MILLENNIAL, PRODUCTION AGRICULTURALISTS' PREFERRED SOURCES OF INFORMATION CONSUMPTION:

A Q-SORT

A Thesis

by

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ABSTRACT

The number of millennials working in production agriculture is increasing as family operations transition generational leadership from the baby boomers to millennials. Millennials have different values and preferences than those of the baby boomers. Because production agriculture information sources, like cooperative extension, want to reach as many producers as possible, they must pay attention and adapt to the preferences of information consumption habits of millennials.

Q-methodology was used to look at preferred sources and methods of information consumption about production agriculture for millennials. After using a varimax factor rotation and centroid factor analysis, 3 factors were extracted. The factors or viewpoints extracted and analyzed were named based on their information source preferences.

Conventional confidants prefer speaking with cooperative extension and other risk management organizations. Relationship reliers appreciate relationships made when receiving information by phone or text. Social savants prefer to turn to social media for new information to see how it is currently working for others. While a large majority of participants fell into the first viewpoint of being a conventional confidant, those who wish to connect to millennial production agriculturalists must diversify the ways they disseminate information.

DEDICATION

This thesis is dedicated to my family. Thank you for allowing me to accomplish my dreams by going to graduate school. Thank you to Jared Biciolis and close friends for supporting me throughout this experience. I dedicate this thesis to Jesus for making it His will to finish it in the time that I did with the people in my life at Texas A & M who mentored me.

“All of time and history had to exist for this moment to happen right here and now,” - Tobin Redwine.

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NOMENCLATURE

4-H	Global network of youth organizations whose mission is engaging youth to reach their fullest potential while advancing the field of youth development.
Cooperative Extension	Put into place to connect agricultural experts and research with community needs, agents placed in each county to disseminate information
Millennial	A person born between the years of 1980-2000
Baby Boomer	A person born between 1946-1964
Production Agriculture	Working in the day-to-day operations to use land to produce crops or livestock for consumption
TAMU	Texas A&M University

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CHAPTER 1:
INTRODUCTION

Millennials are more educated than generations before them (Berridge, 2014). Because of access to higher levels of education, they have been exposed to multiple ways of receiving new information. The way millennials prefer to receive new information may not be the same way than those who came before them. This research seeks to answer this inquiry for millennials working in production agriculture.

Extension agents sought to share new technology and practices regarding agriculture from higher education institutions for more than one hundred years (Gould, Steele, & Woodrum, 2014). Agents conducted field trips and in-person demonstrations for those to receive exposure and experience with these practices and technology (Gould et al., 2014). Tegl et al. (2007) discovered agriculturalists still prefer to receive new information by word-of-mouth. More than ten years later, Whitaker, Leggette and Barbeau (2018) found program goals in extension can be met with more support through Internet-based media. Companies utilize multiples channels to reach their audience to keep them up to date with the organization as a result of more technologies and media outlets being used and created (Scott, 2010).

Millennials surpassed baby boomers as the generation with the largest buying power in the economy (Ordun, 2015). Generation Y (millennials) reamians three times larger than Generation X (Belleau et al., 2007). Millennials are also slower to get married and start families, but still exceed other generations in goals and priorities of their future families and livelihoods (Ordun, 2015). What makes them truly stand out from previous generations is millennials are the first generation connected by Internet and media all across the world (Espinoza et al., 2010).

Millennials are born between 1980 and the year 2000 (Gurău, 2012) which makes the generation range from the age of 18 to 38. Millennials are also our country's present economic

drivers (Ordun, 2015). With younger agriculturalists, there continues to be a communication gap between the resource provider and the farmer or rancher regarding issues the new generation faces (Brislen, Tanaka, & Jacobsen, 2016).

Significance

When seeking new information about agricultural practices, beginning farmers and ranchers still use extension agents and services as a major point of contact (Brislen et al., 2016).

The Internet allowed media to disseminate new information and provide modes of communication from almost anywhere (Cornelisse et al., 2011). Because of this unceasing trend in society, cooperative extension had to adapt and invest in Internet based ways to share research-based information and services to the public with a smaller than preferred budget (Whitaker et al., 2018).

Millennials are early adopters of new technology (Ordun, 2015). Fifty-six percent of millennials believe using new technology helps them to use their time more wisely (Ordun, 2015). With a variety of new technology available to the current generation, I am seeking to understand what the most preferred way of receiving new information about best practices for production agriculturalists is. Cooperative Extension would benefit to know the most preferred method for millennial agriculturists to consume information. This will ensure the widest range possible of information dissemination.

Statement of the Problem

To be efficient at disseminating information, extension agents must understand preferred sources of its target audience: millennial agricultural producers. Research has been found on millennial media habits with extension and interviews asking beginning agriculturalists the information source they prefer to use. However, there is a knowledge gap at looking specifically

how millennial agriculturalists from the southwest prefer to receive new information where they are able to take into consideration all sources of information and be able to talk through why they like particular sources over all others. Millennials will continue to be an integral part of American society for decades to come (Howe & Strauss, 2007).

Therefore, there is a dearth of knowledge about the information consumption habits of an important producer demographic. How can agricultural communicators and extension faculty and staff best reach millennial producers?

Purpose and Objectives

The purpose of this study is to identify sources that most effectively reach millennial producers. This study will achieve this purpose by being guided by the following objectives:

1) Identify millennial production agriculturalists objectivity in preference to access new information regarding production agriculture
2) Create a conceptual model relating the viewpoints on ways millennial production agriculturalists prefer to access new information into theoretical framework

Describing how millennial, production agriculturalists prefer to receive new information addresses two of the seven research priorities of the American Association for Agriculture Education of their national research agenda (Roberts, Harder & Brashears, 2016). The first priority it connects to is Research Priority Area 2: New Technologies, Practices, and Products Adoption Decisions (Linder et al., 2016). Once the preferred methods of information consumption are determined, extension agents will be obligated to adopt stronger ways to disperse their new found research results. This may even involve new methods of technology not every extension office has been familiar with in the past.

The second research priority this research connects to for AAAE is Research Priority 3: Sufficient Scientific and Professional Workforce that Addresses the Challenges of the 21st Century (Stripling & Ricketts, 2016). By better circulating new information about agriculture production, professionals in the workforce will be more equipped to addresses the upcoming food source challenges of the future. The United States seeks to have the safest, most reliable and efficient food source in the world. In order to continue this campaign, our farmers and ranchers need to stay educated on the latest findings of efficient and safe practices.

CHAPTER 2:
LITERATURE REVIEW

Extension

The Cooperative Extension System was put into place to connect agricultural experts with community needs, bridging government officials of the country, state, and counties (Grumbach & Mold, 2009). Extension secured itself in place by the Smith Lever Act of 1914 (Comer, Campbell, Edwards, & Hillison, 2006). This programmed cooperative extension in every county in every state across the United States. Informal extension began in 1850 and became more formalized by 1890 with land grant institutions (Comer et al., 2006). Extension is connected to the land grant institution each state possesses. According to the United States Department of Agriculture (2015):

> Cooperative Extension System (CES) empowers farmers, ranchers, and communities of all sizes to meet the challenges they face, adapt to changing technology, improve nutrition and food safety, prepare for and respond to emergencies, and protect our environment.

Agents have the ability to change the productivity of agricultural operations and improve their economic statuses (Anderson & Feder, 2004) by providing new information discovered by researchers at the land grant institutions. Because of the efforts by Cooperative Extension in the last part of the 20th century, agriculture production operations increased productivity by doubling the number of outputs per unit of input (Hoag, 2005).

Extension agents are placed in every county to ensure they are uncovering and meeting the needs of the community (Birkhaeuser & Evenson, 1991). The idea of extension has spread to many countries across the globe as well. Because of the program's widespread adoption, the extension model is considered to have one of the best innovation adoption rates in the world

(Grumbach & Mold, 2009). This is a high honor and spot to hold. But with great leadership of creating new information for the world to practice and operate their livelihoods off of presents joys and potential hardships (Berwick, 2003).

Agricultural practices can be vastly different depending on the climate. Agents are aware of this and try to meet the needs of all by covering research in multiple areas of interest. However, not all people are easily accessible for extension to reach them, meaning it costs more money and resources to reach their target audience (Anderson & Feder, 2004).

While the cooperative extension system is tied to the Unites States government, extension services have become privatized in many other countries across the world (Hoag, 2005). With this is mind, extension agents might have a tendency to be biased towards agriculturalists with larger operations guaranteed to last generations who will pay more for extension services and use them more frequently (Feder & Slade, 1993).

By the time information is disseminated, new technology has already been spread and adopted. Extension agents must simultaneously communicate to the public and research innovative strategies to keep up with new technology to benefit the community they serve (Birkhaeuser & Evenson, 1991).

One benefit extension has is the subconscious secondary information flows. Production agriculturalists converse on current technologies and practices that may have originally been technically tested and discovered by extension (Birkhaeuser & Evenson, 1991). Cooperative extension cannot rely on solely this snowball of information dissemination to stay relevant. They must also be aware of what other information organizations may be producing, for fear of redundancy (Ludwig, 2007).

Current Extension Communication

Nwobodo, Agbo, Ohagwu, & Igbokwe (2019) found that farmer to farmer, in person extension communication keeps production agriculturalists in tune with the latest information and led to increase in production, operation management skills, and overall operation success.

When people in expert roles give their time and resources to establish a one on one relationship with the producer and give them individualized information specific to their needs, trust is built and the outreach program can be successful (Garcia & Pence, 2018).

While fears of extension services losing their relevance surfaced (McDowell, 2001; Schuh, 1993), extension recognized the need for diversity of information outlets, such as the Internet, with its increasing popularity of use (Howell & Habron, 2004). Extension has also begun to expand to different programs within the community, such as food system economic partnerships, to keep involved with the people they serve in new ways (Colasanti, Wright, & Reau, 2009).

Organizations willing to be change agents are more likely to be sustainable and accomplish the goals of problem solving they wish to achieve (Fear et al., 2006; Peters, 2002; Schuh, 1993). In the case of cooperative extension, those goals include serving the youth and agricultural community they reside in to the best of their ability.

With innovative technology being produced each year, extension needs to continuously provide accessible and unbiased research to those agriculturalists in need (Trede & Whitaker, 1998). Extension employees have decreased while farms and ranches have increased, leaving an information gaps pertinent to be filled (Gakuru, Winters, & Stepman, 2009) and other resources to spread information needing to be identified.

Information and communication technology outlets, such as smart phones, play a pivotal role in agricultural market, allowing for agriculturalists to obtain information more conveniently and quickly (Akhmadi, 2018). While this is true, smart phones eliminate the face-to-face interaction of demonstrating and verbal sharing of knowledge. To the advantage of agricultural programs that have yet to embrace technology, those working in the agriculture industry typically lagged in fully embracing and utilizing all that modern technology has to offer (Flor, 2002).

Using Internet among rural communities rose 24% between the years 1998-2001 (U.S. Department of Commerce, 2002). However, farmers and ranchers living in rural communities are more often than not limited in variety of Internet service providers, even when they do wish to use it (Malecki, 2003).

Howell and Habron (2004) conducted a study exploring how agriculturalists and land owners along watersheds across Michigan prefer to receive new information from their extension services. They found that producers and landowner's ages 20 to 40 years-old preferred written communication, then personal/face to face, then media, and the computer or Internet sources last. While using the computer or Internet was placed last for the younger population, the percentage of preference was double that for millennials than of the older age groups participating (Howell & Habron, 2004).

There is an information gap between today's 20-40 year old (millennials) production agriculturalists and their information consumption preferences from extension related information services.

Production Agriculture

All countries depend on agriculture to provide secure and reliable food sources (Anshari, Almunaway, Masri, & Hamdan, 2018). The innovation and production of row crop agricultural operations have provided food to sustain the human population for billions of years (Robertson, Gross, Hamilton, Landis, Schmidt, Snapp, & Swinton, 2014). Agricultural success or failure of producing fuel, food, and fiber effects the environment and human well-being of the society it sustains (Robertson, et. al, 2014). This value added to society is often underappreciated (Power, 2010).

In order for the United States to remain a key player in the global food economy, future generations must continue to seek careers in production agriculture (Brislen et al., 2016). Of farming operations in the United States, 96% are family-owned leaving no evidence to decline soon (MacDonald, Korb, & Hoppe, 2013).

Ahearn and Newton (2009) reported over 63% of production agriculturalists with more than ten years of experience are above the age of 55. Experienced agriculturalists also tend to have their farming or ranching operations on their residence, (Ahearn & Newton, 2009). This gives the producers more incentive to care for their land and implement what best suits the operation.

The average age of a farmer continues to steadily increase and shows no signs of stopping anytime soon (Hays, 2017). The time has come for millennials to take over their agricultural operations in order for the operation to continue for generations to come (Ristino, 2013).

An expected increase in productivity will push production agriculturalists to base decisions off of new research and technology (Brugger, 2011).

Social influence has been a motivator for the level of perceived usefulness of a new technology and whether or not a technology is adopted by agriculturalists (van Sommeren, 2018). At the end of the day, whether or not a farmer adopts a new practice is dependent upon their resources available, incentives, awareness level, perception (Swinton et al. 2014), and local benefits (Robertson et al. 2014).

Millennials in Production Agriculture

In this Q-methodology study, millennials are defined as those born between the years 1980 and 2000 (Gurău, 2012). While Baby Boomers were the largest generation since 1999 (Fry, 2018), Millennials remain unlike other generations before them and are three times the size of the baby boomers market (Ordun, 2015).

First generation production agriculturalists face the struggles of extremely high start-up costs for their operation and scarcity in land available to purchase or rent (Ahearn & Newton, 2009). Therefore, millennial production agriculturalists are primarily the next generation in line taking over their family operation.

Agricultural operations are in a time period of transition as the baby boomer generation retires and exits the work force (Gasperini, 2017). The different generations embody different values in their work-life balance, decision making, and the way they consume information (Hume, 2010; Ordun, 2015). Both Baby Boomers and Millennials grew up and entered the job force at a time with a different social, economic, and political climates.

Along with all of these environmental differences have come a number of technology advancements. Millennials are more apt to do whatever it takes to keep the family farm sustainable for the future, which includes staying up-to-date on technology, agri-business practices, health regulations, and overall day-to-day operations (Gasperini, 2017).

Because millennials tend to be early adopters of new technology (Ordun, 2015), they have specific justifications for why they prefer receiving information from one source over another (Brislen et al., 2016). The Cooperative Extension Service must seek to help beginning farmers get the information they need in their preferred format to keep them involved in the agricultural industry (Brislen et al., 2016). This study was designed to find that information to support cooperative extension in servicing millennials.

Millennial Preferred Communication Methods

Unlike any other generation prior to millennials, a majority of the public is dependent on smartphones (Anshari & Lim, 2017). Smart phones have allowed access to many new communication mediums for all industries. The agriculture industry in particular has begun to utilize these communication mediums, as well as re-purpose already existing forms of information sources.

New technology and mediums are not adopted due to technological reasons but to cultural reasons (Brenner, 2009). The agricultural industry culture has typically been late adopters to the new technology and mediums (Flor, 2002). Some of these mediums include radio/podcasts, the takeover of the Internet, and twitter.

Radio has capabilities to reach all ages and more remote areas in need of new information (Alhassan & Shehu, 2019). A new form of information dissemination that is a variation of radio in the agricultural community is creating podcasts. They can be access through a cell phone from anywhere a song can be downloaded. Podcasts for agricultural producers is a way to bring traditional radio broadcasting to rural areas that may be previously unreached (Fannin, 2006). Many universities, including Texas A&M University System Agricultural Communications,

have begun to adopt the new technology into education and information sharing practices (Fannin, 2006).

The Internet is also a major source of information for younger farmers and ranchers. Telg and Barnes (2012) reported Florida Farm Bureau Federation Young Farmers and Ranchers used the Internet 69.9% to discover new agricultural information, 41.5% to keep records of their operations, and 39.5% to purchase new equipment and agricultural supplies. While no participant in their study stated Internet usage was their only form of communication to seek new information, it was highly encouraged for the Florida Farm Bureau to increase its usage of the platform to reach its younger members (Telg & Barnes 2012).

Having Internet capabilities allowed farmers and ranchers to access to information from their homes or phones and have a greater and more established online presence (Sutter, 2009). This also eliminates the need to attend an extension field day anytime they need new information. This does not mean that they will not attend them, but it is a major supplement to face-to-face communication.

Twitter is another media platform that society has begun using more frequently to access information. The application for a cell phone allows people to instant message and keep those who follow their account updated on whatever they want to share, typically in a short micro-blog or blurb (Paulson, 2009). Followers can make conversation, make announcements, share links, and share what they do throughout the day.

Many companies are taking to the trend of unbanning social media and phone usage in the workplace because of the benefits organizations and companies receive by connecting more frequently with their members or customers (Brenner, 2009). Twitter provides a stage for organizations and companies to have a dialogue with their consumers (Comm, 2009). It remains

an entertaining tool companies can use to promote more online communication and have a larger online presence to connect with more of their consumers (Mansfield, 2009). Agricultural communicators need to re-assess how they historically have reached their target audience to meet the needs of the present and next generation (Allen, Abrams, Meyers, and Shultz, 2010; Lefebvre, 2007).

With the recent popularity of newer social media platforms connecting those in the agriculture industry, there is an information gap on how millennial production agriculturalists prefer to access new information.

Theoretical Framework

Legris, Ingham, and Collerette's (2001) Technology Acceptance Model guided the study as the theoretical framework. The experience and willingness of a person creates their subjective normal behavior with technology. A person's subjective normal use of technology, the image or appearance of the use of the technology, the relevance of the technology to one's job, the output quality of the technology, and the proved result statistics all determine the perceived value of the technology being presented.

The perceived ease of use contributes not only to the perceived usefulness of the technology but also to the intention to use. Perceived usefulness and the subjective norm also contributes to intention to use. After an intent to use a product has been formed, the actual usage behavior is ultimately revealed (See Figure 1).

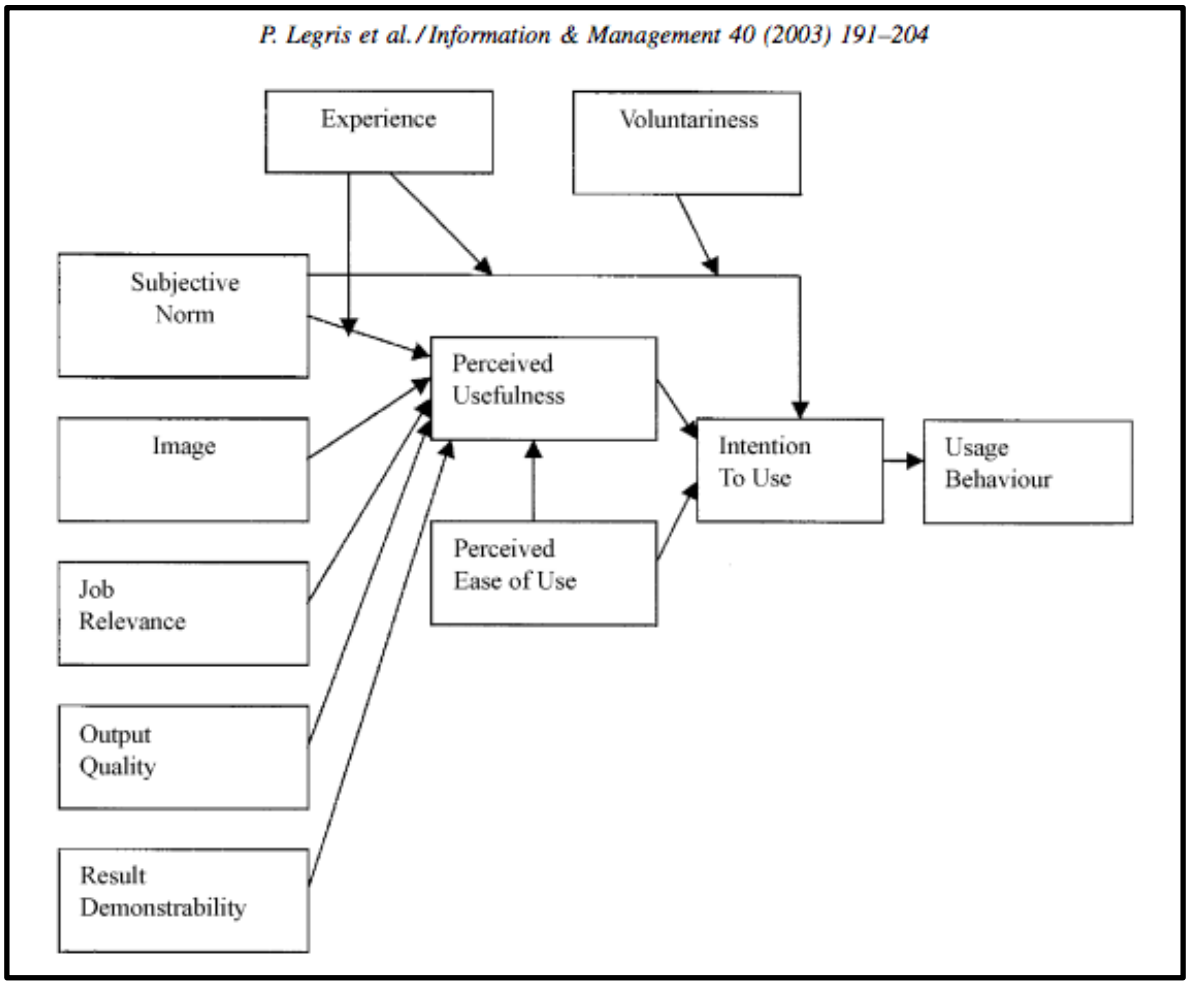


Figure 1. Technology Acceptance Model.

The way production agriculturalists decide what new technology and methods to use on their farms, and form their intention to use, are all based on information received from different sources that will be defined in the concourse of the study, then finally in the Q-set. I will use Legris et al.'s (2001) Technology Acceptance Model to investigate millennial, production agriculturists' preferences of new information sources.

CHAPTER 3:
METHODS

Research Design: Q-Method

The Q-methodology allowed a sample of a population to sort items on q-cards regarding a particular issue into a forced distribution based on preference (Leggette & Redwine, 2016). Conducting a q-sort was chosen because it is unique to other types of data collection because it operates based on operant subjectivity. Operant subjectivity allows researchers to look at the immediate environment about a person and the aspects of who they are to see how they interact with the world around them (Watts & Stenner, 2012). According to Stephenson (1968),

> To introspect, or to turn on his [sic] stream of consciousness: instead he has expressed his operant subjectivity modeling it in some manner as a Q sort. It remains his viewpoint (p.501).

The agricultural communications industry faces a diversity of issues between misconceptions and misinterpretations. Q-sort or Q-methodology allows the researcher to explore multiple perceptions and viewpoints on agricultural issues and viewpoints (Leggette & Redwine, 2016).

This particular study looked at the ways millennials prefer to receive new information about production agriculture. A variety of millennial production agriculturalists with different information needs were identified and analyzed based on their individual source preference.

The participants were subjective in their decision making and had control of their reasoning throughout the entire process. Participants talked through their decision making process as they placed the different information sources along the forced distribution. The process of conducting a Q-sort is further described in the following sections.

Concourse

The concourse is the compilation of all possible statements the respondents could make regarding the subject of the study (van Exel & de Graaf, 2005). A verbal concourse may be obtained via interviews, participant observation, print media, opinions, or visual aids (van Exel & de Graaf, 2005) but was not particularly for this study.

I defined the concourse through an extensive literature review over all the ways millennial, production agriculturalists receive and access new information. I conducted this literature review by use of Google Scholar, the Journal of Agricultural Education, the Journal of Extension and the Journal of Communications as my databases. I began researching by using the keywords millennial information, farmer information source, information source, production agriculture resources, millennial information consumption, and extension resources. The articles used to define the concourse appear in Table 3.1.

Table 3.1

Articles Used to Establish Concourse

Date	Title of the Article	Authors
2018	Assisting Mid-Atlantic Wine Industry Stakeholders in Developing Consumer-Centric Marketing Strategies: Internet Survey Results	Miller, Hyde, Kelley, Rickard, Gardner, Storchmann, Govindasamy
2017	Farm Computer Usage and Ownership	United States Deparment of Agriculture
2018	Food Preservation: Using Technology-Based Tools to Reach Diverse Audiences	Johnson, Kraemer, Case, Hyde, Kershaw
2018	Identifying Needs and Implementing Organizational Change to Improve Retention of Early-Career Agents	Vines, Hunnings, Cletzer, Vines, Westfall-Rudd, Lambur
2013	Improving Generation Y Volunteerism in Extension Programs	Andrews, Lockett
2011	Leveraging New Media in the Scholarship of Engagement: Opportunities and Incentives	Labelle, Anderson-Wilk, Emanuel
2016	Preferred Knowledge Sources for Beginning Farmers: The Case of Kentucky	Brislen, Tanaka, Jacobsen
2018	A Marketing Standpoint: What Marketers Can Teach Extension Professionals About Internet-Based Media	Whitaker, Leggette, Barbeau
2007	Local Marketing and Promotional Efforts of Florida Extension Agents	Telg, Irani, Hurst, Kistler

Q-Set

The Q-set is a sample from the entire population of ideas found within the concourse. Statements were collected from the articles listed in Table 1 until data saturation was met. Once all statements were collected on how millennials prefer to receive new information regarding agricultural production farming practices, the total was reduced to a sample of 36 statements. These statements are listed Figure 2.

Concourse	
Twitter	News websites
Facebook	Cable TV local TV
Blog	Searching Internet: government websites
Face to face	Accessing reports
Searching Internet	Non ag websites
Television ads	Webinars
Print ads	Texting
Mail	Phone call
Video	Discussion forums
Tumblr	classes/field days
Read it	Printed/online hand outs
Instagram	Friends
YouTube	Family
Linked in	Magazines
Snapchat	Books
Vine	Risk management associations
Radio	Face to face with other farmers
Print newspaper	Experts

Figure 2. List of Original Statements from Concourse.

The sample was determined by using the constant, comparative method to carefully synthesize information to ensure there were no duplicated ideas. The final number of statements was 27 as identified in Table 3.2.

Table 3.2

Q-Set.

No.	Statement
1	Face to face with other farmers
2	Books
3	Expert risk management associations
4	Magazines
5	Family
6	Printed or online handouts
7	Friends
8	Class/field days
9	Discussion forums
10	Phone calls
11	Texting
12	Webinars
13	Non-ag related websites
14	Radio
15	Snapchat
16	LinkedIn
17	YouTube
18	Instagram
19	Print ads
20	Video

Table 3.2 (continued)

21	Tumbler
22	Reddit
23	Television: cable or local
24	Blog
25	Twitter
26	Facebook
27	Cooperative extension

P-Set

The participants in the P-set sorted the Q-set into a forced distribution shown in Figure 2. Participants were purposefully chosen based on their variety in perspective and subjectivity. The participants' subjectivity makes them unique as an individual, which includes their emotions, experiences, demographics, and psychographics.

I created the P-set for this study by identifying stakeholders and opinion leaders involved with production agriculture in Texas. The opinion leaders and stakeholders were found using professional networks, such as the Texas Farm Bureau Federation, Texas FFA state alumni, the National Livestock Shows in Texas, the Houston Livestock Stock Show and Rodeo, the Texas Tech University and Texas A&M University's Colleges of Agriculture and Life Sciences, Texas A&M Agri-Life Cooperative Extension, and county cooperative extension offices. From these professional networks, I also used snowball sampling by seeking recommendations from stakeholders and opinion leaders on who fit the qualifications of the P-set. A sample of twenty one participants were taken from Texas (N = 21).

Participant Characteristics

The P-set was comprised of millennial, production agriculturalists across the state of Texas. Participants were identified by contacting the state Farm Bureau Young Farmers and Ranchers chair of Texas to identify millennial agriculturalists in a variety of production areas. An agricultural producer is a farmer or rancher working in the day-to-day operations to use land to produce crops or livestock for consumption (Hendrickson & Porth, 2012).

Texas was relevant because it remained a prominent agricultural farming state in the southwest but contains different landscapes and climates throughout. The state has a unique culture, and grows different crops for different needs. Participants from these states gave a variety of backgrounds from multiple parts of the state. Because the P-set is typically significantly smaller than the q-set (Brouwer, 1999), approximately twenty people from a variety of parts of Texas and a substantial variation of gender provided for a quality and reliable P-set (van Exel & Graaf, 2005).

Q-Sort

The final statements were individually printed on notecards. The notecards were then given to the P-set—millennial, production agriculturalists—to place along the forced distribution. The q-set statements were distributed by the participants from the most preferred method to the least preferred method of accessing information on production agriculture. The distribution table was altered based on the number of final statements decided upon.

Data collection took place during January 15 - February 3, 2019. The Q-sorts were recorded via a laptop recording application and field notes. Each participant was given an allotment of 45 to 90 minutes to complete their Q-sort. The participants started the q-sort process by answering a short demographic survey to describe the participants' gender, ethnicity, age,

how long they have been farming, and the size of their operation(s). After completing the demographic survey, participants completed the Q-sort.

Each participant received the following instructions:

a. Review consent form
b. Complete demographics survey
c. Read through all the statements on the index cards (See Figure 2)
d. Sort cards into three piles of relating to you individually: definitely use, maybe use, and definitely do not use
e. Distribute each pile along the forced distribution (See Figure 3); you may start with any pile, but once you begin with a pile, you must finish sorting the entire pile before moving onto the next
f. Please verbally describe why you are placing each statement in the prospective tile piece

After participants completed the Q-sort, I asked them follow-up questions based on their placement of statements (See Figure 3).

a. What was the statement you placed furthest left? Why?
b. What was the statement you placed furthest right? Why?
c. What are your thought on the overall experience of the process and experience?
d. Is there anything else you wanted to share that I did not get a chance to ask?

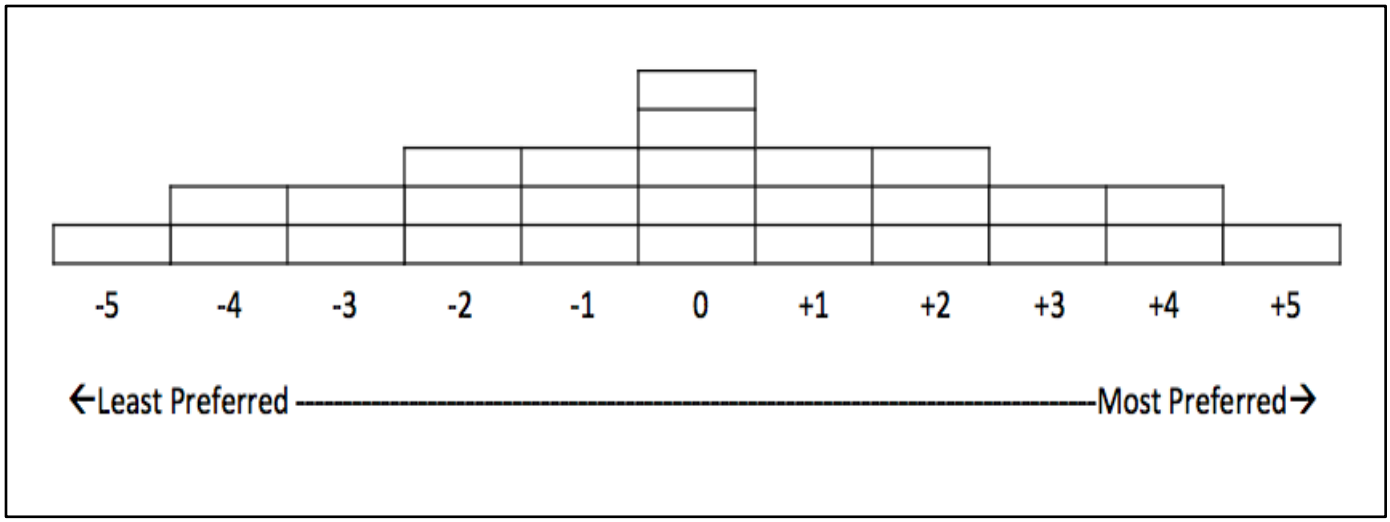


Figure 3. Q-Sort Distribution Board.

PQ Method Data Analysis

Factor Analysis

I used PQMethod, which is a free software available online, to analyze the data collected. Three steps to factor analysis are factor extraction, factor rotation, and factor analysis (Spearman, 1937). Factors are the viewpoints of the P-set participants.

Factor Extraction

For factor extraction, I used the centroid factor analysis to determine the factors most closely related. Centroid Factor Analysis in PQMethod yields a table with Eigenvalues and factor loading scores for each member of the P-set and percentage of variance explained by each factor (Watts & Stenner, 2012). The Eigenvalues must be greater than 1. Depending on the results, I identified the number factors to use for factor analysis (Watts & Stenner, 2012).

Factor Rotation

Once the number of factors were identified, a Varimax rotation was conducted (van Exel & Graaf, 2005). A Varimax rotation alternates the observations and viewpoints as a whole to look at the similarities and differences between all of the individual participants with a strong

factor. This analysis process was objective by statistical principle (van Exel & Graaf, 2005). Factors were rotated to examine opinions from different angles and perspectives (van Exel & Graaf, 2005). While conducting the study, it is important to continuously adjust factor loading scores (Watts & Stenner, 2012). Varimax rotation helped to guide a discovery of usable factor solutions (Watts & Stenner, 2012).

Factor analysis helped determine what factors in the study exhibited correlation (Watts & Stenner, 2012) or the Z-score, which is a distinguished average statement score (van Exel & Graaf, 2005). The answer is determined by the researcher and is considered correct (Coolidge, 2006). The PQMethod gave the data distinguishing statements for each factor, rating them from most important to least important. If a participant was most closely aligned with that factor, they were labeled as a defining sort (van Exel & Graaf, 2005).

Significant factor loading = 2.58 x (1 ÷ √no. of items in the Q set
= 2.58 x (1 ÷ √27)
= 2.58 x (1 ÷ 5.196)
= 2.58 x 0.19245
= **0.496** rounded up to ± **0.50**

I used data collected from the demographic survey to interpret why and how participants sorted cards the way they did to see if there was any correlation with demographics of participants and their information consumption source preferences. Finally, I arranged the factors into a conceptual model explaining differing viewpoints on millennial, production agriculturalists' information preferences.

CHAPTER IV:
RESULTS AND DISCUSSION

The purpose of this study is to identify sources that most effectively reach millennial producers. This study will achieve this purpose by being guided by the following objectives:

1) Identify millennial production agriculturalists objectivity in preference to access new information regarding production agriculture
2) Create a conceptual model relating the viewpoints on ways millennial production agriculturalists prefer to access new information into theoretical framework

The results found in this study showed a large majority explained within one factor and the rest of the participants explained among two other factors. I first exhibit all of the findings within eight factors, then explain why only three factors ended up remaining statistically significant from the rest.

I used Centroid Factor Analysis for this study's factor analysis. Brown's factor analysis allowed for more factors to be recognized (Watts & Stenner, 2012). Had the Horst mathematical factor analysis method been used, there may have been potential for only one prominent factor remaining. The homogeneity in the population was apparent when looking at the data. Brown methodology allows for more of the variance to be further explained by expanding to multiple factors.

After applying the centroid factor analysis to analyze the data, I narrowed the factors down to eight as seen in Table 4.1. Each row represents each participant, along with their pseudonyms. Each column represents a specific viewpoint.

Table 4.1

Un-rotated Factor Matrix

Participants	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**	**Factor 8**
Roy	0.8303	0.0955	-0.2915	0.0227	-0.1219	-0.1203	-0.0027	-0.1022
Ben	0.8041	0.3293	0.0220	-0.0657	-0.3281	-0.0269	0.1798	-0.0458
Buddy	0.8377	0.2716	0.0331	-0.1148	0.1864	-0.0427	-0.0791	-0.1312
John	0.7358	-0.3670	0.1662	0.2472	0.2364	0.1467	0.1327	-0.2167
Jared	0.7041	0.1081	-0.2504	-0.3401	0.2076	-0.0900	0.0072	0.2261
Ashley	0.7827	-0.3383	0.1346	0.1627	0.0398	0.0516	0.2010	-0.0764
Byron	0.7044	-0.4167	-0.0689	0.3702	-0.2111	0.1044	-0.0391	0.0993
Michael	0.7212	0.3713	0.1969	0.0587	0.0830	0.4958	0.0678	-0.0543
Kirk	0.8610	0.1854	0.0675	0.0745	-0.2026	0.0707	-0.2021	0.0807
Jim	0.8506	0.1962	-0.0147	-0.0562	-0.0737	0.2608	-0.2052	0.2628
Perry	0.2727	0.6972	0.0309	0.5519	0.1894	-0.1198	-0.0736	-0.1042
Dalton	0.7300	0.0151	0.3485	-0.3272	0.0165	0.0061	0.3725	0.1257
Spencer	0.7823	-0.2136	-0.1139	-0.2611	0.1825	0.0780	-0.1166	-0.3140
Darryl	0.6752	-0.2468	-0.1772	0.4377	0.1414	-0.1543	0.1788	0.2942
Natalie	0.5250	0.2544	0.6545	-0.0216	0.1784	-0.3761	-0.0299	0.0444
Kevin	0.7971	-0.4298	-0.1753	-0.0582	-0.0371	-0.2015	0.0800	-0.1402
Morgan	0.9280	0.0408	-0.0887	-0.0051	-0.1748	-0.1560	-0.0951	-0.0262
Danny	0.5883	0.3034	-0.5102	-0.0853	0.4182	0.0352	0.1532	0.0699

Table 4.1 (continued)

Ryan	0.8435	-0.1001	-0.0230	-0.0324	-0.0009	-0.1085	-0.3675	-0.0553
Richard	0.7966	0.1820	-0.0487	-0.0661	-0.4629	-0.0437	0.1572	-0.0579
Andy	0.6912	-0.5047	0.2734	-0.1003	0.1492	0.0556	-0.2250	0.1676
Eigenvalues	11.786	2.0706	1.2151	1.0686	0.9205	0.6477	0.6256	0.4956
% Variance Explained	56	10	6	5	4	3	3	2
% Cumulative Variance	56	66	72	77	81	84	87	90

For Brown's varimax rotation, seven factors was the determined number suggested (Watts & Stenner, 2012). With eight being the highest number of factors possible to analyze, I chose eight to allow for as much explained variance possible.

Fifty-six percent of the participants aligned with factor one. Because this number is so significant, factor one automatically was chosen as a distinguishable factor. With forty-four percent variance still needing to be explained, a total of two to four more factors needed to be chosen as other distinguishable factors to show the differences and similarities in varying viewpoints.

Ultimately, I identified a three factor solution to establish defining sorts. There may have been a fourth factor or viewpoint in this study. However, the fourth factor would have accounted for only less than five percent of the population of the study. I decided this was not statistically significant to keep.

While looking just at the Eigenvalues, Brown believes that any factor with an Eigenvalue larger than one is worth keeping. Watts and Stenner (2012) believe this is a good place to start, but this method of determining which factors to keep can lead to spurious correlation.

Having only a total of two factors would not show enough data to explain the total variance among participants. Therefore, I had the choice of keep a total of three, four, or five factors, erring on the side of abundance of caution.

I determined that factor four was problematic because it did not explain an expressive amount enough to report due to possibility of error being greater with a total of four factors rather than three. There was also a more natural break between factor three and factor four. Choosing a three factor analysis allowed for a total of 72% variance to be explained.

The defining sorts among the three distinguishable factors were marked in the Table 4.2 with an X.

Table 4.2

Factor Matrix with Defining Sorts

Sort	Factor 1 Loading	Factor 2 Loading	Factor 3 Loading
Roy	0.4552	0.7342**X**	0.1927
Ben	0.2769	0.6334**X**	0.5269
Buddy	0.343	0.6189	0.5253
John	0.7659**X**	0.1647	0.2999
Jared	0.3654	0.6377**X**	0.1729
Ashley	0.7733**X**	0.2270	0.3094
Byron	0.7714**X**	0.2700	0.0817
Michael	0.1997	0.493	0.6433**X**
Kirk	0.4251	0.5697	0.5244
Jim	0.4061	0.6205**X**	0.4607
Perry	-0.3476	0.4827	0.4556
Dalton	0.4823	0.2306	0.6073**X**
Spencer	0.6664**X**	0.4437	0.1719
Darryl	0.6186**X**	0.4027	0.0597
Natalie	0.1828	0.0286	0.8570**X**
Kevin	0.8365**X**	0.3871	0.0355
Morgan	0.5705	0.6392	0.3699
Danny	0.1292	0.8256**X**	0.0057
Ryan	0.6251**X**	0.4784	0.3202
Richard	0.3799	0.6023**X**	0.4037
Andy	0.8462**X**	0.0035	0.3018
No. of Defining sorts	8	6	3

The rotated factor analysis loadings magnify the factors and show differences and similarities among viewpoints for further analysis.

From these defining sorts, the total number in each factor were analyzed to identify three differencing viewpoints on preferences of millennial production agriculturalists receiving new information on their prospective production areas.

Watts and Stenner (2012) state that for a study to be reliable, the composite reliability should remain above a 0.8. Each factor's composite reliability is at least an entire 0.1 above a 0.8 at a 0.9 or higher, keeping this study to the standard of Watts and Stenner (2012) to be reliable. I found the three factor solution to produce reliable factors as shown in Table 4.3.

Table 4.3

Reliability of a Three Factor Solution

Factors	**1**	**2**	**3**
No. of Defining Variables	8	6	3
Composite Reliability	0.97	0.96	0.923

Table 4.4 shows each factor being compared against one another to see the how similar they are to each other. When factors 1 and 2, 2 and 3, and 3 and 1 are compared, factor 1 and factor 2 are the most similar. Their inter-correlation scores are most alike in each comparison. 1 and 2 were most similar, but their coefficient was low enough that we still find a third factor solution to be sound, valid and reliable. Factor 3 has a score that is more similar to factor two than to factor one.

Table 4.4

Intercorrelation Between Factors Scores

	Factor 1	**Factor 2**	**Factor 3**
Factor 1	1.0000	0.6605	0.5228
Factor 2	0.6605	1.0000	0.5445
Factor 3	0.5228	0.5445	1.0000

Table 4.5 shows the varying array of differences between the factors. These factor arrays show how each statement would be sorted in that particular viewpoint. Each statement is sorted by someone in each viewpoint and what a person belonging to each of those factors would most commonly score it as.

Table 4.5

Q-Sort Values for Statements

Statement	Factor 1	Factor 2	Factor 3
1	5	3	5
2	0	-2	-1
3	3	-1	-2
4	1	1	0
5	4	3	4
6	2	1	2
7	2	5	4
8	4	0	2
9	0	1	-4
10	2	4	-1
11	1	4	0
12	0	0	-3
13	-1	-3	-3
14	0	-3	2
15	-5	0	-2
16	-3	-1	0
17	-2	-1	1

Table 4.5 (continued)

18	-2	-2	3
19	0	2	-1
20	1	2	1
21	-4	-4	-4
22	-3	-5	-5
23	-1	0	0
24	-2	-2	-2
25	-4	-4	3
26	-1	2	1
27	3	0	0

This factor perspective as shown in Table 4.6 was named the Conventional Confidants. Distinguishable statements for the perspective of factor one of being highly preferred are class field days, cooperative extension, expert risk management associations, phone calls, and friends. They heavily value traditional or conventional methods of accessing new information about production agriculture in their prospective field.

Distinguishable statements of being least preferred are listening to the radio, non-agriculturally related websites, linked in, and Reddit. Conventional Confidants lean away from using media outlets as sources of information dissemination.

Table 4.6

Distinguishing Statements for Factor 1: Conventional Confidants

No.	**Statement**	**Q-Sort Value**	**Z-Score**
8	Class/field days	4	1.39
27	Cooperative extension	3	1.31*
3	Expert risk management associations	3	1.15*
10	Phone calls	2	0.94
7	Friends	2	0.65*
14	Radio	0	0.11
13	Non-ag related websites	-1	-0.2
16	LinkedIn	-3	-1.15*
22	Reddit	-3	-1.33

Note. * indicates $p<.01$

The Conventional Confidants have the greatest variability in birth year, gender, years involved, and operation type as shown in Table 4.7. 56% of variance is explained within this one sort. It does not matter what stage of career these millennial production agriculturalists are at to have the viewpoint and fall in line with the Conventional Confidants of factor 1.

Table 4.7

Descriptive Characteristics for Factor 1

Sorts	**Birth Year**	**Gender**	**Years Involved**	**Operation**
John	1997	Male	15	Beef & equine
Ashley	1990	Female	18	Beef & crops
Byron	1994	Male	12	Starter yard beef
Spencer	1992	Female	20	Beef & crops
Darryl	1996	Male	2	Beef cattle
Kevin	1991	Male	17	Sheep, goats & hunting
Ryan	1984	Male	30	Beef, horse, row crop & goats
Andy	1994	Male	12	Cow-calf

Factor 2, noted for being relationship oriented when accessing new information about production agriculture, was named the Relationship Reliers. Statistically significant statements for the perspective of factor two of being highly preferred are phone calls, texting, and class field days as shown in Table 4.8.

Unfavorable statements for the factor two perspective include snapchat and radio. Relationship Reliers, similar to Conventional Confidants, do not fully embrace all types of media to access information. They do prefer Facebook and video usage, unlike Conventional Confidants.

Table 4.8

Distinguishing Statements for Factor 2: Relationship Reliers

No.	**Statement**	**Q-Sort Value**	**Z-Score**
10	Phone calls	4	1.62
11	Texting	4	1.57*
8	Class/field days	0	0.02
15	Snapchat	0	-0.04
14	Radio	-3	-0.72*

Note. * indicates p<.01

Relationship Reliers were all male with one female as shown in Table 4.9. They each were involved with beef cattle operations, were all born after 1990, and had a variety of 5 to 20 years of experience in the production agriculture industry.

Table 4.9

Descriptive Characteristics for Factor 2

Sorts	**Birth Year**	**Gender**	**Years Involved**	**Operation**
Roy	1996	Male	8	Crops, beef cattle
Ben	1991	Male	9	Crops, beef cattle
Jared	1991	Male	5	Beef cattle
Jim	1991	Male	5	Crops, beef cattle
Danny	1994	Female	6	Beef
Richard	1992	Male	20	Cow-calf

Factor 3 was named for their higher value in social media outlets over both of the other two previous factors, Social Savants. Table 4.10 shows statistically significant statements being highly favored for the perspective of Social Savants. These highly favored statements include Twitter, Instagram, radio, class field days, and YouTube.

Unfavorable statements for factor three include phone calls, snapchat, webinars, and discussion forums. While Social Savants still prefer face to face with other farmers, family, and friends over all other outlets of accessing information, they steer clear of expert risk management associations and print ads, unlike both the first two factors.

Table 4.10

Distinguishing Statements for Factor 3: Social Savants

No.	**Statement**	**Q-Sort Value**	**Z-Score**
25	Twitter	3	1.05*
18	Instagram	3	0.91*
14	Radio	2	0.89
8	Class/field days	2	0.7
17	YouTube	1	0.27
10	Phone calls	-1	-0.13*
15	Snapchat	-2	-0.87
12	Webinars	-3	-0.9
9	Discussion forums	-4	-1.08*

Note. * indicates $p<.01$

All three Social Savants were born in 1990 or older as shown in Table 4.11. They each had beef or row crop operation. There were two males and one female.

Table 4.11

Descriptive Characteristics for Factor 3

Sorts	**Birth Year**	**Gender**	**Years Involved**	**Operation**
Michael	1994	Male	20	Beef
Dalton	1990	Male	11	Row crop
Natalie	1997	Female	6	Beef, row crop

Table 4.12 shows statements that do not have statistical significance between any particular pair of factors. All statements in Table 7 are non-significant at P>.01 and those flagged with an asterisk are also non-significant at P>.05.

All three factor viewpoints place high value on statement number one (face to face with other farmers) and number five (family). Medium value was placed on statement number two (books), number four (magazines), number twenty (video), number seventeen (YouTube), and twenty three (Television: cable or local). Low valued statements included statement number twenty-four (blog), number twenty-one (Tumblr), and number twenty-two (Reddit) for all three factor viewpoints.

Table 4.12

Consensus and Disagreement Statements

		Factor 1		**Factor 2**		**Factor 3**	
No.	**Statement**	**QSValue**	**ZScore**	**QSValue**	**ZScore**	**QSValue**	**ZScore**
1*	Face to face with other farmers	5	1.82	3	1.47	5	2.12
2*	Books	0	-0.04	-2	-0.55	-1	-0.35
4*	Magazines	1	0.22	1	0.2	0	-0.06
5*	Family	4	1.43	3	1.38	4	1.6
17	YouTube	-2	-0.47	-1	-0.43	1	0.27
20*	Video	1	0.36	2	0.5	1	0.36
21*	Tumblr	-4	-1.65	-4	-1.83	-4	-1.94
22	Reddit	-3	-1.33	-5	-1.86	-5	-2.04
23*	Television: cable or local	-1	-0.36	0	-0.24	0	-0.01
24*	Blog	-2	-0.75	-2	-0.72	-2	-0.62

CHAPTER V:
CONCLUSIONS AND RECOMENDATIONS

Conclusions

The purpose of this study was to identify sources that most effectively reach millennial producers. This study achieved this purpose by being guided by the following objectives:

1) Identify millennial production agriculturalists objectivity in preference to access new information regarding production agriculture
2) Create a conceptual model relating the viewpoints on ways millennial production agriculturalists prefer to access new information into theoretical framework

This study successfully met the objectives guiding its genesis by identifying three significant viewpoints of millennial production agriculturalists, Conventional Confidants, Relationship Reliers, and Social Savants, and by creating a conceptual model relating those viewpoints to specific pieces of the theoretical frame work used in this study, the Technology Acceptance Theory.

Objective 1

With this group of millennial production agriculturalists from various parts of the state of Texas, three statistically significant factors surfaced through seeing to fruition a Q-Sort study: *Conventional Confidants* (Factor 1), *Relationship Reliers* (Factor 2), and *Social Savants* (Factor 3). John, Ashley, Byron, Spencer, Darryl, Kevin, Ryan, and Andy's Q-sorts were marked as statistically significant for Factor 1. Roy, Ben, Jared, Jim, Danny, and Richard surfaced as statistically significant for Factor 2. Michael, Dalton, and Natalie were marked as statistically significant for Factor 3.

Factors 1, 2, and 3 produced composite reliability coefficients of 0.90 or higher, making each factor for the study reliable, as shown in Table 4.3. A three factor analysis ultimately

served to explain 72% of the variance amongst the population of millennial production agriculturalists and their preference of where to access new information regarding their operation.

Conclusions for Factor 1

The Conventional Confidants were a group made of 6 males and 2 females. Darryl was the youngest participant, being born in 1996, and had only 2 years of experience working in production agriculture. All other participants ranged in having experience in production agriculture of 12 years or more. Ryan was the oldest participant in the group, being born in 1984. The types of production agriculture in the group varied from beef production, cow-calf, horse production, goat production, providing hunting grounds, and row crops, as listed in Table 8. While collecting all of the demographic information about the Conventional Confidants was necessary to achieve and have in hand a well-rounded understanding of them, the study focused on the age of the participants and their careers. There was no correlation between gender, age, and the participant viewpoints with their preferences.

The Conventional Confidants were named because of their preferences to more conventional or traditional methods of receiving new information about production agriculture. They prefer the personal or face to face communication Cooperative Extension and those who they know. Conventional Confidants prefer to hear the information from a personal trusted source or an experienced organization before looking into other options, such as social media, the radio, or non-agriculturally related websites.

This confirms Howell and Habron (2004) by finding the same results, being approximately 20-40-year-old production agriculturalists prefer face to face or interpersonal communication before any media outlet to access information. The information the Conventional

Confidants are seeking from organizations are likely to have subconsciously come from Cooperative Extension indirectly (Birkhaeuser & Evenson, 1991). Conventional Confidants also reinforce the findings from Flor (2002) that found those working in production agriculture, regardless of age, are typically found to be laggards of the latest technology. For this study, the new technology is the Internet and various forms of social media applications for cell phones. This description for the Conventional Confidants make up 56% of the variance within the 21 participants of the study.

Conclusions for Factor 2

The Relationship Reliers group was composed of five male participants and one female participant. All participants in the group were born within the 1990's and were involved with either row crop production or beef production agriculture, as shown in Table 10. 5 participants in the group had experience levels of less than 10 years while Richard had 20 years of experience working in production agriculture. Just like the Conventional Confidants, this data does not suggest there is any correlation between gender, years of experience, types of operation, or years involved in production agriculture with the Relationship Reliers preferences of information sources.

The Relationship Reliers were named based on their higher valued preferences of information sources being all relational based. The sources they valued most that stood out from the other groups were accessing information via phone calls and texting. Both of these sources are only possible through interpersonal relationships with others they know and trust involved in the industry. It is also important to note that both phone calls and texting would not be possible without the use of the participants' cell phones. This particular group of millennials are not as

conventional as the participants in Factor 1 but were not as technologically savvy regarding their information sources as I found in the participants in Factor 3.

Relate back to literature

Having one on one relationships with those in the industry (Garcia and Pence, 2018) serves successful for Relationship Reliers. They allow those in their agricultural social groups to influence their opinion on the usefulness of a technology and whether or not they will adopt the new technology into practice (van Sommeren, 2018). However, they prefer using their cellphones to contact their social groups to then get the new information. Relationship Reliers align with the general public today of being greatly dependent on their smart phones (Anshari and Lim, 2017).

Conclusions for Factor 3

The Social Savants constitute one female and two males. They were all three born in the 1990's and were either involved in beef production and/or row crop production as shown in Table 12. The data does not show the types of commodities, gender, or birth year correlating with preference of information source. The homogeneity in the types of involvement and production in agriculture may be due to the prominence of those commodities in the state of Texas over other commodities.

The Social Savants were named for their distinguishable preference for social media information sources over other sources. Factor 3 is the only factor out of all three to place high value on social media applications and media in general. Social Savants' prefer of Twitter, Instagram, radio, and class/field days is statistically significant and unequivocally stands out in the data presented. They are early adopters of new technology on the market and are willing to use untraditional methods to achieve success running the family farm they prepare to or have

taken over. Social Savants are technologically superior when it comes to agricultural information consumption. They are first to know the latest news and want to discover it themselves rather than getting the information from their interpersonal group.

Relate back to literature

The Internet is a major source and preferred source of information for these millennial farmers and ranchers (Telg and Barnes, 2012). Social Savants appreciate the capability to access new information from wherever they are (Sutter, 2009). They are clearly moving away from how production agriculturalists have historically reached out to their target audience (Allen, Abrams, Meyers, and Shultz, 2010; Lefebvre, 2007) and how they access information for themselves.

Conclusions for Consensus

The Conventional Confidants, the Relationship Reliers, and the Social Savants all consistently value face to face with other famers and family as the most preferred source of information for production agriculture as shown in Table 13. Regardless of the up and coming technological advancements to access information, millennials still prefer to go to their family members who have come before them to seek new information as well as seek face to face connections with other farmer.

Agricultural production operations are in a period of intergenerational transition (Gasperini, 2017), leaving millennials to still seek information and guidance from those who were previously in their position. This could be family or other farmers who have been in their position. They want to keep their family farms sustainable for generations (Gasperini, 2017) just as their family has accomplished before them. Millennials have specific reasons for why they may prefer a method of accessing new information over another (Brislen et al., 2016).

For the Conventional Confidants, there is a time for family and face to face communication as well as a time to seek information from supporting organizations, like Cooperative Extension. For Relationship Reliers, they mainly focus on their interpersonal relationships with family by either face to face communication or over the phone. For Social Savants, there is a time to use the new technology available while still keeping intact mentorships from family and face to face one on one communication with other farmers in their prospective area of production agriculture.

Objective 2

I created Figure 4 by incorporating pieces from the Technology Acceptance Model by Legris et al. (2003) and the 3 factor viewpoints discussed in objective 1 of millennial production agriculturalists regarding how they prefer to receive new information. Conventional Confidants (Factor 1) rely more on the experience they have in class/field days, with Cooperative Extension, and with the Expert Risk Management Associations to access new information on production agriculture. Relationship Reliers prefer to find out the subjective norms from their personal relationships and industry professionals in their circle when they access information before adopting a new technology or procedure in production agriculture.

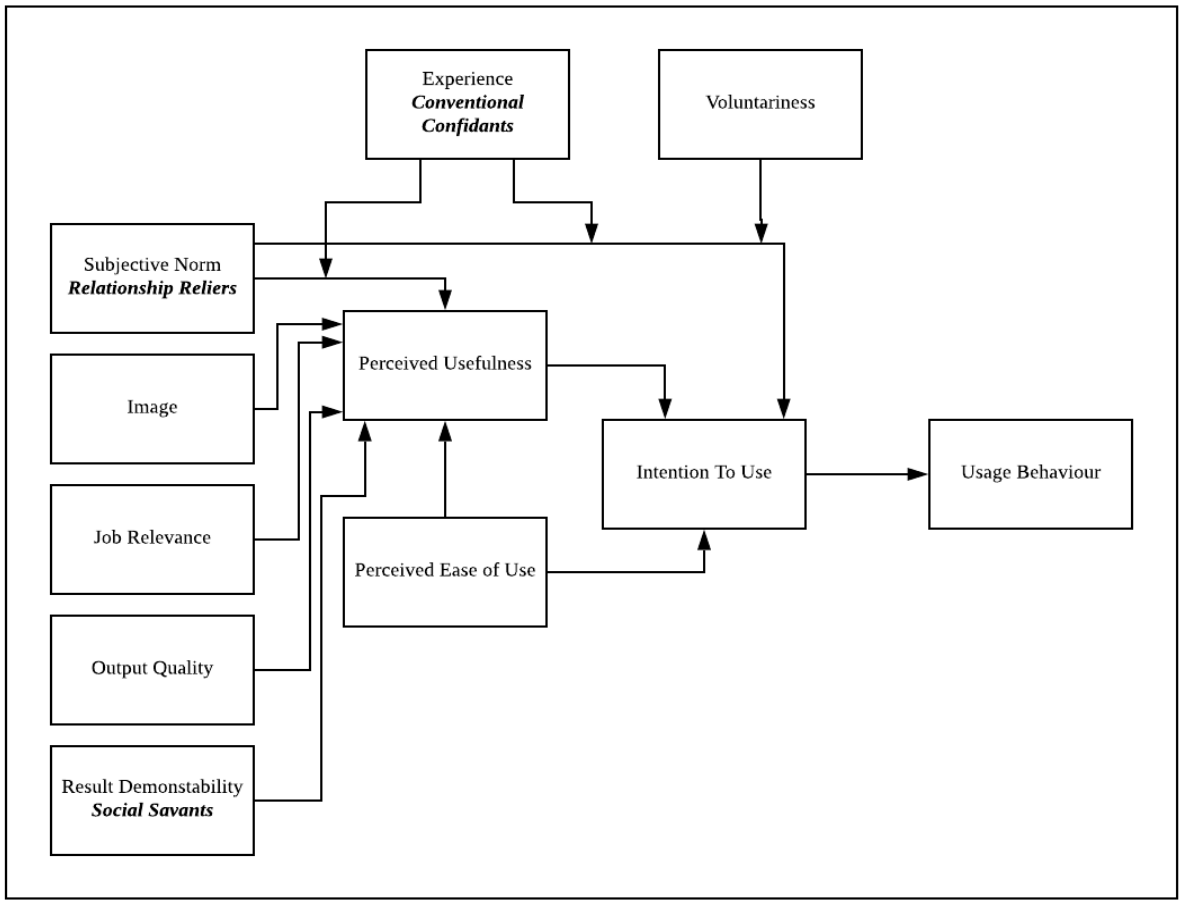


Figure 4. Millennial Production Agriculturalist Technology Usage Model.

Recommendations

The purpose of this study was to identify sources that most effectively reach millennial producers. Because this specific study had a participant population based in Texas, I recommend completing this study in other states across the country, especially in the southwest region of the United States. I would like to see differences in what state a millennial production agriculturalist comes from, even where high producing commodities are similar, impacts their information source preference. I also recommend researchers to replicate this study comparing different states in different regions to see if there are baseline characteristics millennial production agriculturalists have information sources should be aware of.

I recommend changing the term Cooperative Extension to Texas Agri-Life Extension because that is the name Texas has branded their Cooperative Extension System.

I recommend looking deeper into the characteristics of the participants. Add to the survey to inquire about the level of decision making power the producer has on their operation. It would also be helpful to learn if the work the participant does in production agriculture is their primary source of income or not.

In order to make sure the participants in the P-set are diverse in backgrounds, I recommend gaining participants who vary in production agricultural commodities. A large number of participants were involved primarily in beef or row crop production. Nontraditional production agriculturalists who work on smaller and different operations, such as viticulture, gardening, fruit production, or vegetable production, have the potential to provide different perspectives and higher percentages of variance to the factors selected.

Factor 1: Conventional Confidants

The Conventional Confidants equate to 56% of the variance in the study. If a company or organization, such as Cooperative Extension, I recommend focusing a majority of their budgets catering towards this viewpoint. Continue to provide field days or in person classes with one on one communication that allows the producer to feel they are getting individual attention and their preferred methods of accessing information is being met.

Conventional Confidants prefer to seek information from practitioners in Cooperative Extension and in expert risk management associations. I recommend reaching out to millennial production agriculturalists so they know these organizations are there willing to help and encourage the next generation.

I recommend researchers to replicate this study with a larger sample size to see if the same large percentage of millennial production agriculturalists align with factor one. I also recommend the study to be changed and conducted again by adding more statements that differentiate between commodity groups, such as the Farm Bureau Federation, and risk management associations, such as Crop Protection Services, so the participant will understand exactly what kind of information source the research is asking about.

Factor 2: Relationship Reliers

Relationship Reliers prefer to access new information via call or text. I recommend for practitioners to follow up with millennial production agriculturalists through a phone call after making a connection with them or giving them new information to see how the new information came to fruition on their farm or ranch. Organizations should still allocate money to meet the needs for this view point of millennials.

I recommend researchers to replicate this study by expanding the number of participants overall to see if Factor 2 accounts for more variance with more people. This will show if there are more statements that emerge within factor 2, since there were only two statistically significant statements that emerged from this study as highly valuable uniquely to Relationship Reliers.

Factor 3: Social Savants

I recommend practitioners staying abreast with the latest mediums for information sources. While a majority of millennial production agriculturalists still prefer cooperative extension, there is a percentage that prefers only forms of media, especially social media platforms for cell phones. I recommend practitioners having an online presence on these social

media platforms. Millennials should know the organizations they look for new information from are evolving with the times and technologies to stay relevant.

I recommend this study being replicated with a more equal variety of millennials born in the 1980's and 1980's. This will allow any correlation to rise between age and which factor the participant relates with. I also recommend when replicating this study to specify between radio and podcasts to see if millennial production agriculturalists use this medium or not to see new information about agriculture. This research could help practitioners know if they need to have a presence on podcasts or not.

Consensus

I recommend for organizations to provide opportunities for millennial production agriculturalists to meet other farmers inside and outside of their generation. This will allow a space for producers to share struggles and ideas on how to solve them between themselves. This would also allow them to collaborate by region or age to see if they are experiencing similar issues or information gaps that the organization can service as a whole.

I recommend this study to be conducted every five years for the next twenty years to see if there are any changes within the generation as they age in their careers to see if their preference changes. As the participants age, their values and priorities may change, causing their preferences to change. There may also be new information sources to be considered at that time not available to use at this point in time.

Extension agents from the Cooperative Extension Service are strategically placed to meet the needs of the community they serve (Birkhaeuser & Evenson, 1991). In order to accomplish this mission, they must cater to all types of millennials, including: Conventional

Confidants, Relationship Reliers, and Social Savants, to stay relevant and helpful in this constantly changing society.

REFERENCES

Ahearn, M. C., & Newton, D. J. (2009). Beginning farmers and ranchers.

Akhmadi, H. (2018, November). Use of Information and Communication Technology (ICT) on Agricultural Marketing in Indonesia a Brief Literature Review. In *4th International Conference on Food, Agriculture and Natural Resources (FANRes 2018)*. Atlantis Press.

Alhassan, M., & Shehu, A. (2019). Community Radio in Promoting Agriculture: A Study of "Agric Panorama" Programme on ABU FM Radio. *KIU Journal of Humanities*, *3*(4), 57-62.

Allen, K., Abrams, K., Meyers, C., & Shultz, A. (2010). A Little Birdie Told Me About Agriculture: Best Practices and Future Uses of Twitter in Agricultural Communications. *Journal of Applied Communications*, *94*(3), 2.

Anshari, M., Almunawar, M. N., Masri, M., & Hamdan, M. (2019). Digital Marketplace and FinTech to Support Agriculture Sustainability. *Energy Procedia*, *156*, 234-238.

Anderson, J. R., & Feder, G. (2004). Agricultural extension: Good intentions and hard realities. The World Bank Research Observer, 19(1), 41-60.

Anshari, M., & Lim, S. A. (2017). E-Government with Big Data Enabled through Smartphone for Public Services: Possibilities and Challenges. *International Journal of Public Administration*, *40*(13), 1143-1158.

Belleau, B. D., Summers, T. A., Xu, Y., & Pinel, R. (2007). Theory of reasoned action: Purchase intention of young consumers. Clothing and Textiles Research Journal, 25(3), 244-257.

Berridge, S. (2014). Millennials after the Great Recession. *Bureau of Labor Statistics*.

Berwick, D. M. (2003). Disseminating innovations in health care. *Jama*, *289*(15), 1969-1975.

Birkhaeuser, D., Evenson, R. E., & Feder, G. (1991). The economic impact of agricultural extension: A review. Economic development and cultural change, 39(3), 607-650.

Brislen, L., Tanaka, K., & Jacobsen, K. (2016). Preferred Knowledge Sources for Beginning Farmers: The Case of Kentucky. *Journal of Extension*, *54*(4), 4FEA5.

Brouwer, M. (1999). Q is accounting for tastes. Journal of Advertising Research, 39(2), 35-35.

Brugger, F. (2011). Mobile applications in agriculture. *Syngenta Foundation*, 1-38.

Brenner, B. (2009, October 19). Social networking security concerns top of mind for businesses. IT Business. Retrieved from http://www.itbusiness.ca/IT/client/en/home/News.asp?id=54933

Colasanti, K., Wright, W., & Reau, B. (2009). Extension, the land-grant mission, and civic agriculture: Cultivating change. *Journal of Extension*, *47*(4), 1-10.

Comer, M. M., Campbell, T., Edwards, K., & Hillison, J. (2006). Cooperative Extension and the 1890 land-grant institution: The real story. Journal of Extension, 44(3), 1-6.

Comm, J. (2009). Twitter power: How to dominate your market one tweet at a time. Hoboken, NJ: John Wiley & Sons, Inc.

Cornelisse, S., Hyde, J., Raines, C., Kelley, K., Ollendyke, D., & Remcheck, J. (2011). Entrepreneurial Extension conducted via social media. Journal of Extension, 49(6), 5.

Espinoza, C., Ukleja, M., & Rusch, C. (2010). Managing the Millennials: Discover the core competencies for managing today's workforce. Hoboken, New Jersey: John Wiley & sons, Inc.

Fannin, B. L. (2006). Podcasting agriculture news: Producing portable audio news for farmers and ranchers. *Journal of Applied Communications*, *90*(2), 3.

Fear, F. A., Rosaen, C. L., Bawden, R. J., & Foster-Fishman, P. G. (2006). Coming to critical engagement: An autoethnographic exploration. Lanham, MD: University Press of America.

Flor, A. G. (2002). Information and communication opportunities for technology transfer and linkages. In *Conference on Paper presented during the Expert Consultation on Agricultural Extension, Research-Extension-Farmer Interface and Technology Transfer* (Vol. 16).

Fry, R. (2018, April 03). Millennials approach Baby Boomers as America's largest generation in electorate. Retrieved from http://www.pewresearch.org/fact-tank/2018/04/03/millennials-approach-baby-boomers-as-largest-generation-in-u-s-electorate/

Gasperini, F. A. (2017). Public policy and the next generation of farmers, ranchers, producers, and agribusiness leaders. *Journal of agromedicine*, *22*(4), 312-315.

Gakuru, M., Winters, K., & Stepman, F. (2009). Innovative farmer advisory services using ICT. *documento presentado en el taller de W3C "Africa perspective on the role of movile technologies in fostering social development", Maputo*, *1*.

Garcia, M. A., & Pence, R. (2018). Tactics for efficient agriculture outreach targeting small and midsize farmers; a case study in the Coachella Valley. *International Journal of Agricultural Extension*, *6*(3), 165-173.

Gould, F. I., Steele, D., & Woodrum, W. J. (2014). Cooperative Extension: A century of innovation. *Journal of Extension*, *52*(1), 1-5.

Gurău, C. (2012). A life-stage analysis of consumer loyalty profile: comparing Generation X and Millennial consumers. Journal of consumer Marketing, 29(2), 103-113.

Grumbach, K., & Mold, J. W. (2009). A health care cooperative extension service: transforming primary care and community health. *JAMA*, *301*(24), 2589-2591.

Hays A. Generational flow: replacing farmers and ranchers in the family farm. Noble research institute. https://www.noble.org/news/publications/ag-news-and - views/2017/june/generation-flow-replacing-farmers/. Published 2017. Accessed June 1, 2017.

Hendrickson, M. K., & Porth, M. (2012). Urban agriculture—best practices and possibilities. University of Missouri, 1-52.

Hoag, D. L. (2005). WAEA Presidential Address: Economic Principles for Saving the Cooperative Extension Service. *Journal of Agricultural and Resource Economics*, 397-410.

Howe, N., & Strauss, W. (2007). The next 20 years: how customer and workforce attitudes will evolve. Harvard business review, 85(7-8), 41-52.

Howell, J. L., & Habron, G. B. (2004). Agricultural landowners' lack of preference for internet extension. *Computer*, *33*(2.401), 0-493.

Hume, M. (2010). Compassion without action: Examining the young consumers consumption and attitude to sustainable consumption. Journal of world business, 45(4), 385-394.

Lefebvre, R. C. (2007). The new technology: The consumer as the participant rather than target audience. Social Marketing Quarterly, 13(3), 31-42.

Leggette, H. R., & Redwine, T. (2016). Using Q methodology in agricultural communications research: A philosophical study. *Journal of Applied Communications*, *100*(3), 7.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & management*, *40*(3), 191-204.

Linder, J. R., Rodriguez, M. T., Strong, R., Jones, D., & Layfield, D. (2016). Research priority 2: New technologies, practices, and products adoption decisions. *American Association for Agricultural Education national research agenda*, *2020*, *19-27*.

Ludwig, B. G. (2007). Today is yesterday's future: globalizing in the 21st century. *Journal of International Agricultural and Extension Education*, *14*(3), 5-15.

MacDonald, J. M., Korb, P., & Hoppe, R. A. (2013). Farm size and the organization of US crop farming.

Malecki, E.J. 2003. Digital development in rural areas: potentials and pitfalls. *Journal of Rural Studies* 19:201-14.

Mansfield, H. (2009). 10 Twitter tips for higher education. University Business Magazine.

McDowell, G. R. (2001). Land-grant universities and Extension into the 21st century. Renegotiating or abandoning a social contract. Ames, IA: Iowa State University Press

Nwobodo, C. E., Agbo, C. M., Ohagwu, V. A., & Igbokwe, E. M. (2019). Farmers' Adjustment to Dwindling Services of the Public Extension System in Enugu State, Nigeria. *Journal of Agricultural Extension*, *23*(1), 149-160.

Ordun, G. (2015). Millennial (Gen Y) consumer behavior their shopping preferences and perceptual maps associated with brand loyalty. *Canadian Social Science*, *11*(4), 40-55.

Paulson, H. (2009, August 25). What the heck is Twitter, and what do I do with it? Daily Camera. Retrieved from http://www.dailycamera.com/features/ci_13169356

Peters, S. J. (2002). Citizens developing a voice at the table: A story of educational organizing in contemporary Extension work. Journal of Extension [On-line], 40(4) Article 4FEA1. Available at: http://www.joe.org/joe/2002august/a1.php

Power, A. G. (2010). Ecosystem services and agriculture: tradeoffs and synergies. *Philosophical transactions of the royal society B: biological sciences*, *365*(1554), 2959-2971.

Ristino, L. (2013). Back to the new: Millennials and the sustainable food movement. Vt. J. Envtl. L., 15, 1.

Roberts, T. G., Harder, A., & Brashears, M. T. (Eds). (2016). American Association for Agricultural Education national research agenda: 2016-2020. Gainesville, FL: Department of Agricultural Education and Communication.

Robertson, G., Gross, K. L., Hamilton, S. K., Landis, D. A., Schmidt, T. M., Snapp, S. S., & Swinton, S. M. (2014). Farming for ecosystem services: An ecological approach to production agriculture. *BioScience*, *64*(5), 404-415.

Schuh, G. E. (1993). Political and social trends affecting the 1860 land-grant institutions. Journal of Agricultural & Food Information, 1(1): 5-19.

Scott, D. M. (2010). The new rules of marketing and PR: How to use social media, blogs, news releases, online video, and viral marketing to reach buyers directly (2nd ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Spearman, C. (1937). Psychology down the ages, 2 vol.

Stephenson, W. (1993). Introduction to Q-methodology. *Operant Subjectivity*, *17*(1), 1-13.

Stripling, C. T., & Ricketts, J. C. (2016). Research priority 3: Sufficient scientific and professional workforce that addresses the challenges of the 21st century. American Association for Agricultural Education national research agenda, 2020, 29-35.

Sutter, J. D. (2009, July 2). Twittering from the tractor: Smartphones sprout on the farm. CNN.com. Retrieved from http://www.cnn.com/2009/TECH/07/02/twitter.farmer/index.html

Swinton SM, Lupi F, Robertson GP, Hamilton SK. (2007). Ecosystem services and agriculture: Cultivating agricultural ecosystems for diverse benefits. Ecological Economics 64: 245–252.

Telg, R., & Barnes, C. (2012). Communication preferences of Florida Farm Bureau young farmers & ranchers. *Journal of Applied Communications*, *96*(2), 8.

Telg, R., Irani, T., Hurst, A., & Kistler, M. (2007). Local marketing and promotional efforts of Florida Extension agents. Journal of Extension, 45(2), Article 2FEA5. Available at: https://www.joe.org/joe/2007april/a5.php

Trede, L., & Whitaker, S. (1998). Beginning farmer education in Iowa: Implications to Extension. Journal of Extension [online], 36(5) Article 5FEA3. Available at: http://www.joe.org/joe/1998october/a3.php

U.S. Department of Agriculture National Agricultural Statistics Service. (2015). Farm computer usage and ownership. Retrieved from http://usda.mannlib.cornell.edu/usda/nass/FarmComp//2010s/2015/FarmComp-08-19-2015.pdf

U.S. Department of Commerce. 2002. *A nation online: How Americans are expanding their use of the Internet*. National Telecommunications and Information Administration [On-line]. Available at: http://www.ntia.doc.gov/ntiahome/dn/index.html

Van Exel, J., & De Graaf, G. (2005). Q methodology: A sneak preview. *Retrieved January*, *24*, 2009.

van Sommeren, M. A. (2018). *The influence of a farmers' Self-Identity on the decision-making about adopting technological innovations*.

Watts, S., & Stenner, P. (2012). Doing Q methodological research: Theory, method & interpretation. Sage.

Whitaker, H., Leggette, H. R., & Barbeau, S. (2018). A Marketing Standpoint: What Marketers Can Teach Extension Professionals About Internet-Based Media. *JOURNAL OF EXTENSION*, *56*(6).

Appendix A

Recruitment Email

Hello Production Agriculturalist,

My name is Taylor Rogers and I am a graduate student at Texas A&M University studying agricultural communications. My thesis seeks to understand Millennial Production Agriculturalists and their preferences receiving new information in their prospective area. Here are the details of my study:

Who: Production agriculturalists born between 1980 and 2000. For this study, involvement in production agriculture is defined as having direct involvement—in your personal operation or with your family's business—of any size or type of production agriculture, including row crops, livestock, nursery, etc.
What: You will take a short demographics survey about your operation, look at ways to receive new information and rank them accordingly, then describe why and how you ranked. I will guide you through the process.
When: 45 minutes or less at the location & time of your choosing by February 3, 2019
Why: To contribute to useful research benefiting agricultural organizations and commodity groups, such as Texas Farm Bureau – and to help an appreciative graduate student!

If you are interested in participating or have any questions, **please contact me by email at tjrogers@tamu.edu or by phone at (602) 757-5809**. Please feel free to share with others who might meet the criteria as well about the study. Distance is not a deterrent for me. I am willing to travel wherever you are located.

Thank you so much for helping me with this study, and I am hopeful the findings will be a valuable asset to serve the agricultural community in the future.

Sincerely,
Taylor Rogers
Graduate Research Assistant
Texas A&M University

(602) 757-5809
tjrogers@tamu.edu

Appendix B

Consent Information sheet

Title of Research Study: Millennial, Production Agriculturalists' Preferred Sources of Information Consumption

Investigator: Taylor Rogers, Tobin Redwine

Funded/Supported By: This research is supported by Texas A&M University.

Why are you being invited to take part in a research study?

You are being asked to participate because you are a millennial agricultural producer.

What should you know about a research study?

- The activities conducted in this study involve research.
- Description of the procedures to be performed (including audio).
- Participation for this study is completely voluntary.

Who can I talk to?

If you have questions, concerns, or complaints, or think the research has hurt you, talk to the researchers, Taylor Rogers and Tobin Redwine, Ph. D. at (979)-220-6932.

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

You will complete a Q-Sort distribution

- You will complete a survey asking about your birth year, gender, ethnicity, agricultural operation, involvement in agricultural commodity groups, and length of time being involved in production agriculture.
- The study should take approximately 1 hour. You will be asks to sort through a list of statements on notecards and place them onto a forced distribution. As you place them, you will be asked to speak aloud why you are placing the statements in their determined spots along the distribution. Audio will be recorded during this part of the study.
- You will only interact with the lead researcher, Taylor Rogers, for this study.
- The research will be conducted at Texas A&M University and at the Arizona National Livestock Show.
- Research will take place during the months of January, and February.

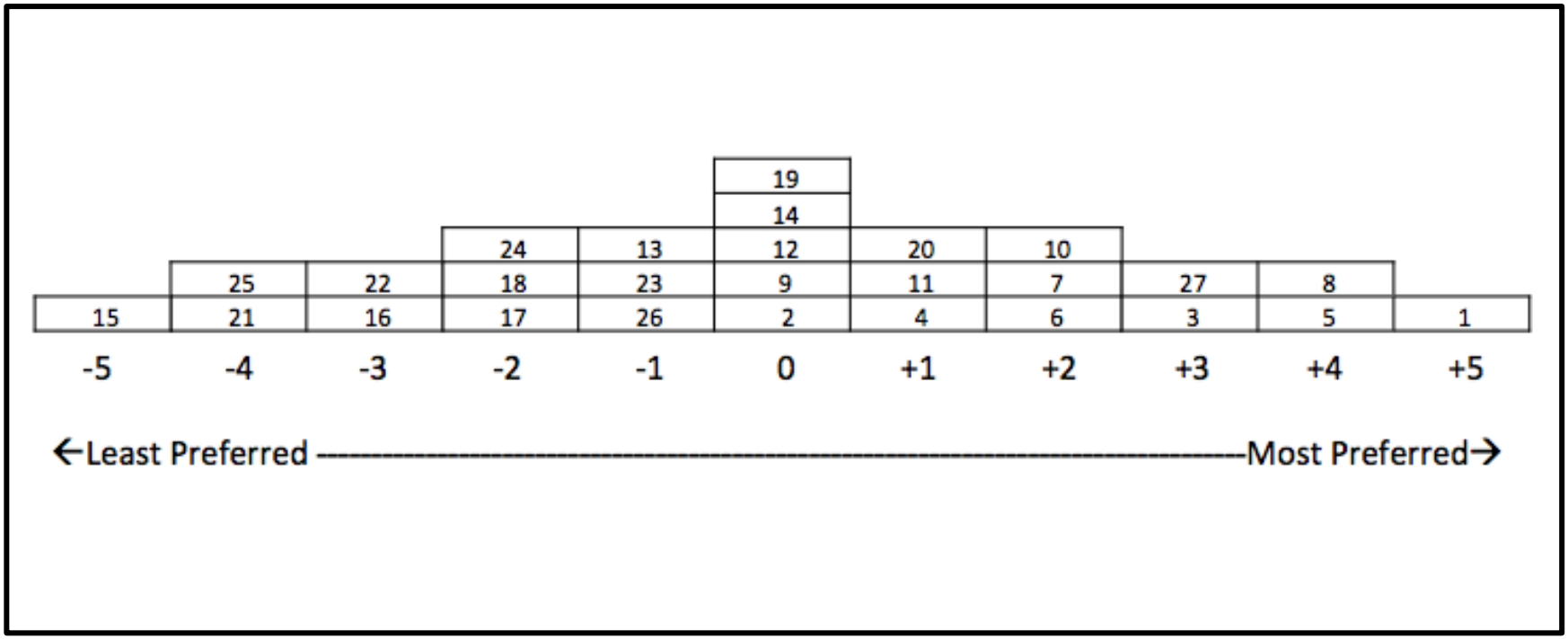
APPENDIX C

Correlation Coefficients from PQ Method

	Participant																			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21
Q1	100																				
Q2	71	100																			
Q3	76	66	100																		
Q4	48	40	52	100																	
Q5	53	54	64	41	100																
Q6	56	57	57	78	47	100															
Q7	55	49	38	65	34	72	100														
Q8	51	67	70	55	43	49	38	100													
Q9	69	76	72	53	56	58	61	69	100												
Q10	72	70	72	46	61	53	54	77	85	100											
Q11	29	33	40	13	17	8	7	43	36	27	100										
Q12	54	64	61	53	54	57	36	59	57	61	3	100									
Q13	64	49	64	64	56	59	52	51	57	62	-1	58	100								
Q14	59	37	42	64	38	60	67	35	49	53	21	41	43	100							
Q15	27	49	55	35	28	37	16	44	49	41	37	59	31	27	100						
Q16	69	53	57	69	55	73	70	31	61	50	-11	53	76	65	27	100					
Q17	86	74	79	58	64	66	63	58	83	79	28	63	71	62	44	77	100				
Q18	58	52	60	30	64	33	23	48	43	53	33	32	52	46	16	42	48	100			
Q19	66	64	64	63	62	61	59	51	74	72	17	46	74	54	46	69	80	43	100		
Q20	69	87	63	46	57	55	53	58	73	68	22	60	51	43	36	59	84	37	63	100	
Q21	45	32	53	68	45	71	66	36	51	57	-17	56	60	48	41	64	59	18	67	33	100

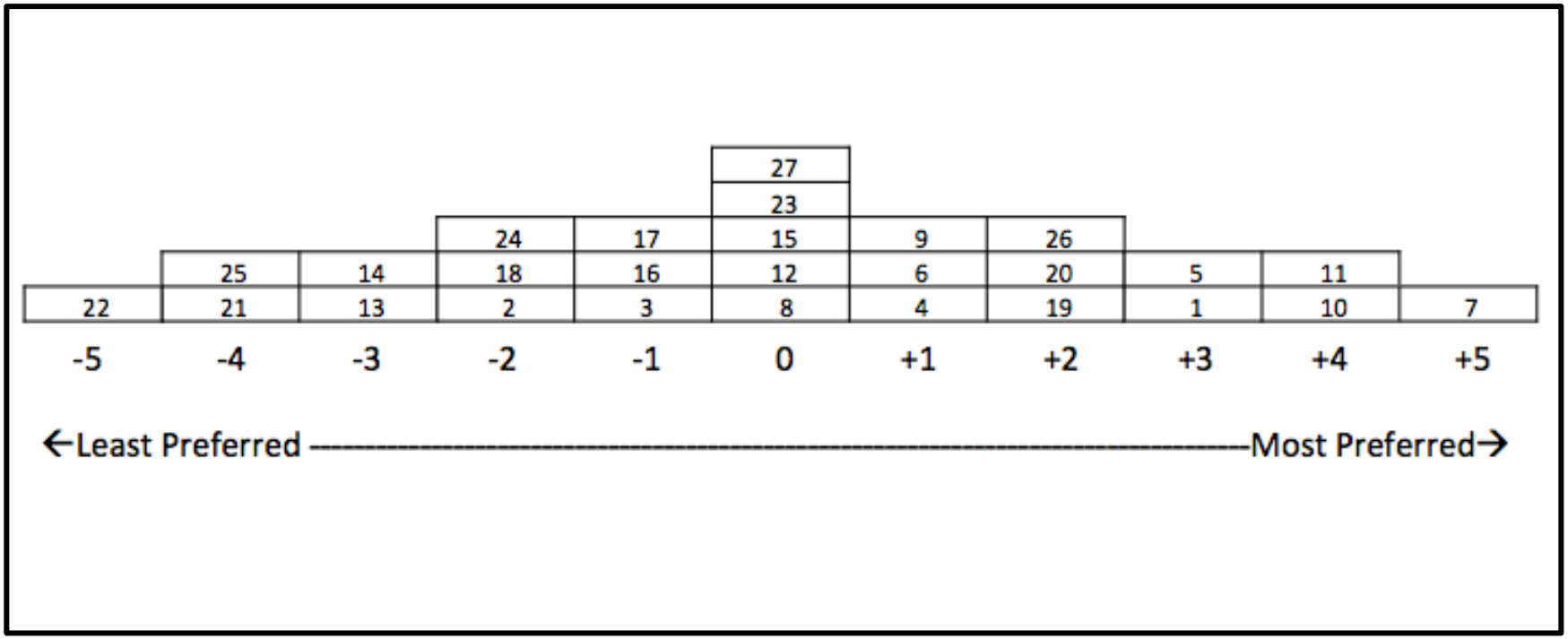
Appendix D

Factor Array for Factor 1



Appendix E

Factor Array for Factor 2



Appendix F

Factor Array for Factor 3