00	7.00	7.00	6.67	5.00	6.00	6.00	4.00	5.25	1.00	1.00	1.00	0.00	3.00
4	1	4.00	4.00	4.00	4.00	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	7.00	6.00	6.00	6.00	6.00	6.00	6.00	1.00	0.00	1.00	0.00	2.00
1	1	5.00	6.00	5.00	4.00	6.00	5.20	3.00	4.00	6.00	4.00	4.00	6.00	4.50	5.00	7.00	6.00	6.00	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
3	2	7.00	7.00	6.00	7.00	6.00	6.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.67	5.00	4.00	4.00	5.00	4.50	1.00	0.00	1.00	0.00	2.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00	1.00	1.00
3	1	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00
1	2	6.00	6.00	7.00	6.00	7.00	6.40	3.00	5.00	3.00	5.00	3.00	6.00	4.17	6.00	6.00	7.00	6.33	6.00	3.00	2.00	3.00	3.50	1.00	0.00	0.00	1.00	2.00
2	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	5.00	5.00	5.00	4.75	1.00	1.00	0.00	0.00	2.00
1	1	4.00	4.00	4.00	5.00	3.00	4.00	4.00	5.00	6.00	4.00	4.00	5.00	4.67	4.00	4.00	5.00	4.33	4.00	4.00	3.00	4.00	3.75	1.00	0.00	0.00	1.00	2.00
3	2	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	4.00	5.00	5.00	5.00	4.83	5.00	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.25	0.00	0.00	0.00	1.00	1.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	5.00	7.00	7.00	5.00	5.00	7.00	6.00	7.00	7.00	6.00	6.67	5.00	6.00	6.00	5.00	5.50	1.00	1.00	1.00	1.00	4.00
2	2	6.00	6.00	7.00	7.00	6.00	6.40	6.00	6.00	6.00	7.00	7.00	7.00	6.50	7.00	6.00	7.00	6.67	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	1.00	3.00

1	1	5.00	5.00	5.00	6.00	5.00	5.20	3.00	3.00	5.00	4.00	4.00	5.00	4.00	6.00	6.00	6.00	6.00	2.00	4.00	4.00	4.00	3.50	1.00	1.00	1.00	0.45	3.45
2	1	6.00	7.00	6.00	6.00	7.00	6.40	6.00	6.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	6.00	4.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
1	2	7.00	7.00	7.00	4.00	7.00	6.40	1.00	3.00	4.00	3.00	3.00	4.00	3.00	7.00	7.00	7.00	7.00	6.00	6.00	5.00	4.00	5.25	1.00	1.00	1.00	0.00	3.00
4	2	4.00	4.00	4.00	4.00	4.00	4.00	6.00	4.00	7.00	7.00	3.00	4.00	5.17	6.00	6.00	6.00	6.00	5.00	5.00	3.00	2.00	3.75	1.00	1.00	1.00	1.00	4.00
4	1	6.00	6.00	6.00	5.00	5.00	5.60	4.00	5.00	4.00	5.00	5.00	6.00	4.83	5.00	6.00	6.00	5.67	6.00	5.00	5.00	4.00	5.00	1.00	1.00	0.00	1.00	3.00
1	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	4.00	5.00	4.00	4.50	1.00	0.00	0.00	0.00	1.00
3	1	5.00	7.00	3.00	6.00	6.00	5.40	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
3	2	7.00	7.00	7.00	7.00	7.00	7.00	5.00	7.00	6.00	7.00	7.00	7.00	6.50	7.00	7.00	7.00	7.00	5.00	4.00	4.00	3.00	4.00	0.00	1.00	0.00	0.00	1.00
2	2	6.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	4.00	4.00	4.00	4.25	1.00	0.00	1.00	0.00	2.00
1	2	6.00	5.00	5.00	4.00	5.00	5.00	3.00	4.00	4.00	4.00	4.00	5.00	4.00	4.00	4.00	5.00	4.33	5.00	5.00	4.00	3.00	4.25	1.00	0.00	0.00	0.00	1.00
2	2	5.00	5.00	6.00	7.00	7.00	6.00	5.00	5.00	5.00	4.00	5.00	5.00	4.83	6.00	7.00	6.00	6.33	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
3	2	6.00	6.00	6.00	6.00	6.00	6.00	5.00	6.00	5.00	5.00	5.00	5.00	5.17	5.00	5.00	5.00	5.00	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
2	1	7.00	7.00	7.00	6.00	7.00	6.80	7.00	7.00	7.00	7.00	6.00	6.00	6.67	6.00	7.00	7.00	6.67	4.00	5.00	4.00	3.00	4.00	1.00	1.00	1.00	1.00	4.00
1	2	3.00	5.00	3.00	7.00	3.00	4.20	1.00	2.00	2.00	1.00	3.00	4.00	2.17	4.00	7.00	6.00	5.67	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	1.00	4.00
1	2	5.00	7.00	5.00	7.00	7.00	6.20	1.00	4.00	7.00	5.00	5.00	6.00	4.67	6.00	6.00	7.00	6.33	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	0.00	3.00
4	2	6.00	6.00	6.00	7.00	6.00	6.20	6.00	7.00	7.00	7.00	5.00	7.00	6.50	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
2	1	6.00	7.00	7.00	6.00	7.00	6.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	4.00	5.50	1.00	1.00	0.00	1.00	3.00
2	2	5.00	5.00	6.00	6.00	5.00	5.40	5.00	5.00	6.00	6.00	5.00	5.00	5.33	5.00	5.00	6.00	5.33	5.00	5.00	5.00	4.00	4.75	1.00	0.00	0.00	0.00	1.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	4.00	4.00	4.00	4.25	1.00	0.00	0.00	0.00	1.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.67	7.00	7.00	7.00	7.00	4.00	5.00	4.00	3.00	4.00	1.00	1.00	0.00	1.00	3.00
2	2	5.00	6.00	5.00	5.00	6.00	5.40	6.00	6.00	6.00	7.00	6.00	7.00	6.33	6.00	6.00	6.00	6.00	5.00	6.00	6.00	4.00	5.25	1.00	1.00	1.00	1.00	4.00
1	2	6.00	6.00	6.00	7.00	7.00	6.40	6.00	7.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	0.00	0.00	2.00
2	1	7.00	7.00	6.00	7.00	7.00	6.80	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.67	5.00	6.00	6.00	4.00	5.25	1.00	0.00	1.00	1.00	3.00
3	2	6.00	6.00	6.00	6.00	7.00	6.20	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	3.00	2.00	4.00	3.25	1.00	0.00	0.00	0.00	1.00
2	2	6.00	6.00	7.00	5.00	6.00	6.00	6.00	7.00	7.00	6.00	6.00	6.00	6.33	6.00	6.00	6.00	6.00	2.00	2.00	2.00	3.00	2.25	0.00	1.00	1.00	0.00	2.00
1	1	6.00	7.00	7.00	7.00	6.00	6.60	6.00	6.00	7.00	7.00	6.00	6.00	6.33	4.00	4.00	4.00	0	6.00	6.00	6.00	4.00	5.50	1.00	1.00	1.00	1.00	4.00
4	1	7.00	7.00	7.00	7.00	6.00	6.80	6.00	6.00	7.00	7.00	6.00	6.00	6.33	4.00	4.00	4.00	4.00	3.00	4.00	4.00	4.00	3.75	1.00	1.00	0.00	1.00	3.00
4	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.83	6.00	6.00	6.00	6.00	4.00	5.00	4.00	3.00	4.00	0.00	0.54	0.56	0.45	1.55

3	2	6.00	5.00	6.00	7.00	5.00	5.80	6.00	7.00	7.00	6.00	5.00	6.00	6.17	6.00	7.00	6.00	6.33	5.00	4.00	4.00	3.00	4.00	1.00	1.00	0.00	1.00	3.00
4	2	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	0.00	1.00	3.00
3	1	7.00	7.00	7.00	7.00	6.00	6.80	6.00	5.00	7.00	5.00	5.00	6.00	5.67	6.00	5.00	7.00	6.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	1.00	4.00
1	1	5.00	4.00	6.00	7.00	6.00	5.60	2.00	2.00	4.00	1.00	5.00	6.00	3.33	5.00	7.00	3.00	5.00	4.00	5.00	5.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
3	2	7.00	6.00	7.00	7.00	6.00	6.60	3.00	5.00	6.00	5.00	6.00	7.00	5.33	6.00	7.00	7.00	6.67	5.00	4.00	4.00	2.00	3.75	1.00	1.00	1.00	1.00	4.00
4	1	5.00	6.00	5.00	6.00	5.00	5.40	6.00	6.00	6.00	5.00	5.00	6.00	5.67	6.00	6.00	6.00	6.00	5.00	4.00	4.00	4.00	4.25	1.00	0.00	0.00	0.45	1.45
1	2	6.00	4.00	6.00	7.00	7.00	6.00	5.00	6.00	5.00	5.00	7.00	7.00	5.83	7.00	6.00	7.00	6.67	6.00	6.00	6.00	6.00	6.00	1.00	0.00	0.00	0.00	1.00
2	1	4.00	7.00	5.00	3.00	5.00	4.80	4.00	3.00	7.00	4.00	5.00	4.00	4.50	7.00	6.00	6.00	6.33	5.00	3.00	2.00	3.00	3.25	1.00	0.00	0.00	0.00	1.00
1	2	4.00	4.00	4.00	5.00	4.00	4.20	5.00	5.00	5.00	4.00	5.00	4.00	4.67	4.00	4.00	5.00	4.33	5.00	4.00	4.00	3.00	4.00	1.00	1.00	1.00	1.00	4.00
3	2	5.00	5.00	5.00	5.00	5.00	5.00	4.00	5.00	5.00	4.00	5.00	5.00	4.67	5.00	6.00	6.00	5.67	4.00	5.00	5.00	4.00	4.50	1.00	0.54	0.56	0.45	2.55
3	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	0.00	3.00
2	2	6.00	5.00	5.00	6.00	6.00	5.60	6.00	5.00	6.00	5.00	5.00	7.00	5.67	6.00	6.00	4.00	5.33	5.00	6.00	4.00	3.00	4.50	1.00	1.00	0.00	0.00	2.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	6.00	6.00	7.00	6.50	7.00	7.00	7.00	7.00	5.00	4.00	3.00	2.00	3.50	0.00	1.00	0.00	0.00	1.00
2	1	6.00	6.00	6.00	6.00	6.00	6.00	4.00	6.00	4.00	4.00	4.00	5.00	4.50	4.00	4.00	4.00	4.00	5.00	6.00	6.00	6.00	5.75	1.00	1.00	0.00	0.00	2.00
2	2	4.00	6.00	5.00	3.00	4.00	4.40	4.00	3.00	5.00	5.00	4.00	3.00	4.00	4.00	7.00	4.00	5.00	4.00	5.00	5.00	4.00	4.50	1.00	0.00	1.00	0.00	2.00
1	1	6.00	6.00	6.00	6.00	6.00	6.00	4.00	4.00	5.00	4.00	5.00	4.00	4.33	5.00	5.00	6.00	5.33	6.00	4.00	4.00	4.00	4.50	0.79	0.54	0.56	0.45	2.34
1	1	4.00	4.00	4.00	4.00	4.00	4.00	2.00	2.00	2.00	2.00	4.00	4.00	2.67	4.00	4.00	4.00	4.00	2.00	2.00	3.00	3.00	2.50	1.00	0.00	0.00	0.00	1.00
4	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	4.00	3.00	3.75	1.00	1.00	1.00	0.00	3.00
4	2	6.00	7.00	6.00	7.00	6.00	6.40	6.00	6.00	6.00	5.00	6.00	6.00	5.83	7.00	7.00	6.00	6.67	4.00	4.00	4.00	4.00	4.00	1.00	0.00	1.00	0.00	2.00
3	2	5.00	7.00	5.00	6.00	6.00	5.80	5.00	5.00	6.00	5.00	5.00	6.00	5.33	6.00	6.00	6.00	6.00	4.00	5.00	5.00	4.00	4.50	1.00	0.00	1.00	1.00	3.00
4	1	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	2.00	5.00	5.00	5.00	4.25	1.00	0.00	0.00	0.00	1.00
2	2	7.00	7.00	7.00	6.00	7.00	6.80	5.00	7.00	7.00	6.00	7.00	7.00	6.50	7.00	6.00	7.00	6.67	6.00	6.00	6.00	4.00	5.50	0.00	0.00	0.00	1.00	1.00
3	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	6.00	5.00	5.00	5.00	1.00	0.00	0.00	1.00	2.00
1	2	5.00	4.00	4.00	5.00	5.00	4.60	4.00	5.00	5.00	5.00	5.00	5.00	4.83	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	4.50	1.00	0.00	0.00	0.00	1.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	1.00	0.00	1.00
2	1	6.00	7.00	7.00	6.00	7.00	6.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	5.00	5.00	3.00	4.25	1.00	1.00	1.00	0.00	3.00
2	2	7.00	7.00	7.00	5.00	7.00	6.60	5.00	6.00	7.00	7.00	5.00	7.00	6.17	7.00	7.00	7.00	7.00	2.00	5.00	5.00	5.00	4.25	1.00	1.00	1.00	0.00	3.00

4	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	4.00	4.00	3.00	4.00	1.00	1.00	0.00	0.00	2.00
2	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	0.00	0.00	0.00	1.00
1	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	0.00	2.00
3	2	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	7.00	7.00	7.00	6.67	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	0.00	1.00	0.00	0.00	1.00
4	2	5.00	6.00	5.00	5.00	4.00	5.00	5.00	7.00	6.00	6.00	6.00	6.00	6.00	4.00	4.00	5.00	4.33	4.00	5.00	5.00	4.00	4.50	1.00	1.00	0.00	0.00	2.00
3	2	4.00	4.00	4.00	5.00	4.00	4.20	5.00	4.00	5.00	5.00	5.00	5.00	4.83	6.00	6.00	6.00	6.00	5.00	3.00	3.00	3.00	3.50	1.00	0.00	1.00	1.00	3.00
2	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	4.00	5.00	5.00	3.00	4.25	1.00	1.00	1.00	0.00	3.00
1	1	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	4.00	4.00	4.00	4.25	1.00	0.54	0.56	0.45	2.55
1	2	2.00	4.00	4.00	3.00	3.00	3.20	2.00	2.00	3.00	3.00	4.00	5.00	3.17	4.00	6.00	5.00	5.00	3.00	3.00	3.00	3.00	3.00	1.00	0.00	0.00	0.00	1.00
3	1	5.00	5.00	6.00	6.00	5.00	5.40	4.00	5.00	6.00	5.00	5.00	6.00	5.17	6.00	6.00	5.00	5.67	4.00	4.00	5.00	4.00	4.25	1.00	0.00	1.00	0.00	2.00
2	1	4.00	4.00	4.00	4.00	5.00	4.20	3.00	6.00	7.00	4.00	4.00	4.00	4.67	4.00	6.00	5.00	5.00	4.00	2.00	2.00	2.00	2.50	1.00	0.00	1.00	0.00	2.00
4	1	6.00	7.00	6.00	5.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	5.00	6.00	5.75	1.00	0.00	1.00	0.00	2.00
3	1	5.00	4.00	5.00	5.00	6.00	5.00	5.00	4.00	5.00	5.00	4.00	5.00	4.67	5.00	5.00	5.00	5.00	4.00	5.00	5.00	4.00	4.50	1.00	1.00	0.00	1.00	3.00
1	2	6.00	6.00	6.00	7.00	6.00	6.20	6.00	6.00	6.00	6.00	4.00	6.00	5.67	5.00	5.00	4.00	4.67	2.00	5.00	5.00	5.00	4.25	1.00	0.00	0.00	1.00	2.00
2	2	4.00	7.00	6.00	6.00	7.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	6.33	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00
4	1	4.00	4.00	4.00	4.00	4.00	4.00	2.00	4.00	2.00	3.00	5.00	4.00	3.33	3.00	3.00	1.00	2.33	3.00	4.00	4.00	3.00	3.50	1.00	0.00	0.00	0.00	1.00
3	2	5.00	7.00	5.00	7.00	5.00	5.80	6.00	7.00	7.00	7.00	6.00	7.00	6.67	5.00	6.00	5.00	5.33	2.00	5.00	4.00	2.00	3.25	1.00	0.00	0.00	0.00	1.00
2	1	4.00	5.00	5.00	6.00	5.00	5.00	5.00	4.00	5.00	4.00	5.00	6.00	4.83	5.00	5.00	7.00	5.67	2.00	5.00	5.00	5.00	4.25	1.00	0.00	0.00	1.00	2.00
4	2	3.00	4.00	5.00	7.00	7.00	5.20	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
1	1	6.00	7.00	6.00	7.00	7.00	6.60	4.00	6.00	6.00	5.00	7.00	7.00	5.83	7.00	7.00	7.00	7.00	4.00	6.00	6.00	3.00	4.75	1.00	0.00	0.00	0.00	1.00
4	2	4.00	6.00	5.00	7.00	5.00	5.40	7.00	4.00	6.00	3.00	3.00	7.00	5.00	6.00	6.00	7.00	6.33	4.00	4.00	4.00	3.00	3.75	1.00	1.00	1.00	1.00	4.00
3	1	4.00	6.00	6.00	4.00	4.00	4.80	7.00	7.00	7.00	7.00	5.00	6.00	6.50	6.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	1.00	1.00	1.00	1.00	4.00
3	1	5.00	6.00	5.00	7.00	5.00	5.60	7.00	6.00	5.00	7.00	7.00	6.00	6.33	7.00	7.00	7.00	7.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
4	1	6.00	7.00	7.00	7.00	7.00	6.80	6.00	6.00	6.00	5.00	6.00	6.00	5.83	5.00	5.00	5.00	5.00	5.00	4.65	5.00	5.00	4.91	1.00	1.00	0.56	0.45	3.01
3	1	5.00	6.00	3.00	7.00	5.00	5.20	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
3	1	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	7.00	7.00	7.00	6.67	7.00	7.00	7.00	7.00	4.00	5.00	5.00	5.00	4.75	0.00	0.00	0.00	1.00	1.00
4	1	4.00	4.00	4.00	4.00	4.00	4.00	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
2	2	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00

3	2	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
3	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.00	6.00	2.00	6.00	6.00	5.00	4.00	4.00	6.00	4.67	6.00	6.00	6.00	4.00	5.50	1.00	1.00	1.00	1.00	4.00
1	1	5.00	6.00	6.00	4.00	6.00	5.40	6.00	7.00	7.00	6.00	6.00	6.00	6.33	6.00	6.00	6.00	6.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
2	1	6.00	6.00	6.00	5.00	5.00	5.60	2.00	3.00	3.00	3.00	3.00	5.00	3.17	6.00	6.00	6.00	6.00	3.00	4.00	4.00	3.00	3.50	1.00	1.00	1.00	1.00	4.00
3	1	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	6.00	6.00	7.00	7.00	6.17	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	0.00	0.00	0.00	1.00
1	2	6.00	3.00	2.00	5.00	4.00	4.00	5.00	3.00	4.00	4.00	4.00	5.00	4.17	4.00	5.00	6.00	5.00	4.00	2.00	3.00	3.00	3.00	0.00	1.00	0.00	0.00	1.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00
2	1	7.00	7.00	7.00	6.00	7.00	6.80	5.00	7.00	7.00	5.00	7.00	7.00	6.33	4.00	4.00	5.00	4.33	5.00	5.00	5.00	4.00	4.75	1.00	1.00	0.00	0.00	2.00
1	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00
1	1	3.00	7.00	5.00	7.00	6.00	5.60	3.00	5.00	6.00	3.00	5.00	6.00	4.67	6.00	7.00	7.00	6.67	5.00	4.00	4.00	3.00	4.00	1.00	1.00	1.00	1.00	4.00
4	1	3.00	5.00	4.00	5.00	5.00	4.40	5.00	5.00	6.00	6.00	5.00	6.00	5.50	4.00	5.00	5.00	4.67	5.00	4.00	4.00	4.00	4.25	1.00	1.00	1.00	1.00	4.00
4	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	5.00	5.00	4.00	4.50	1.00	0.00	1.00	0.00	2.00
4	2	6.00	6.00	6.00	5.00	5.00	5.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	4.00	4.67	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
4	2	6.00	6.00	6.00	7.00	7.00	6.40	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	6.00	5.67	3.00	5.00	5.00	4.00	4.25	0.79	0.54	0.56	0.45	2.34
1	1	6.00	7.00	6.00	7.00	6.00	6.40	5.00	6.00	7.00	6.00	7.00	7.00	6.33	7.00	7.00	6.00	6.67	5.00	5.00	5.00	4.00	4.75	1.00	0.00	0.00	1.00	2.00
4	2	6.00	5.00	5.00	6.00	5.00	5.40	5.00	5.00	6.00	6.00	5.00	6.00	5.50	6.00	6.00	4.00	5.33	6.00	5.00	4.00	4.00	4.75	1.00	1.00	0.00	1.00	3.00
3	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	6.00	6.00	6.00	5.00	6.00	5.67	6.00	6.00	6.00	6.00	5.00	5.00	5.00	4.00	4.75	1.00	1.00	0.00	1.00	3.00
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	6.00	4.00	4.00	4.00	4.00	4.00	1.00	1.00	1.00	0.00	3.00
3	2	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00
3	1	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	1.00	1.00
4	1	5.00	7.00	6.00	7.00	7.00	6.40	7.00	7.00	7.00	7.00	7.00	6.00	6.83	7.00	6.00	3.00	5.33	2.00	4.00	2.00	1.00	2.25	1.00	1.00	1.00	0.00	3.00
2	1	5.00	7.00	7.00	5.00	7.00	6.20	6.00	7.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	6.00	6.67	2.00	5.00	5.00	4.00	4.00	0.00	0.00	1.00	0.00	1.00
1	1	6.00	5.00	7.00	6.00	7.00	6.20	5.00	5.00	6.00	6.00	7.00	5.00	5.67	7.00	6.00	7.00	6.67	6.00	5.00	3.00	5.00	4.75	0.00	0.00	1.00	0.00	1.00
2	2	6.00	5.00	5.00	6.00	6.00	5.60	4.00	5.00	5.00	5.00	5.00	5.00	4.83	6.00	5.00	5.00	5.33	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
3	2	7.00	7.00	7.00	5.00	6.00	6.40	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	1.00	4.00
2	1	4.00	6.00	6.00	4.00	6.00	5.20	1.00	5.00	3.00	5.00	5.00	5.00	4.00	4.00	5.00	3.00	4.00	2.00	1.00	1.00	1.00	1.25	1.00	0.00	1.00	1.00	3.00
3	1	5.00	5.00	5.00	5.00	5.00	5.00	7.00	6.00	7.00	6.00	6.00	7.00	6.50	6.00	5.00	6.00	5.67	3.00	4.00	4.00	4.00	3.75	1.00	1.00	1.00	0.00	3.00
4	2	5.00	7.00	6.00	7.00	7.00	6.40	4.00	6.00	6.00	5.00	5.00	6.00	5.33	6.00	7.00	7.00	6.67	5.00	5.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00

4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	5.00	5.00	5.50	1.00	0.00	0.56	0.45	2.01
4	1	7.00	7.00	7.00	5.00	7.00	6.60	7.00	6.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	1.00	0.00	0.45	2.45
4	2	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	6.67	7.00	7.00	7.00	7.00	4.00	3.00	4.00	4.00	3.75	1.00	0.00	0.00	1.00	2.00
1	2	4.00	4.00	4.00	4.00	5.00	4.20	4.00	4.00	4.00	3.00	4.00	4.00	3.83	4.00	4.00	4.00	4.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
2	1	5.00	4.00	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	7.00	5.50	4.00	4.00	5.00	4.33	4.00	3.00	3.00	3.00	3.25	0.00	0.00	0.00	0.00	0.00
3	2	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.00	3.00	3.00	3.25	1.00	1.00	0.00	0.00	2.00
1	1	5.00	5.00	4.00	5.00	5.00	4.80	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
1	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	6.00	7.00	6.00	6.00	7.00	6.17	7.00	7.00	6.00	6.67	2.00	5.00	5.00	5.00	4.25	1.00	1.00	1.00	0.00	3.00
1	1	5.00	5.00	5.00	6.00	4.00	5.00	6.00	6.00	6.00	5.00	5.00	5.00	5.50	5.00	5.00	6.00	5.33	5.00	4.00	4.00	3.00	4.00	0.00	0.00	1.00	1.00	2.00
4	1	6.00	6.00	5.00	6.00	6.00	5.80	7.00	7.00	7.00	7.00	7.00	6.00	6.83	7.00	6.00	7.00	6.67	4.00	5.00	5.00	3.00	4.25	1.00	1.00	1.00	1.00	4.00
2	1	6.00	5.00	5.00	7.00	5.00	5.60	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	2.00	4.00	4.00	3.00	3.25	1.00	1.00	1.00	0.00	3.00
4	1	7.00	6.00	6.00	6.00	7.00	6.40	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	6.00	6.00	5.00	5.50	0.79	0.54	0.56	0.45	2.34
3	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
3	1	4.00	5.00	4.00	4.00	6.00	4.60	5.00	6.00	6.00	6.00	6.00	6.00	5.83	6.00	3.00	6.00	5.00	5.00	5.00	3.00	3.00	4.00	1.00	1.00	1.00	1.00	4.00
1	1	5.00	4.00	4.00	3.00	4.00	4.00	3.00	3.00	3.00	3.00	4.00	4.00	3.33	3.00	6.00	6.00	5.00	4.00	4.00	4.00	3.00	3.75	0.00	0.00	0.00	0.00	0.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	0.00	0.56	0.45	2.01
4	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	1.00	0.00	0.00	0.00	1.00
4	2	6.00	7.00	7.00	7.00	6.00	6.60	5.23	5.55	5.87	5.54	5.67	6.03	5.65	5.85	5.94	5.87	5.89	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
1	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	4.00	4.00	4.50	1.00	0.00	1.00	0.00	2.00
4	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	5.00	4.00	6.00	5.00	5.00	5.00	1.00	1.00	1.00	0.00	3.00
2	2	6.00	5.00	6.00	5.00	5.00	5.40	5.00	5.00	4.00	4.00	4.00	6.00	4.67	5.00	6.00	6.00	5.67	3.00	5.00	5.00	4.00	4.25	1.00	1.00	1.00	1.00	4.00
3	1	6.00	6.00	6.00	3.00	6.00	5.40	4.00	3.00	5.00	5.00	4.00	5.00	4.33	5.00	6.00	6.00	5.67	6.00	5.00	4.00	4.00	4.75	1.00	1.00	1.00	0.00	3.00
3	2	1.00	7.00	7.00	7.00	6.00	5.60	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	4.00	5.50	0.00	0.00	0.00	0.45	0.45
2	1	5.00	4.00	5.00	4.00	5.00	4.60	5.00	5.00	4.00	4.00	4.00	5.00	4.50	5.00	4.00	4.00	4.33	4.00	4.00	4.00	4.00	4.00	1.00	1.00	0.00	1.00	3.00
4	1	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00	5.00	4.00	4.67	4.00	4.00	4.00	3.00	3.75	0.00	0.00	0.00	0.00	0.00
4	2	7.00	7.00	7.00	7.00	6.00	6.80	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	0.00	1.00	1.00	0.00	2.00
3	2	6.00	5.00	6.00	6.00	6.00	5.80	3.00	3.00	6.00	5.00	6.00	5.00	4.67	6.00	6.00	6.00	6.00	6.00	3.00	3.00	3.00	3.75	1.00	1.00	0.00	0.00	2.00
2	2	6.00	6.00	5.00	6.00	7.00	6.00	6.00	6.00	6.00	7.00	5.00	7.00	6.17	6.00	6.00	6.00	6.00	5.00	6.00	6.00	6.00	5.75	0.00	0.00	0.00	0.00	0.00

1	2	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	6.00	5.00	7.00	4.00	5.33	7.00	5.00	7.00	6.33	6.00	6.00	6.00	6.00	6.00	1.00	1.00	1.00	0.00	3.00
1	1	5.00	4.00	4.00	7.00	5.00	5.00	1.00	4.00	7.00	3.00	3.00	7.00	4.17	7.00	7.00	7.00	7.00	6.00	6.00	6.00	4.00	5.50	1.00	1.00	1.00	0.00	3.00
3	1	6.00	6.00	6.00	5.00	6.00	5.80	5.00	5.00	7.00	6.00	5.00	7.00	5.83	5.00	5.00	6.00	5.33	5.00	6.00	6.00	5.00	5.50	1.00	1.00	1.00	0.00	3.00
2	2	5.00	6.00	6.00	6.00	7.00	6.00	5.00	4.00	5.00	5.00	6.00	6.00	5.17	6.00	6.00	6.00	6.00	4.00	4.00	4.00	4.00	4.00	1.00	0.00	1.00	0.00	2.00
3	2	5.00	5.00	5.00	5.00	5.00	5.00	3.00	3.00	4.00	4.00	3.00	5.00	3.67	5.00	5.00	6.00	5.33	4.00	3.00	3.00	3.00	3.25	1.00	0.00	0.00	0.00	1.00
1	2	5.00	6.00	5.00	6.00	6.00	5.60	6.00	6.00	6.00	7.00	5.00	6.00	6.00	6.00	7.00	6.00	6.33	4.00	3.00	4.00	3.00	3.50	1.00	1.00	1.00	0.00	3.00
3	1	6.00	6.00	6.00	7.00	5.00	6.00	6.00	5.00	6.00	6.00	6.00	5.00	5.67	5.00	5.00	6.00	5.33	5.00	5.00	4.00	4.00	4.50	0.00	0.00	1.00	0.00	1.00
4	1	5.00	7.00	5.00	4.00	7.00	5.60	5.00	6.00	7.00	7.00	5.00	7.00	6.17	7.00	7.00	7.00	7.00	5.00	6.00	6.00	5.00	5.50	1.00	0.00	1.00	1.00	3.00
2	1	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	7.00	6.00	7.00	7.00	6.50	6.00	6.00	6.00	6.00	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	0.00	2.00
2	2	5.00	5.00	4.00	4.00	5.00	4.60	5.00	5.00	5.00	5.00	4.00	5.00	4.83	5.00	5.00	6.00	5.33	4.00	5.00	5.00	4.00	4.50	1.00	0.00	1.00	1.00	3.00
4	1	5.00	5.00	6.00	7.00	6.00	5.80	6.00	5.00	7.00	6.00	7.00	6.00	6.17	6.00	6.00	6.00	6.00	3.00	5.00	5.00	6.00	4.75	0.00	1.00	1.00	0.00	2.00
3	1	6.00	6.00	6.00	6.00	6.00	6.00	5.00	6.00	7.00	6.00	6.00	6.00	6.00	6.00	6.00	5.00	5.67	3.00	3.00	3.00	3.00	3.00	1.00	1.00	1.00	1.00	4.00
3	1	6.00	5.00	5.00	7.00	6.00	5.80	5.00	5.00	6.00	5.00	5.00	5.00	5.17	6.00	6.00	4.00	5.33	5.00	5.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
1	2	7.00	7.00	6.00	7.00	5.00	6.40	5.00	6.00	7.00	4.00	6.00	6.03	5.67	7.00	7.00	6.00	6.67	6.00	6.00	6.00	5.00	5.75	1.00	1.00	1.00	0.00	3.00
4	2	5.00	5.00	6.00	5.00	5.00	5.20	6.00	6.00	5.00	5.00	6.00	5.00	5.50	6.00	6.00	6.00	6.00	4.00	6.00	4.00	4.00	4.50	0.00	0.00	0.00	1.00	1.00
3	2	5.00	5.91	6.00	6.00	4.00	5.38	4.00	5.00	5.00	4.00	5.00	6.00	4.83	3.00	4.00	5.00	4.00	4.00	5.00	4.00	3.00	4.00	1.00	0.00	0.00	0.00	1.00
2	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	4.00	4.00	4.00	4.00	6.00	6.00	4.00	5.00	1.00	0.00	0.00	1.00	2.00
4	1	6.00	5.00	5.00	5.00	5.00	5.20	6.00	5.00	5.00	6.00	6.00	6.00	5.67	6.00	5.00	5.00	5.33	5.00	5.00	5.00	4.00	4.75	1.00	1.00	0.00	0.00	2.00
1	1	6.00	7.00	6.00	6.00	4.00	5.80	6.00	5.00	4.00	6.00	5.00	6.00	5.33	7.00	7.00	6.00	6.67	4.00	5.00	3.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00
2	2	4.00	5.00	5.00	5.00	5.00	4.80	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.45	4.65	4.50	4.10	4.43	0.79	0.54	0.56	0.45	2.34
4	1	7.00	7.00	7.00	7.00	7.00	7.00	1.00	2.00	2.00	5.00	5.00	7.00	3.67	6.00	6.00	7.00	6.33	2.00	4.00	4.00	2.00	3.00	1.00	1.00	1.00	0.00	3.00
3	2	6.00	6.00	6.00	7.00	7.00	6.40	5.00	5.00	5.00	4.00	5.00	5.00	4.83	5.00	5.00	5.00	5.00	2.00	5.00	5.00	4.00	4.00	1.00	1.00	0.00	0.00	2.00
1	1	5.00	6.00	5.00	6.00	4.00	5.20	4.00	6.00	6.00	3.00	5.00	6.00	5.00	6.00	7.00	7.00	6.67	4.00	5.00	5.00	4.00	4.50	1.00	1.00	0.00	0.00	2.00
3	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	0.00	2.00
3	1	5.65	6.00	5.00	6.00	7.00	5.93	7.00	5.00	6.00	5.00	6.00	7.00	6.00	7.00	7.00	6.00	6.67	4.00	6.00	5.00	4.00	4.75	1.00	0.00	0.00	1.00	2.00
1	2	7.00	7.00	6.00	6.00	7.00	6.60	4.00	6.00	5.00	4.00	5.00	6.00	5.00	7.00	7.00	5.00	6.33	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	0.00	0.00
2	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.03	6.84	7.00	7.00	7.00	7.00	6.00	5.00	5.00	5.00	5.25	1.00	1.00	0.00	0.00	2.00
3	1	3.00	3.00	3.00	4.00	3.00	3.20	1.00	1.00	4.00	3.00	4.00	4.00	2.83	5.00	5.00	6.00	5.33	6.00	6.00	6.00	4.00	5.50	1.00	0.00	1.00	0.00	2.00

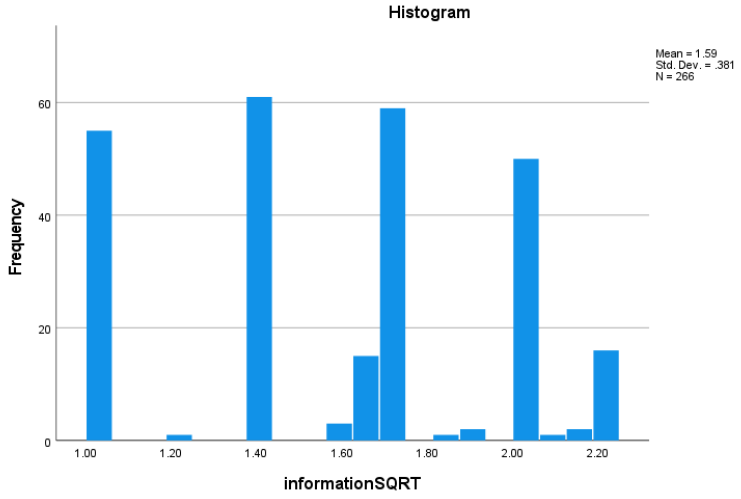
2	1	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	4.00	5.00	5.00	5.00	4.75	1.00	1.00	1.00	1.00	4.00
4	2	7.00	1.00	7.00	7.00	6.00	5.60	6.00	7.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
1	1	5.00	7.00	6.00	7.00	5.00	6.00	6.00	6.00	6.00	7.00	5.00	7.00	6.17	6.00	7.00	7.00	6.67	5.00	2.00	3.00	1.00	2.75	1.00	1.00	1.00	1.00	4.00
1	2	4.00	4.00	1.00	7.00	4.00	4.00	1.00	1.00	5.00	1.00	4.00	4.00	2.67	4.00	6.00	6.00	5.33	6.00	4.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
3	1	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	4.00	6.00	4.00	4.00	4.00	4.00	4.00	1.00	0.00	1.00	0.00	2.00
2	2	5.00	6.00	5.00	7.00	4.00	5.40	5.00	5.00	6.00	5.00	6.00	5.00	5.33	7.00	7.00	7.00	7.00	6.00	4.00	4.00	4.00	4.50	1.00	1.00	1.00	1.00	4.00
4	1	6.00	5.00	6.00	4.00	5.00	5.20	4.00	5.00	7.00	6.00	6.00	7.00	5.83	5.00	4.00	6.00	5.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	0.00	1.00	1.00
3	2	6.00	6.00	6.00	5.00	6.00	5.80	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	4.00	3.00	3.00	3.00	3.25	1.00	1.00	1.00	0.00	3.00
4	2	6.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	7.00	7.00	7.00	6.00	6.83	6.00	6.00	6.00	6.00	3.00	6.00	6.00	5.00	5.00	1.00	1.00	1.00	1.00	4.00
1	2	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	5.00	5.00	5.00	4.00	4.75	0.00	0.00	0.00	0.45	0.45
2	1	6.00	5.00	6.00	3.00	5.00	5.00	7.00	6.00	6.00	6.00	6.00	6.00	6.17	6.00	6.00	5.00	5.67	2.00	4.00	4.00	4.00	3.50	0.00	0.00	0.00	1.00	1.00
3	1	7.00	7.00	6.00	7.00	7.00	6.80	7.00	6.00	7.00	7.00	7.00	7.00	6.83	7.00	7.00	7.00	7.00	4.00	5.00	5.00	4.00	4.50	1.00	0.00	0.00	0.45	1.45
2	2	7.00	7.00	6.00	7.00	7.00	6.80	6.00	7.00	7.00	6.00	7.00	7.00	6.67	7.00	7.00	7.00	7.00	3.00	4.00	4.00	4.00	3.75	1.00	0.00	1.00	0.00	2.00
3	2	3.00	6.00	4.00	4.00	5.00	4.40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.00	3.00	4.00	3.67	5.00	5.00	5.00	5.00	5.00	1.00	0.00	1.00	1.00	3.00
1	2	4.00	5.00	5.00	5.00	5.00	4.80	5.00	5.00	5.00	5.00	5.00	6.00	5.17	6.00	6.00	6.00	6.00	4.00	4.00	4.00	4.00	4.00	1.00	1.00	1.00	1.00	4.00
1	1	7.00	7.00	7.00	7.00	7.00	7.00	5.00	7.00	7.00	7.00	6.00	7.00	6.50	7.00	7.00	7.00	7.00	4.00	6.00	6.00	3.00	4.75	1.00	1.00	1.00	1.00	4.00

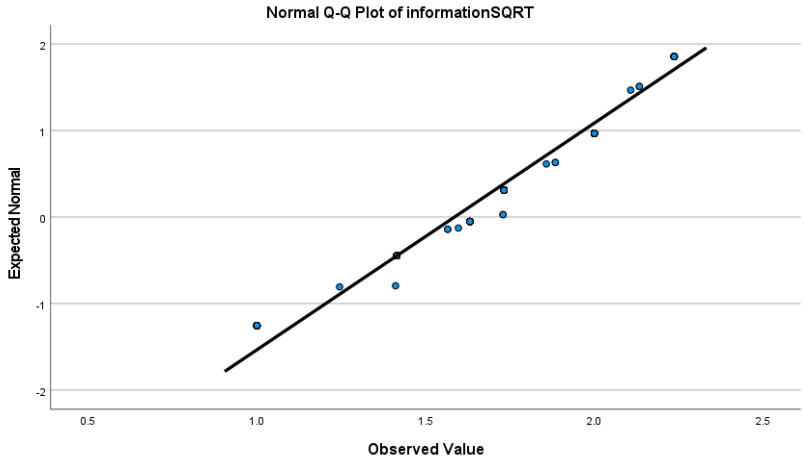
Note. A = Information Source; B = Message Frame; C = T1 Dependability; D = T2 Honesty; E = T3 Reliability; F = T4 Sincerity; G = T5 Trustworthiness; H = Trust Average I = E1 Expertise; J = E2 Experience; K = E3 Knowledge; L = E4 Qualification; M = E5 Skill; N = E6 Competence; O = Expertise Average P = C1 Integrity; Q = C2 Goodwill; R = C3 Openness; S = Credibility Average T = B1 I am interested in learning more about meat products cured with this new, amino acid-based alternative curing system. U = B2 I would consume a meat product cured with this new, amino acid-based alternative curing system. V = B3 I would purchase a meat product cured with this new, amino acid-based alternative curing system. W= B4 I would purchase a meat product cured with this new, amino acid-based alternative curing system instead of a conventionally cured meat product. X = Anticipated Consumption Behavior Average Y = IR1What is the conventional meat curing method used to cure most meat products? Z = IR 2When curing meat using the new alternative meat curing system, what is added to meat? AA = IR3 What system does L-arginine activate? AB = IR4 When activated, what does the endothelial nitric oxide synthase system produce?; AC =Information Recall Total Score

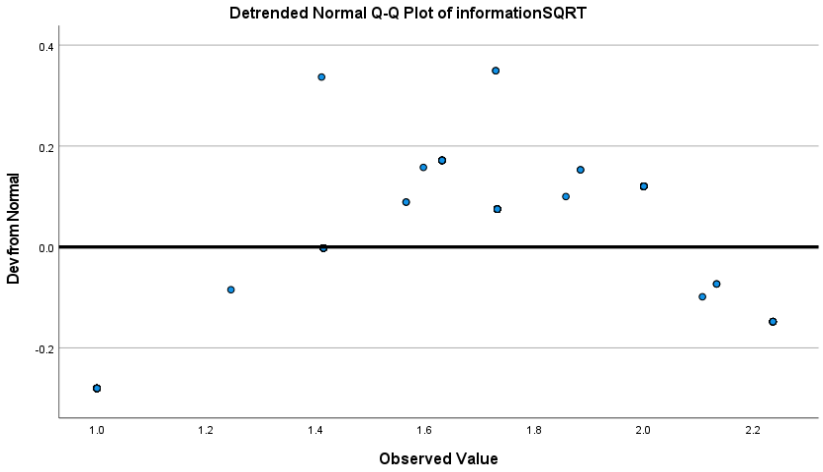
APPENDIX F

NORMAL DISTRIBUTION FIGURES

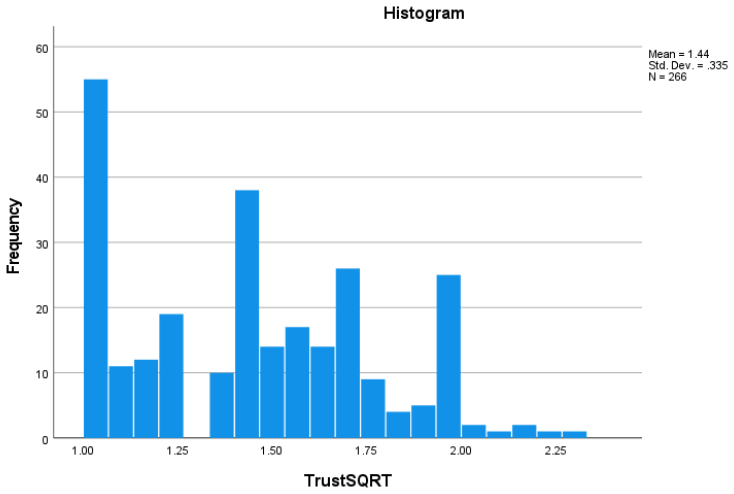
Information Source

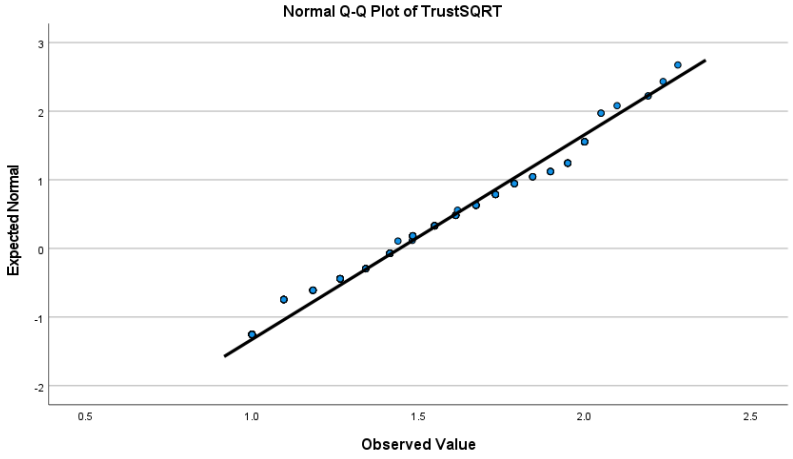


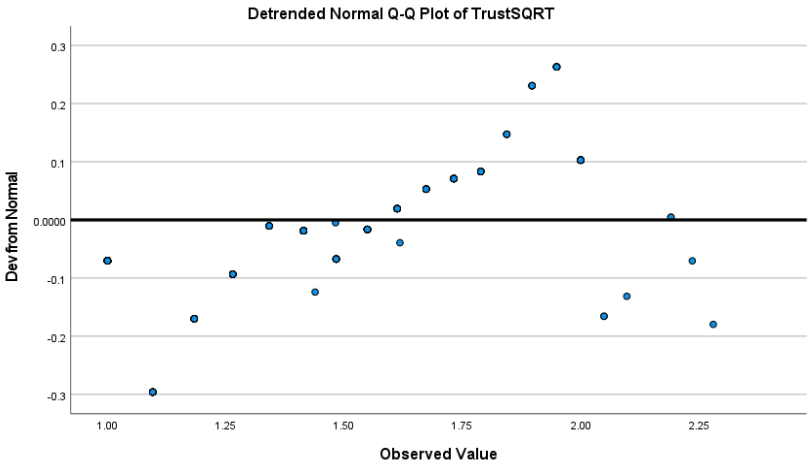




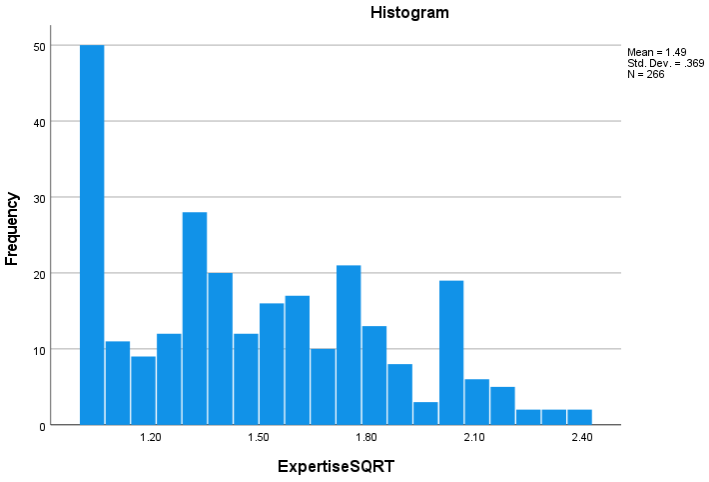
Trust

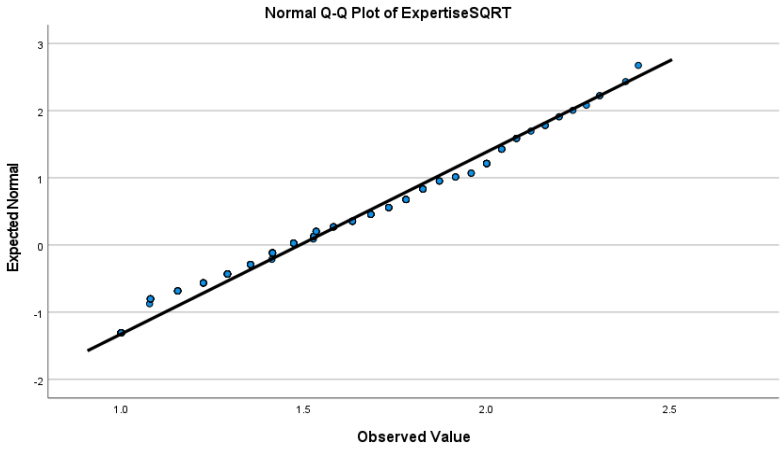

Histogram
Mean = 1.44
Std. Dev. = .335
N = 266
Frequency
TrustSQRT

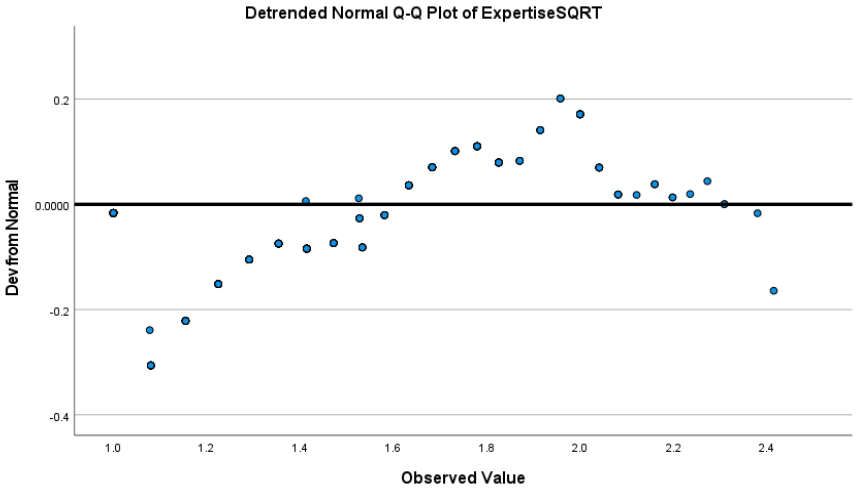

Normal Q-Q Plot of TrustSQRT
Expected Normal
Observed Value


Detrended Normal Q-Q Plot of TrustSQRT
Dev from Normal
Observed Value

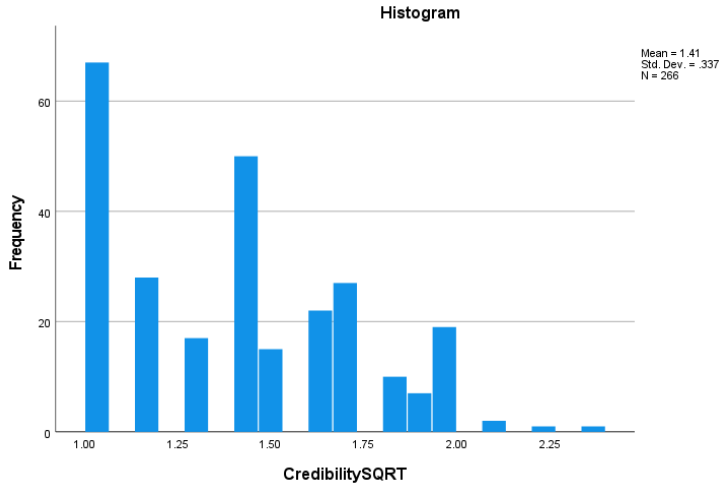
Perceived Source Expertise

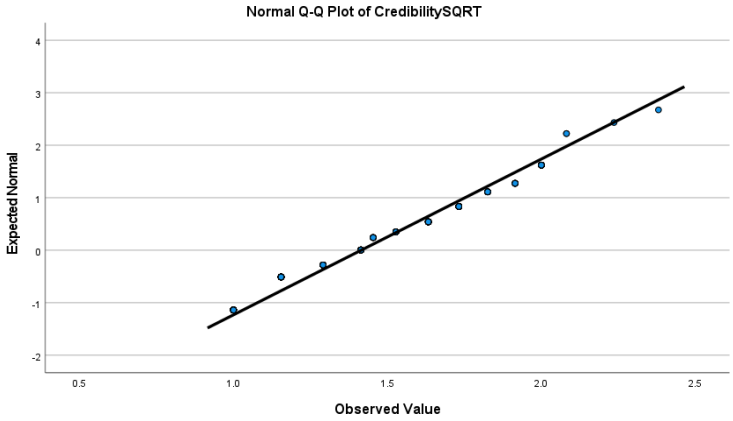


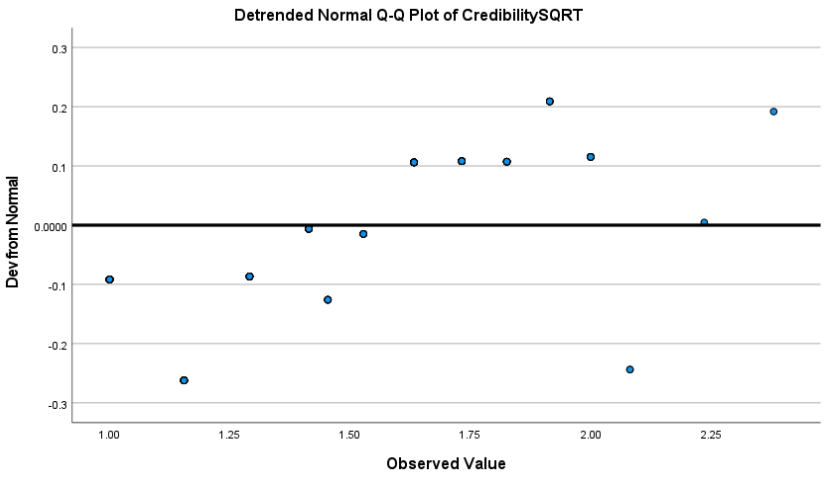




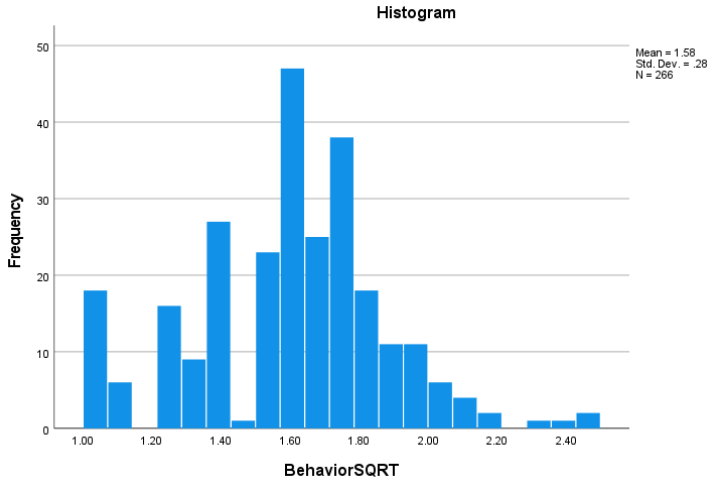
Perceives Source Credibility

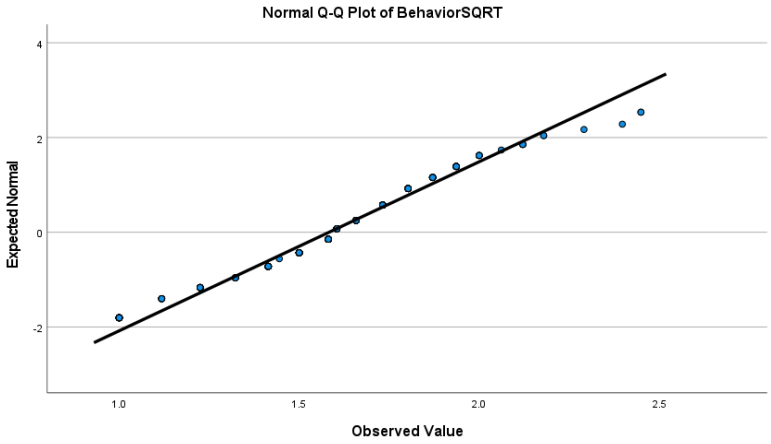


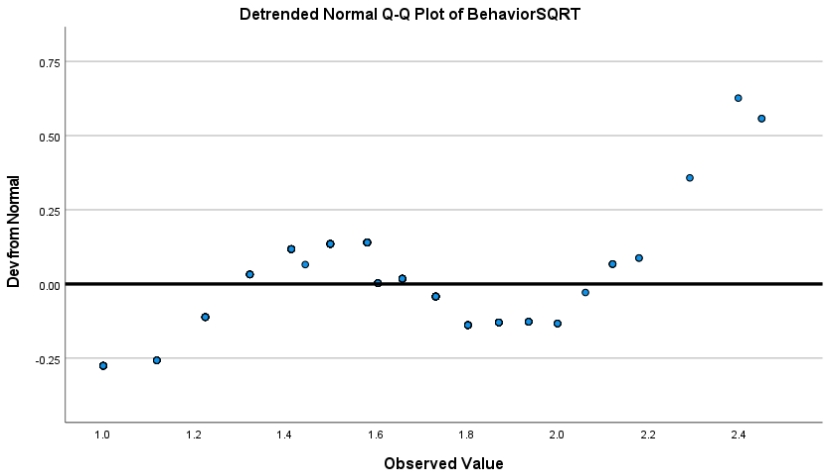




Anticipated Consumption Behavior



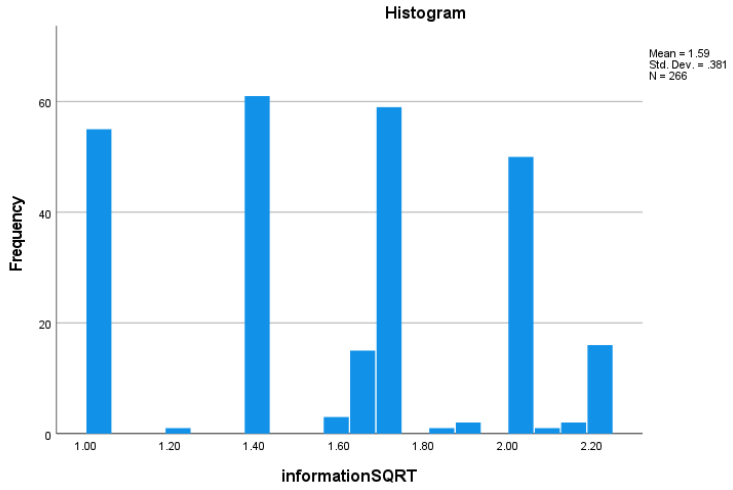


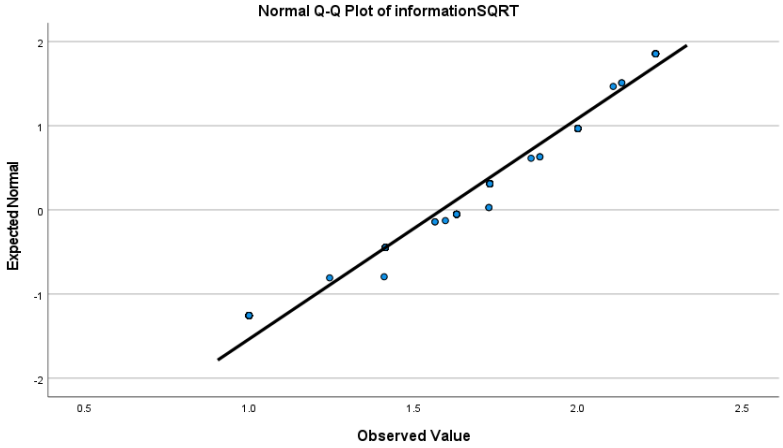


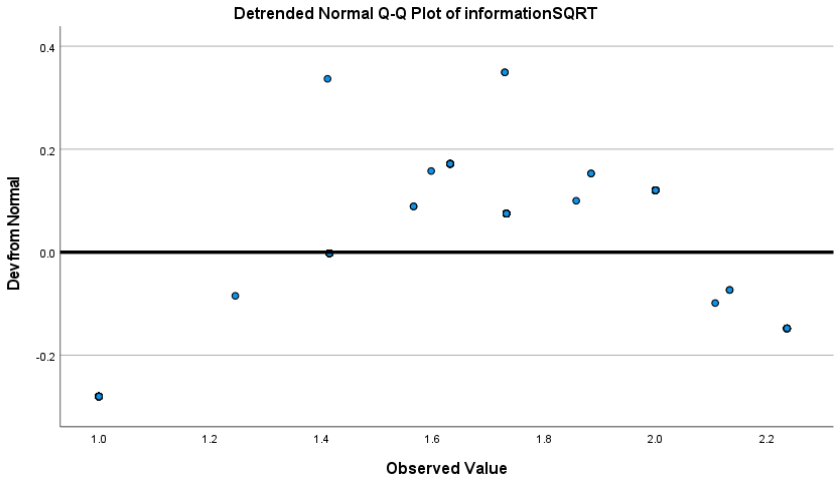
APPENDIX G

TRANSFORMED DATA RESULTS

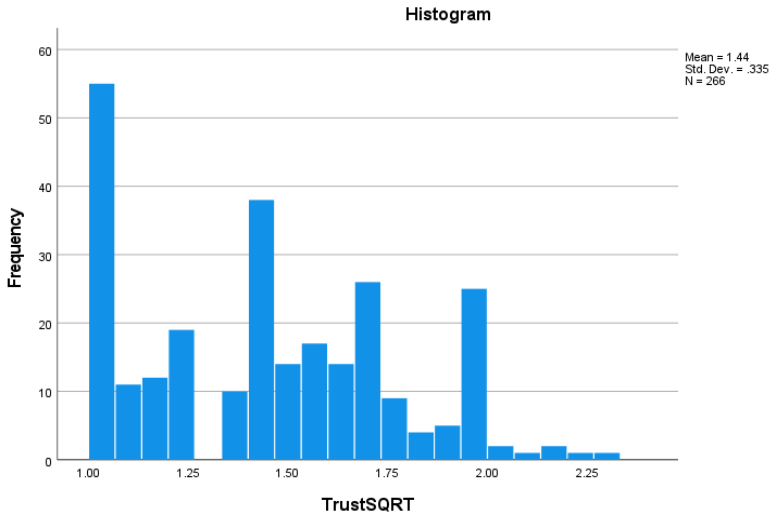
Information Recall

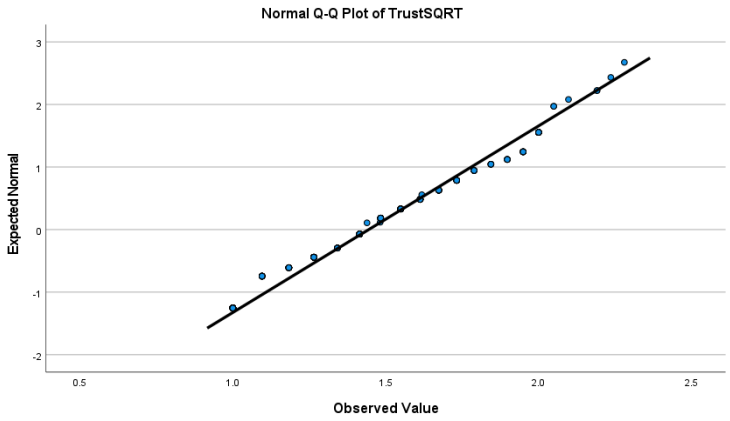


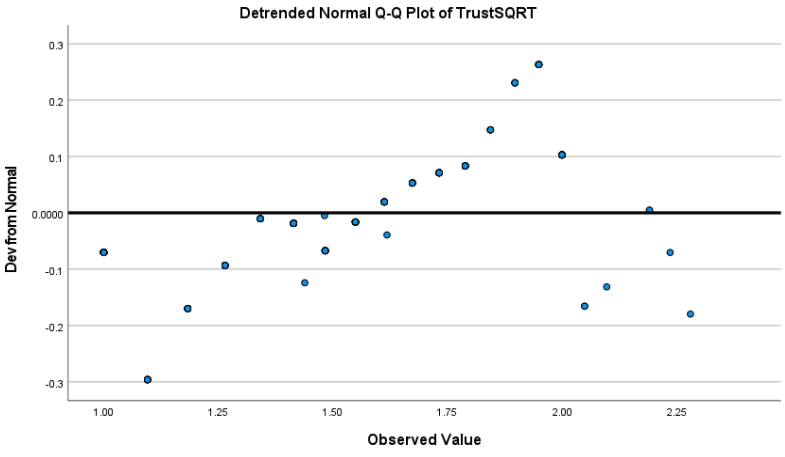




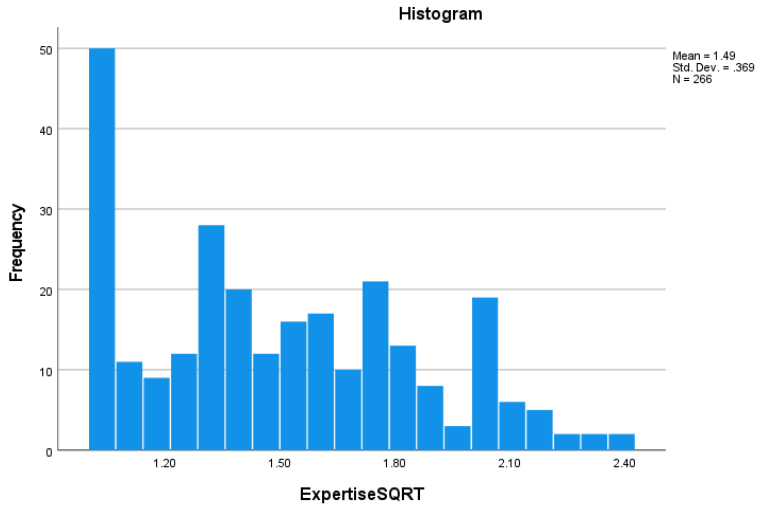
Trust

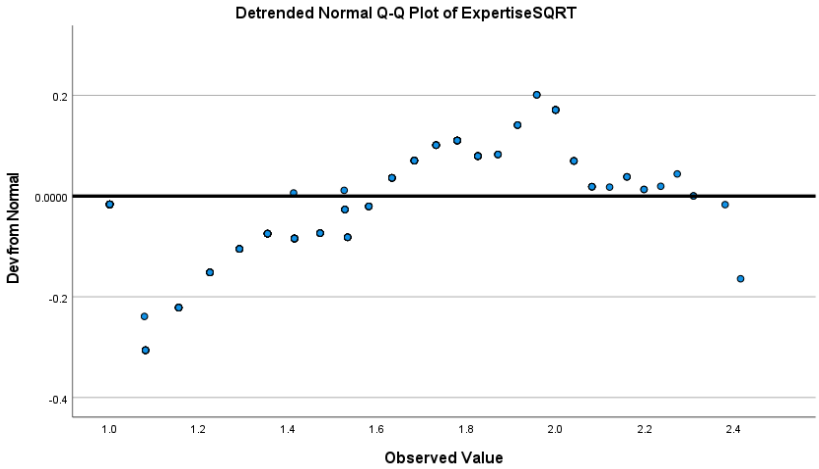

Histogram
Mean = 1.44
Std. Dev. = .335
N = 266
Frequency
TrustSQRT


Normal Q-Q Plot of TrustSQRT
Expected Normal
Observed Value

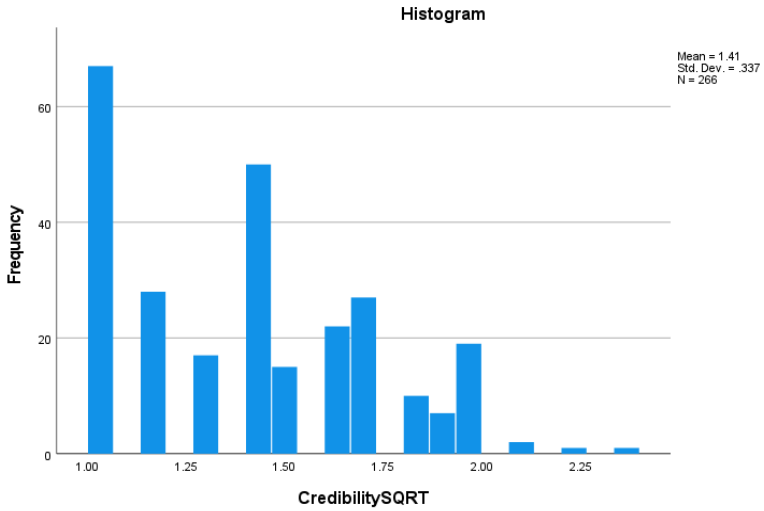

Detrended Normal Q-Q Plot of TrustSQRT
Dev from Normal
Observed Value

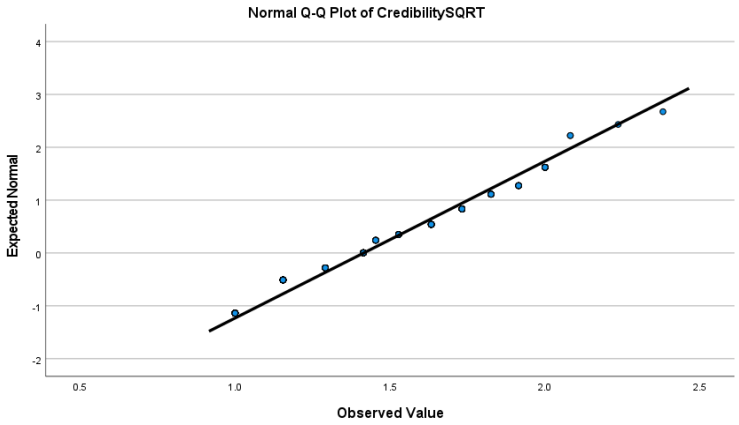
Perceived Source Expertise

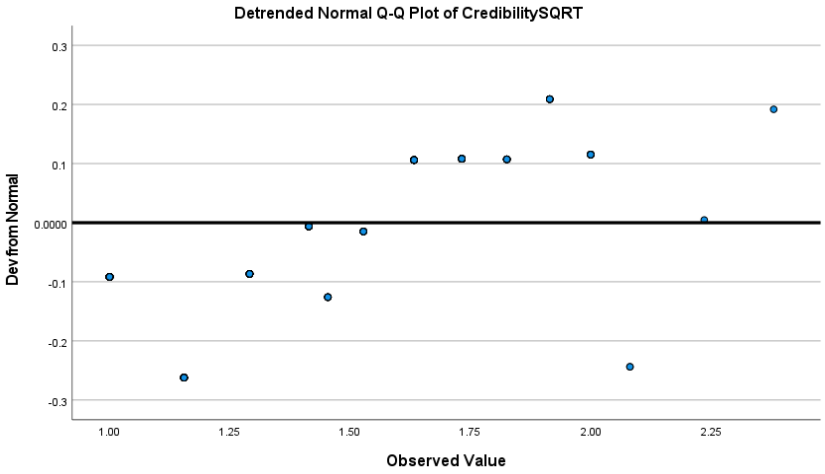




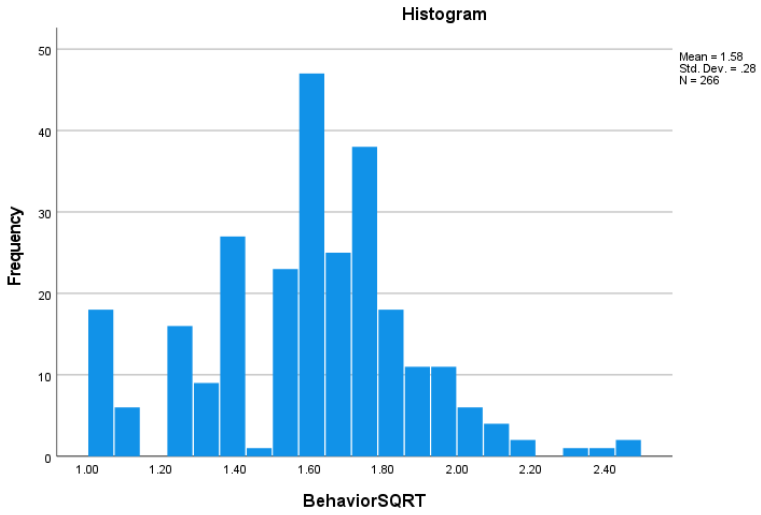
Perceived Source Credibility

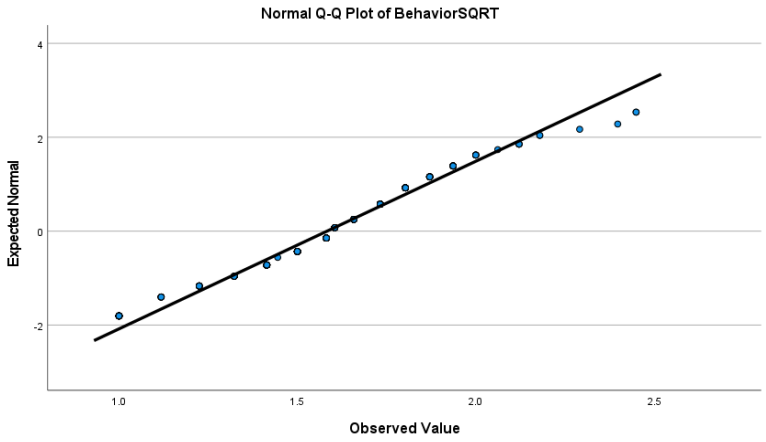


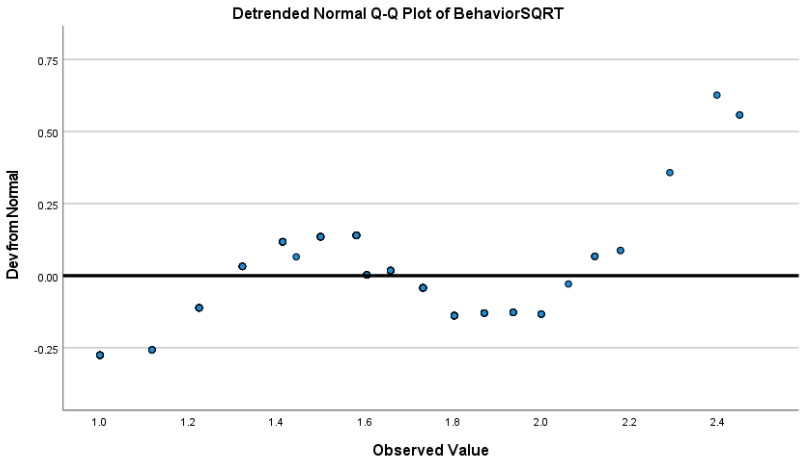




Anticipated Consumption Behavior







Multivariate Analysis of Variance

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.983	2885.676[b]	5.000	254.000	0.000	0.983
	Wilks' Lambda	0.017	2885.676[b]	5.000	254.000	0.000	0.983
	Hotelling's Trace	56.805	2885.676[b]	5.000	254.000	0.000	0.983
	Roy's Largest Root	56.805	2885.676[b]	5.000	254.000	0.000	0.983
InformationSource	Pillai's Trace	0.140	2.508	15.000	768.000	0.001	0.047
	Wilks' Lambda	0.864	2.547	15.000	701.584	0.001	0.048
	Hotelling's Trace	0.153	2.578	15.000	758.000	0.001	0.049
	Roy's Largest Root	0.114	5.813[c]	5.000	256.000	0.000	0.102
Frame	Pillai's Trace	0.017	.876[b]	5.000	254.000	0.498	0.017
	Wilks' Lambda	0.983	.876[b]	5.000	254.000	0.498	0.017
	Hotelling's Trace	0.017	.876[b]	5.000	254.000	0.498	0.017
	Roy's Largest Root	0.017	.876[b]	5.000	254.000	0.498	0.017
InformationSource * Frame	Pillai's Trace	0.054	0.932	15.000	768.000	0.528	0.018
	Wilks' Lambda	0.947	0.929	15.000	701.584	0.531	0.018
	Hotelling's Trace	0.055	0.926	15.000	758.000	0.535	0.018
	Roy's Largest Root	0.034	1.727[c]	5.000	256.000	0.129	0.033

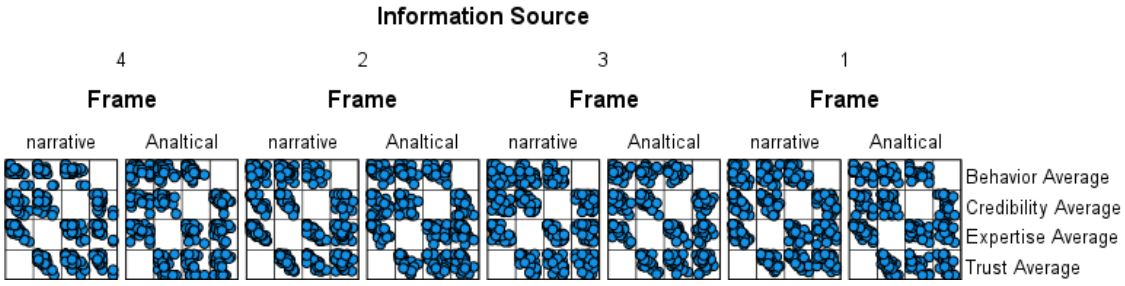
a. Design: Intercept + InformationSource + Frame + InformationSource * Frame

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

APPENDIX H

BIVARIATE SCATTERPLOTS


Information Source
4
2
3
1
Frame
Frame
Frame
Frame
narrative
Analtical
narrative
Analtical
narrative
Analtical
narrative
Analtical
Behavior Average
Credibility Average
Expertise Average
Trust Average