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Perceptions Regarding Importance and Frequency of Use of Selected Communication Tools by Iowa Cattle Producers

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Perceptions regarding importance and the frequency of use of selected communication tools by Iowa cattle producers

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DEDICATION

This thesis is dedicated to my parents and grandparents, for encouraging me to pursue a path in agriculture and always believing in me when I was discouraged. It was your kind words and thoughtfulness that kept me going to pursue my dream.

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ABSTRACT

New technologies have profoundly affected the agricultural industry in the twentieth century. Within the agriculture industry numerous forms of communication exist. Forms of communication accessible to cattle producers and industry leaders include face-to-face, print media, electronic media, and social media. With several communication tools available to producers it is imperative to understand producers' perceived importance and usage of these communication tools. Understanding the usage of communication tools by cattle producers will help beef industry partners, beef breed associations, and the overall beef industry to better communicate with producers. Nonetheless, if electronic forms of communication provide quick access to information, one should not always make the assumption that it will replace print media forms of communication.

The purpose of this study was to identify perceptions regarding importance and the frequency of use of communication tools by producer-members of the Iowa Cattlemen's Association who received the electronic newsletter. The population consisted of (N = 3021) producer-members of the Iowa Cattlemen's Association who received the electronic newsletter. A random sample of the members (n = 974) was taken from the population (N=3021). In order to achieve a 95% confident level with a sampling error of +/- 5%, a sample size of 341 was needed. This research utilized an oversample in an effort to acquire a thirty-five percent response rate which was found in similar studies with similar populations.

Findings of this study suggest that different generations of producers prefer different modes of communication. Additionally, respondents had positive views for the use of print media for beef industry information. Electronic media was used more often for personal use than any other communication channel. This study also clarifies the assumption that

smartphones provide frequent access to electronic and social media communication channels. If producers owned smartphones their perceived importance and use of electronic and social media channels increased. Further research is needed to determine reasons why communication channels are important for cattle producers. Additionally, further research is needed to determine why cattle producers prefer print media communication channels for beef industry information but prefer electronic communication channels for personal information.

CHAPTER I. INTRODUCTION

Rogers (2003) defined communication as a process in which people, create, share, and exchange information in order to reach a mutual understanding. Communication is an important aspect of agriculture as "United States Farmers are insatiable consumers of information" (Boehle & King, 1996, p. 21). Nonetheless, the value of information cannot be overemphasized since it has and will continue to contribute "immensely to the stagnation or progressiveness of many farm operations" (Riesenberg & Gor, 1989, p. 7). Cattle production enterprises are one such operation where producers utilize a number of communication channels that include face to face, print media, and electronic media (Boone, Meseinbach, & Tucker, 2000). Using speech to share information is described as face-to-face or verbal communication. Verbal communication remains the most powerful human interaction (Begley, 2004). Print media includes publications, brochures, flyers, and magazines that are offered through subscription or free to farmers, and may often target specific groups of farmers (Boone, Meseinbach, & Tucker, 2000). Electronic media is a popular form of communication where users can exchange information (December, 2006), such as the Internet. The Internet can be utilized to strengthen research and increase a farmer's information source (Basu & Banerjee, 2011).

As technology continues to change, "no longer can knowledge providers rely solely on face to face contacts" (Field, Gardiner, Lemenager, Long, & Herring-Suttee, 2006, p. 17). Face-to-face contact may not be as expeditious as electronic communication tools (Park & Mishra, 2003). Expeditious forms of communication are used by farmers. Farmers use expeditious technologies because they can receive and manage information regardless of their location (Park & Mishra, 2003). Communication technologies can allow farmers to

build new business partnerships, sell farm products, and acquire new product information (Park & Mishra, 2003). Although technology has benefits, unfortunately, some producers do not have access to new technologies. The gap that exists between those that have Internet access and those that do not is termed the digital divide (Cullen, 2001). Numerous factors can increase or decrease the digital divide, such as a person's demographic differences, interests and skills (Donnermeyer & Hollifield, 2003). In the 2011 United States Census Bureau's Population survey, it was found that rural Americans lagged behind urban Americans in broadband internet connection (National Telecommunications and Information Administration, 2011). A divide in broadband internet connection also existed among rural and suburban populations (Donnermeyer & Hollifield, 2003). Although the rural population lagged behind the urban population for Internet usage, studies have shown that the rural population, specifically livestock producers, often prefer different forms of communication such as print media (Brashear, Hollis, & Wheeler, 2000; Gillespie, 2011).

Brashear et al. (2000) studied swine producer's knowledge and preferences of new technologies which revealed that 89% of small operations producing an average of 5,000 hogs or less annually used print publications specific to the industry. Additional information sources popular among swine producers included face-to-face contact with sales representatives from various feed companies (Brashear et al., 2000). This study also indicated that the swine producers who had not adopted new technologies learned about new technologies from current users. Many large producers, with an annual production of 37,000 hogs or more, utilized University specialists more often than did small operations (Brashear et al, 2000).

Gillespie (2011) identified preferred sources and usage of communication tools by cattle producers who were members of the Drover's Cattle Network. Much like swine producers in Brashear's (2000) study, the cattle producer-members of the Drover's cattle network also felt that livestock publications were the most important to communicate information. Publications that contained information about the cattle industry were the most popular. The Gillespie (2011) study indicated that social media was the least preferred source of communication for cattle producers. Interestingly, after livestock publications, the internet was identified as the cattle producer's second choice of preferred communication technologies. Cattle producer-members of the Drover's network identified the most credible sources of information were livestock publications and beef industry organizations (Gillespie, 2011). Although the internet was cattle producers' second choice for preferred information, many felt that it was not a credible source (Gillespie, 2011).

Statement of the Problem

Baym (2010) indicated that there are currently more ways to communicate than ever before. Diekmann and Batte (2009) stated that "information has increased dramatically in value over the past decades and has become vital to the financial success of farmers" (p. 1). Lasley, Padgitt, and Hanson (2001) specified that new technologies have affected the agriculture industry. New technologies available to farmers open new opportunities for delivering information. With numerous forms of communication available to producers it is imperative to understand the perceived importance and frequency of use of these communication forms. Additionally, the technology needs to be flexible for the producer if the goal is to satisfy a need by the consumer (Field et al., 2006). As the internet may provide easy access to information, one should not make the assumption that it has completely

replaced traditional print media (Nasi & Rasaen, 2013). Furthermore, Field et al. (2006) questioned if it was "reasonable to assume that future [cattle] producers will desire to move beyond the limits of their communities of place and profession to engage in a community through a variety of virtual tools and applications?" (p. 10). Do demographics of cattle producers have an effect on how Iowa Cattlemen's Association producer-members use communication tools? This study will also help define the demographics of Iowa Cattlemen producer-members. Lastly, the preferred communication channels of cattle producers are identified in the literature that is at least three years old. Gillespie (2011) indicated that because technology changes rapidly, a study conducted in three- to- five years to determine the acceptance of social media as well as other communication channels may be needed. Is it practical to assume that all beef producer populations are identical in their perceived importance and use of communication tools? The present study will determine if similar populations prefer the same communication channels.

Purpose and Objectives

This study helped determine communication preferences of producers who belong to the Iowa Cattlemen's Association. The purpose of this study was to examine Iowa Cattlemen's Association members perceived importance and frequency of use of selected communication tools used for personal and beef industry information. Furthermore, this study identified ways in which the Iowa Cattlemen's Association and beef industry representatives can better communicate with producer-members. To help address the perceptions and usage of communication tools by producers, the following objectives were used to frame the study:

1.) Describe demographics of the members of the Iowa Cattlemen's Association who received the association's electronic newsletter, specifically: gender, age, education, number of cattle in operation, role in cattle operation, type of cattle operation and ownership of technology.
2.) Determine participants level of perceived importance of selected communication tools.
3.) Determine participants frequency of use of selected communication tools
4.) Identify differences between the perceived level of importance of selected communication tools used for general (non-industry related) and beef industry purposes by age, role in cattle operation, type of cattle operation, income level, and smartphone ownership.
5.) Identify differences between the frequency of use of selected communication tools for general (non-industry related) and beef industry purposes by age, role in cattle operation, type of cattle operation, income level, and smartphone ownership.

Need for Study

Understanding how a cattle producer perceives and uses communications tools helps to identify if a digital divide exists between and among producers. If a digital divide is identified, this research will help determine how to manage the divide. Additionally this research allowed the beef industry to effectively communicate with their producers. Although research has indicated beef producers preferences for communication tools among producer-members of the Drover's cattle network (Gillespie, 2011), there is a need to determine if the preferences are consistent throughout other beef producer populations as well. As society moves further into an information age with an increasing availability of

various communication tools, a need exists to determine the perceptions of beef producers as to the importance of communications tools and their frequency of use. Additionally, can one assume that the Iowa Cattlemen's Association members who received the electronic newsletter use other electronic communication tools to engage in beef industry relations?

Implications and Significance

This study sought to determine the perceived importance and frequency of use of selected communications tools by beef producers for personal and business purposes. Communications is an important tool, and it is essential that beef producers understand how to use this too to educate themselves about the latest news in the industry. This study will impact how cattle producers in other states and the beef industry communicate with Iowa cattle producers in Iowa. Lastly, understanding the communication preferences of producers will allow the Iowa Cattlemen's Association, the Iowa Beef Council and beef industry partners to effectively communicate with Iowa beef producers.

Definition of Terms

The following in a list of terms and their definitions from the literature used to best frame this study:

Communication tool: An information source that is used to communicate with a person. Examples of communication tools include, pen and paper, computer, telephone, or visual (face- to -face) communication.

Cow/Calf operator: A producer with a sustainable herd of cows who produces calves for later sale. Beef cow calf production occurs in every state and is economically important in most of the United States (McBride & Mathews, 2011).

Feedlot operator: A producer who feeds grain and other roughages to cattle for about 90-120 days to reach a desired weight for slaughter. This type of operation usually ranges in size from fewer than 100 head to many thousands. (National Cattlemen's Beef Association, 2013).

Electronic Media: Media that uses electronics or electromechanical energy for the audience to access the content. Any equipment that is used in the electronic process, radio, television, telephone, desktop, handheld device and computer, can be considered electronic media. In this study, electronic media refers to electronic newsletters, text messaging, email, and websites (Electronic Media, 2006).

Traditional Print Media: Portable and disposable publications that are printed on paper to include books, newspapers, magazines, journals, and newsletters. In this study, print media refers to magazines, journals, brochures, and print newsletters (Curtis, 2011).

Seedstock producer: A producer who raises purebred or genetically superior cattle to use for breeding purposes (Lyons-Blythe, 2010). Producers who manage seedstock operations document Expected Progeny Differences (EPDs), pedigrees and genetic merits of their herd (The Beef Site, 2014).

Show Cattle operator: A producer who raises cattle for the purpose of show and show animals. This producer may also breed for superior physical attributes of an animal (Cattlemen's Beef Board, 2007).

Social Media: Internet based application tools used to share information among people. These applications include, Facebook, Twitter, Youtube, and numerous others. In social networking sites, people can create profiles for themselves (Boyd & Ellison, 2008). This

research identified social media forms as Facebook, Twitter, LinkedIn, Youtube and Pinterest.

Stocker/Backgrounder: A producer who buys calves between the ages of 6-12 months and raises them to be sold to feedlot producers. Cattle in stocker/backgrounder operations are usually kept at the operation for at least five months (Cattlemen's Beef Board, 2007).

Organization of Thesis

This thesis is organized into six chapters: introduction, literature review, comprehensive methods, two research papers that address the objectives of the study in greater detail, and conclusions. The introduction outlines the need to better understand communication tools used by farmers—specifically cattle producers. In the literature review, the connection between cattle producers and the diffusion of innovations theory (Rogers, 2003) is addressed, and the need for the specific study is raised. Chapter three provides an in-depth methodology of the study and addresses issues of reliability and validity. Research findings are dispersed in two separate papers found in chapters four and five. Chapter four identifies the perceptions regarding the importance of communication tools by cattle producers. Chapter five examines the current frequency of use of communication tools by cattle producers. Chapter six addresses the conclusions of the study, implications of the findings are discussed and the need for additional research is identified. Lastly, the appendices include the survey instrument, contact letters, and all output results.

References

Basu, T., & Banerjee, S. (2011). Impact of Internet on rural development in India: a case study. *Amity Journal of Media & Communication 2*(1), 12-18. Retrieved from http://eds.b.ebscohost.com/ehost/pdfviewer/pdfviewer

Baym, N. (2010). *Personal connection in the digital divide.* Malden, Massachusetts: Polity Press.

Begley, K. (2004). Face to face communication, making human connections in a technology-driven world. Retrieved from http://www.axzopress.com/downloads/pdf/1560526998pv.pdf

Boehlje, M. D. & King, D. A. (1998). Extension on the brink - Meeting the private sector challenge in the information marketplace. *Journal of Applied Communications*, 82(3), 21-35. Retrieved from http://www.agriculture.purdue.edu/agcomm/AgCom/EXTonBrink/jac.pdf

Boone, K., Meisenbach, T., Tucker, M. (2000). Agricultural communications changes and challenges. (1st ed.) Ames: Iowa State University Press

Boyd, D., Ellison, N. (2008). Social network sites: Definition, history, and scholarship. *Journal of Computer Mediated Communication, 13*, 210-230. doi: 10.1111/j.1083-6101.2007.00393.x

Brashear, G., Hollis, G., Wheeler, M. (2000). Information transfer in the Illinois swine industry: how producers are informed of new technologies. Journal of Extension (38)1 p. 1-4.

Cattlemen's Beef Board (2007). Fact sheet: beef from pasture to plate. Retrieved from http://www.beefboard.org/news/files/factsheets/From-Pasture-to-Plate.pdf

Cullen, R. (2001). Addressing the digital divide. *Online Information Review(25)*5 p. 311-320. doi: 10.1108/14684520110410517.

Curtis, A. (2011). About Print Media. Retrieved from http://www2.uncp.edu/home/acurtis/Courses/ResourcesForCourses/PrintMedia.html

December, J. (1996). Units of analysis for Internet communication. *Journal of Computer Mediated Communication, 1*. 0. doi: 10.1111/j.1083-6101.1996.tb00173.x.

Donnermeyer, J. & Hollifield, C. (2003). Digital divide evidence in four rural towns. *IT & Society, Spring*, 107-117.

Diekman, F., Batte, M., (2009). Examining information search strategies of Ohio farmers. *Journal of Extension (47)*6. 6FEA8.

Electronic Media (2006). Electronic media serve-supple-solution. Retrieved from http://www.electronicmedia.co.za/

Field, T., Gardiner, H., Lemenager, R., & Herring Suttee. (2006). The future of beef industry information dissemination: a report to the national cattlemen's beef association. Retrieved from http://www.learningace.com/doc//ncba-future-of-beef-industry-field-et-al-2006

Flaherty L., Pearce K., & Rubin, R. (1998) Internet and face-to-face communication: Not functional alternatives, *Communication Quarterly, 46*(3), 250-268

Gillespie, J. L. (2011). U.S beef producer's current use and perceptions of social media as a communications tool. (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf

Lasley, P., Padgitt, S., & Hanson, M. (2001). Telecommunication technology and its implications for farmers and extension services. *Technology in Society23*, 109-120. doi: 10.1016/S0160-791X(00)00039-7

Lyons-Blythe, D. (2010, January 26). Cattle ranching jargon may divide groups. [Life on a Kansas Cattle Ranch] Retrieved from http://www.kansascattleranch.blogspot.com/2010/01/cattle-ranching-jargon-may-divide.html

McBride, W., Mathews, K. (2011). *Beef cow-calf production lifestyle choice among many farmers.* Retrieved from http://www.ers.usda.gov/amber-waves/2011-june/beef-cow-calf-production.aspx#.Uop5eeL-Ict

National Cattlemen's Beef Association (2013). *Glossary of terms.* Retrieved from http://www.beefusa.org/f.aspx

National Telecommunications and Information Administration (NTIA) (2011). *Digital nation: Expanding internet usage.* Retrieved from http://www.ntia.doc.gov/files/ntia/publications/ntia_internet_use_report_february_2011.pdf

Park, T., & Mishra, A. (2003). *Internet usage by farmers. Evidence from a national survey.* Paper presented at the AAEA annual meeting, Montreal, Canada.

Riesenberg, L., & Gor, C.O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education 30*(3).7-13.doi: 10.5032/jae.1989.03007

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press

The Beef Site (2014). Beef cattle seedstock. Retrieved from http://www.thebeefsite.com/articles/1938/beef-cattle-seedstock

CHAPTER II. LITERATURE REVIEW

This chapter discusses the literature related to agricultural communications. The chapter is divided into the following sections: fundamentals of communication; definition of information; the importance of information for cattle producers; sources of information and their role in communications; and preferences of communication tools for cattle producers. Lastly, overview of the theoretical framework, Rogers (2003) Diffusion of Innovations theory is discussed as it plays an important role in communication technologies used by cattle producers. Three aspects of the Diffusion of Innovations are explained. These three aspects include, the innovation decision process, attributes of an innovation and adopter categories as they relate to the adoption of communication tools by cattle producers.

Fundamentals of Communication

Success or failure in any setting depends upon the communication that takes place; today we live in a world where excellent communications skills are needed (Telg & Irani, 2012). In both written and oral communication, the sender puts a thought into a specific form using words and symbols. The thought is sent through a communication channel and is 'decoded' by the receiver (Ritchie, 1991). The receiver then interprets the thought and communicates a thought back to the sender. In verbal communication the receiver may confront barriers which reduce the understanding of the message. In written communications, the receiver may also have unintended barriers that exclude the receiver from understanding the message (Telg & Irani, 2012). Other barriers to written communication include trust and confidence (Button & Rossera, 2001). When there is a lack of trust or confidence, it will "lead to distortions in the information flow" (Button & Rossera, 2001, p. 347). In written communication, the sender and receiver may not be present, which

allows for greater misinterpretation than in a face-to-face conversation (Telg & Irani, 2012).

A well-known communication model is the Shannon-Weaver Communication Transmission Model (Shannon & Weaver, 1948). This model consists of five parts which include: the information source, the transmitter, the channel, the receiver and the destination. The information source produces a message that is communicated to a transmitter. The transmitter encodes the message into a signal. The channel is the medium that is used to transmit the signal. The receiver decodes the signal back into a message. The destination becomes the receiver of the message.

Information Defined

Everyone defines information differently (Boehlje & King, 1998). Information is described as answering questions in order to reduce uncertainty (Ritchie, 1991). Information can include spoken or written words, facial expressions and body movements. In order to reduce uncertainty, the information that is presented must connect what is already known to what is unknown (Ritchie, 1991). In mass communication, information is defined as facts, news and ideas that help shape social behavior. According to Douglas (1985) opinions, data and knowledge are considered information. Information is specific to an audience and can direct individuals to make decisions about an idea, innovation or situation (Boehlje & King, 1998). Ritchie (1991) stated that "information is always relevant to the context of some human activity" (p.4). Information may be directed towards a certain person or can include social activities with groups of people.

The Importance of Information for Cattle Producers

Communication is a critical component of agriculture. Communication helps farmers make important decisions regarding their operations on a daily basis (Cidro & Radhakrishna,

2006). "In order to maintain the competiveness of the Illinois swine industry, producers need rapid access to emerging technologies" (Brashear, Hollis & Wheeler, 2000, p.1) which will allow them to become profitable in the industry. Cattle producers are no different; they need technologies and information to become successful in their operations (Boehlje & King, 1998). As forms of technology increase, so is the information that is available to producers. As the value of information increases, an enquiry faced by most people is, "how do we compete in this new evolving information marketplace" (Boehlje & King, 1998, p. 22)? Field, Lemanager, Long, and Herring-Suttee (2006) suggested that "the challenge in the future will be the integration of information from a variety of sources and disciplines into effective decisions tools" (p.9).

Sources of Information and their Role in Communications

Today, Americans live in a world in which there are choices. Boone, Meisenbach and Tucker (2000) stated that just as consumers make decisions on their fashion styles and the food they eat, Americans also have choices in the information and entertainment sources they choose. A few information sources include print media, electronic media and social media.

Traditional media includes words, pictures, and diagrams to convey information (Farooq, Muhammad, Chauhdary, & Ashraf, 2007). Print media attracts consumers when the information within the print source is relevant to the life of the consumer (Farooq et al., 2007, p. 378). Types of print media include brochures, flyers, magazines and journals.

Electronic media is a popular form of communication where users can exchange information (December, 2006). Any electronic equipment used to disseminate information that includes radio, television, telephone, desktop, handheld devices, and computers are

grouped as electronic media (Boone et al., 2000). One of the fastest growing electronic media communication tools is the Internet (Flaherty, Pearce, & Rubin, 1998). December (2006) described an analysis of the electronic communication channels and indicated that people use the Internet for many purposes. One major reason is to communicate; some people use the Internet to interact and share information.

Internet based applications that are built from Web 2.0 technologies and allow users to create and exchange content is known as social media (Vaast, & Kaganer, 2013). In social networking sites, people can create profiles for themselves. Social networking sites combine multiple modes of communication and provide control over what content is placed on the web. The impact of social media tools is evident as numerous corporations are utilizing it for communication purposes; however, the users of new media are changing overtime (Baym, 2010). Social media includes platforms such as Facebook, YouTube, and Twitter. Web based communication tools are changing the way people form opinions which drives consumer preferences (Hoffman, 2009).

The five specific purposes for which communications tools are used include: gain knowledge, communicate, share ideas, explain and persuade (National Career and Technical Education, 2006). Cattle producers have an opportunity to learn about a topic, share ideas, communicate, and persuade someone through the use of various communications tool.

Communicate

The process of communicating involves an information source and a receiver (Ritchie, 1991). Communicating is the process of stating information so that it can be interpreted by the destination. If a person is communicating it "creates [a] relationship between what is perceived or known by one person and what is perceived or known by

another" (Ritchie, 1991, p. 11). The interchange of ideas or information can be through speech, signals, or writing (Telg & Irani, 2012). When people communicate they can convey information with others in verbal or written context.

Learn

Learning is "concerned with the acquisition of habits, knowledge and attitudes" (Knowles, Holton, & Swanson, 2012, p. 11). Learning allows individuals to change and make both personal and social adjustments to information already obtained. Learning emphasizes the person who is changing or expected to change (Knowles et al., 2012). Hilgard and Bower (1966) indicated that "learning is a process by which an activity originates or is changed through reacting to an encountered situation" (p. 2). When producers read magazines or other forms of communication they learn about the industry so that they can share their knowledge to others.

Share

The process in which individuals exchange their knowledge to create new knowledge is defined as sharing (Van den Hoof & DeRider, 2004). Sharing consists of offering knowledge and collecting new knowledge (Ardichvili, Page, and Wentling, 2003). Individuals are eager to share information they know as they consider it to be valuable and believe their knowledge is appreciated by others (de Vries, Van den Hooff, & DeRidder, 2006). Individuals, who share knowledge, expect others to share knowledge as well (Alder & Kwon, 2002). Furthermore, people who share knowledge want a balance between offering and collecting knowledge (de Vries, et al., 2006).

Cattle Producers Preferences of Communication Tools

A farmer's information search is driven by numerous factors that include socio-economic, demographic and business related aspects (Patrick & Ullerich, 1996). Numerous researchers have examined communication tool preferences for farmers (Diekmann & Batte, 2009; Gillespie, 2011; Risenberg & Gor, 1989; Vergot, Israel, & Mayo, 2005). Gillespie (2011) identified preferred sources and usage of communication tools by cattle producers who were members of the Drover's cattle network. Producers in the Gillespie (2011) study preferred print media publications. This study also found that producers in the Drover's cattle network preferred the Internet as a source of information, but social media was the least likely preferred source of information. Gillespie (2011) suggested advertising social media applications through print media communication channels. If producers see that they are able to get the same content through social media applications, the use of social media applications may increase (Gillespie, 2011). Furthermore, Gillespie (2011) indicated that the size of the operation did not matter; producers of both large and small operations preferred print media sources. These findings are contradictory to earlier studies by Vergot et al., (2005).

Vergot et al. (2005) studied the usage of communication channels by beef producers served by extension agents in 12 counties in the Northwest Florida extension district. Producers preferred print media channels, radio, and research demonstrations and the preferred method of receiving information varied from producer to producer. Therefore the researchers suggested that it may be relevant to use multiple channels of communication when communicating to cattle producers. The findings from the Vergot III, Isreal, and Mayo (2005) study suggested using mass media to target larger clientele.

Diekmann and Batte (2009) examined the information needs of Ohio farmers and identified factors that influenced their choices. Diekmann and Batte (2009) found that Ohio farmers preferred different levels of information sources and delivery methods based upon demographic, socio-economic, and attitudinal influences. Even with different demographic characteristics and attitudes, farmers still preferred print media over voice media sources such as radio and television broadcasting (Diekmann & Batte, 2009). Additionally, Diekmann and Batte (2009) also found that the larger the farm size the more likely the operation was to use electronic media. The findings of the Diekmann and Batte (2009) indicated that demographic characteristics of producers did have an effect on technology use; this study is consistent with Risenborg and Gor's (1989) research findings.

As demographic characteristics play an important role in the use of technology, it is also important to determine if the advancement of technology affects preference of communication channels by producers. A review of research conducted during the 1980's prior to numerous advancements in communication technology should be utilized.

Riesenberg and Gor (1989) identified the most credible and preferred sources of information by Idaho farmers. This study revealed that farmers with larger farms preferred print media publications while farmers of smaller operations preferred computer based communication. Farmers with college experience preferred all methods of communication which included computer based, print, and interpersonal methods (Riesenberg & Gor, 1989). Even though the Riesenberg & Gor (1989) study is 24 years old, it indicated that there are differences in preferred methods to receive information depending on the size of the operation and that recognition of preferred methods of communication tools should be warranted.

Obahayujie and Hillison (1988) examined how part- and full-time beef farmers evaluated communication methods used by agricultural extension agents. In the Obahhayujie and Hillison (1988) study, part-time beef producers were identified as individuals who derived less than 50 percent of their income from the sale of beef cattle. Full-time beef farmers were those that derived more than 50 percent of their income from the sale of beef cattle. Part-time producers preferred more individual contacts, such as on farm demonstrations and home visits, but full time producer's preferred print media, radio, and leaflets.

As technology is continuously changing, it is important to note preferences for communication channels by cattle producers during the 1980's. The preferences for cattle producers during the 1980s will help determine if technology advancements play a role in the preferred communication channels of today's cattle producers. As there are differences in communication preferences depending on producer demographics during the1980s, is it reasonable to assume that 24 years later similar patterns will be identified?

Use of Computers by Farmers

Park and Mishra (2003) conducted research on Internet usage by farmers, and indicated that demographic characteristics affect the preferences for the Internet. Producers with diversified farms used the Internet more than farms with just one commodity. Additionally, farmers who received an income on the farm engaged in Internet applications more than farmers who received an off farm income. Other demographics that have an effect on a persons' computer use is their age. Smith, Paul, Goe, and Kenney (2004) indicated that a person's age had a negative effect on computer usage. The older the person the less likely they are to use a computer. Iddings and Apps (1990) examined what influences farmers'

computer use and found that age, time, and experience were all crucial to a farmers' Internet use. Other crucial components which impacted farmer's computer use included lack of understanding, awareness, and the complexity of the technology (Donnermeyer & Hollifield, 2003). The last component crucial to the use of computer is access. Some producers may not have the access to the computer or other communication technologies to use them.

Digital Divide

The digital divide is known as the 'gap' that exists between producers who have Internet access and those that do not (Cullen, 2001). The Internet can have positive impacts for those who are fortunate to have access to it (Pearce and Rice, 2013). Donnermeyer and Hollifield (2003) indicated that the rural population lagged behind the urban population in the adoption of Internet. In the United States, demographic characteristics, skills, and interest of users may increase or decrease the gap between those that have Internet access and those that do not.

Advancement in Technology

As technology continues to advance, it is imperative to understand how beef producers use communications tools. Research data on personal connections in the digital age by Baym (2010) indicated that "there have never been more ways to communicate with one another than there are now" (p.1). Furthermore, with rapid new innovations and the dispersion of the new technology, there is a need to explore producers preferred methods of communication. This literature review showcases research that is at least three years old regarding cattle producers preferred communication channels. With rapid, new innovations being adopted, is it logical to conclude that the preferred methods of communication by beef producers would be different than with those found in previous studies? Furthermore, will

demographic characteristics continue to play an important role in the use of the Internet by a producer?

Theoretical Framework

Rogers (2003) claimed that "getting a new idea adopted, even when it has obvious advantages is difficult" (p. 1). Getting the idea adopted by everyone in society is difficult as the speed of adoption is different depending on the idea (Rogers 2003). Roger's (2003) Diffusion of Innovations theory served as a theoretical framework for this study. The Diffusion of Innovations theory searches for the how, why, and at what rate new innovations spread through social systems (Rogers, 2003). Diffusion of Innovations theory is comprised of three aspects which aid in the acceptance of a new idea. These include the innovation decision process, the rates of adoption (perceived attributes of an innovation) and the adopter categories.

The Innovation Decision Process

The Innovation Decision Process is the process where individuals progress through a series of phases regarding the acceptance of a new idea. The phases range from forming an attitude to making a decision to adopt or reject the new idea. The steps of the innovation decision process are 1) Knowledge, 2) Persuasion, 3) Decision, 4) Implementation, 5) Confirmation (Rogers, 2003).

Knowledge

The first stage, knowledge, occurs when an individual is exposed to an innovation. People can play a passive role when they are exposed to innovation (Rogers, 2003). For example, individuals could become exposed to an invention and then may not want to implement the innovation on their own. Some individuals exhibit a selective exposure which

is the tendency to only pay attention to messages that are consistent with their own beliefs. Individuals may also have selective perception, this is "the tendency to interpret communication messages in terms of the individuals existing attitudes and beliefs" (Rogers, 2003, p. 171). The knowledge stage permits a person to learn and process knowledge about an innovation. There are three types of knowledge: the awareness knowledge, the how- to knowledge and the principles knowledge. Awareness knowledge is when the individual is aware that an innovation exists. How-to knowledge consists of gaining the necessary information on how to use the innovation. Lastly the principles knowledge determines how the innovation works. As producers gain the knowledge of a communication tool, it will increase their understanding of the communication tool. If producers gain positive knowledge about a communication tool, it may increase the perceived importance and frequency of use of the tool.

Persuasion

In the persuasion stage, an individual seeks out information about the new idea and then decides to form an attitude about the innovation. Attitude is an individual's beliefs about an innovation that influences their actions. Influence from the adopter's peers help shape an individual's attitudes about an innovation (Seligman, 2006). The adopter may gain a favorable attitude about the innovation if his or her peers have a favorable attitude it (Seligman, 2006).

Decision

Decision is the stage in which individuals engage in activities that will ultimately lead them to adopt or reject the innovation (Rogers, 2003). Discontinuance is when a person decides to adopt and then rejects the decision. Producers may decide to adopt a specific

communication tool for a specific time and then later may discontinue the use if they do not find the innovation important.

Rejection can occur even after a person decides to adopt, this is termed discontinuance (Roger, 2003). If an individual decides to reject an innovation, there are two types, active and passive. Active rejection is when an individual considers adopting the innovation but then decides not to adopt the innovation. Passive rejection is when the individual does not even consider adopting the innovation (Rogers, 2003).

Implementation

When individuals put the innovation to use, they implement it. The implementation stage is more serious for organizations. If organizations chose to actively reject the innovation it may have an impact on the company and a number of individuals may be involved (Rogers, 2003). Depending on the innovation, the implementation stage may continue for a lengthy period of time, however, when the new idea loses its distinctive quality the innovation or idea may disappear.

Confirmation

In the confirmation stage, an individual "seeks reinforcement for the innovation-decision already made and may reverse this decision if exposed to conflicting messages about the innovation" (Rogers, 2003, p. 189). During this stage, individuals try to reduce dissonance. Dissonance is defined as an individual changing feelings and attitudes toward an innovation. Often individuals will seek out information that will support their decision that has already been made (Rogers, 2003). Producers will confirm they use a communication tool and look for evidence that supports their choice to adopt or reject. Producers may also promote the use of the communication tool to other individuals when they adopt it.

Rate of Adoption (Perceived attributes of an Innovation)

Individuals adopt different innovations at different times; therefore, the speed and rate of adoption will not be the same for each innovation (Oldenburg & Glanz, 2008; Rogers, 2003). The rate of adoption is characterized by the speed at which an innovation is adopted by members of a given social system (Rogers 2003). The rate of adoption of an innovation can be explained by the innovation's perceived attributes (Rogers, 2003). These include relative advantage, compatibility, complexity, trialability, and observability.

Relative Advantage

Relative advantage is "the degree to which an innovation is perceived as being better than the idea it surpasses" (Rogers, 2003, p. 229). Each innovation is unique in its relative advantage compared with other innovations. Relative advantage is a strong predictor of an innovation's rate of adoption (Rogers, 2003). As a person adopts an innovation or perceived idea, preventive innovation can occur. A preventive innovation occurs when the individuals adopt an innovation so that it will lessen the cause of an unwanted occurrence. As producers adopt communication tools such as a smart phone, they may find that information can be accessed more quickly than through a traditional computer.

Compatibility

Compatibility is the innovation's perceived ability to be consistent with other existing values, needs of potential adopters and past experiences. If the innovation is compatible with an individual it will fit their needs better than if the innovation is not compatible. Cultural beliefs can affect the rate of adoption as an innovation may or may not be compatible with cultural beliefs (Rogers, 2003). An innovation may also be compatible with other technologies or innovations that have been previously introduced, which can either increase

or decrease the rate of adoption. Lastly, an innovation can also fit the needs of an individual (Rogers, 2003). If producers find that communication tools are compatible to their way of life, they may adopt it much quickly than other innovations.

Complexity

A third attribute of the rate of adoption of innovations is complexity. Complexity is the perceived difficulty of the innovation. If the innovation or idea is easy to use, it will more than likely be adopted by those in the society (Rogers, 2003). According to Rogers (2003) any innovation may be considered complex or simple depending on the adopter. If the communication tool is perceived as difficult to use by the producer it may not be adopted as quickly as less complicated technologies. If the innovation is easy to use, it may be adopted quickly by members of the social system.

Trialability

The fourth attribute of the rate of adoption of innovations is trialability. Trialability is the "degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). If an innovation can be tried for a period of time it will more than likely have an advantage over those ideas that cannot be tested (Rogers, 2003). If a person tries an innovation they will more than likely form an opinion about the innovation. Uncertainty and inevitability of the innovation may be revealed during a personal trial of the innovation. Producers can experiment with a social media platform such as Twitter, prior to fully adopting it, which will lead them to forming a decision about the innovation.

Observability

Observability, the last attribute, is defined as "the degree to which the results of the innovation are visible to others" (Rogers, 2003, p. 258). The results of some innovations are

easily observed and communicated whereas the results of other innovations may not be as easily observed. If the benefits of the innovation are clearly defined, it will more than likely be adopted by the social system and the rate of adoption will increase.

Adopter Categories

Individuals in a society do not adopt the same innovation at the same time and, therefore, can be categorized into adopter categories (Roger's 2003). Although everyone adopts ideas at different times the adoption of the innovation still follows a bell shaped curve as shown in Figure 2 (Rogers, 2003). Rogers (2003) defines five adopter categories 1) innovators, 2) early adopters, 3) early majority, 4) later majority, and 5) laggards.

Innovators

The innovators are venturesome and tend to be the first to adopt an innovation. Innovators are risk takers and do not mind the set back of a new innovation that does not work properly. Innovators are usually not respected by others in the social system but they are important in the innovation decision process as they launch new creative ideas (Rogers, 2003). If a producer is one of the first to use an innovation, he or she could be considered an innovator.

Early Adopters

The second category is early adopters. These are individuals who are respected by the social system (Rogers 2003). The early adopters "decrease uncertainty about a new idea by adopting it" (p. 283). Nonetheless, other potential adopters will turn to the early adopter for advice on ideas or innovations (Rogers, 2003). Producers are early adopters if they are not the innovator and if they are one of the first to adopt the innovation.

Early Majority

The third adopter category, early majority, adopts the new ideas before the majority in the social system adopts the innovation. The early majority are an important aspect in the diffusion process as they are not too early and not too late in the adoption process (Rogers 2003). These individuals "provide interconnectedness in the social system's interpersonal networks" (Rogers, 2003, p. 284). If producers seldom lead but do follow an adoption of the social system, they are considered a part of the early majority.

Late Majority

Late majority people adopt after the majority of the people in the social system have adopted (Rogers, 2003). These adopters are skeptical about the innovation but choose to adopt the innovation. These individuals make up about one-third of the diffusion system (Rogers 2003). Most of these individuals adopt as a result of peer pressure (Rogers, 2003). If the innovation has been adopted by almost everyone in the society, and the disbelief of the innovation is low, then producers will decide to adopt (Rogers, 2003).

Laggards

Laggards are the last of the social system to adopt a new innovation or idea. Many of the laggards are isolated in the social system, and their decisions are based upon what has previously been done in the past (Rogers 2003). Laggards tend to be mistrustful of the innovation and choose not to adopt it until they know that the innovation will not fail. Producers in this category adopt the communication tool because of a known impact it has made for individuals in the social system.

Summary

As communication technologies increase, it is important that preferences and use of communication tools by cattle producers be identified (Maddox, Mustian, & Jenkins, 2003).

Industries will survive if they work toward communicating with producers utilizing producer's preferences for communication tools (Maddox et al., 2003). Communicating technology is the main engine that will move society in the information age (Flor, 2002). Many producers have access to communication tools but their adoption of these technologies is lagging (Flor, 2002; Smith, Paul, Goe & Kenny, 2004).

Roger's (2003) Diffusion of Innovations theory is not without its criticism. Roger's (2003) identifies specific categories of which adopters fit into, one must be careful when categorizing individuals as not everyone fits into the same categories at the same time. The lagging adoption of technologies is due in part from not understanding the benefits the technology may serve (Smith et al., 2004). However, the benefits of technology can be explained by having the appropriate knowledge of the product itself, as this is important to move forward in the innovation decision process (Gillespie, 2011). Just as the knowledge obtained about a product is essential, the relative advantage of the technology is imperative (Rogers, 2003). Producers need to know how the communication technology has an advantage over other communication technologies utilized previously (Rogers, 2003). As producers move through the adoption process, their understanding of technology increases as well as their understanding of the perceived benefits. Educating farmers, specifically cattle producers, to become confident in using information sources may be beneficial as it could aid in the adoption of communication technology (Risenberg & Gor, 1989).

References

Adler, P. S., & Kwon, S.W. (2002). Social capital: Prospects for a new concept. *Academy of Management Review, (1)*27, 17-40.

Ardichvili, A., Page, V., & Wentling, T. (2003). Motivation and barriers to participation in virtual knowledge-sharing communities of practice. Journal of Knowledge Management, (1)7, 64-77.

Baym, N. (2010). *Personal connection in the digital divide.* Malden, Massachusetts: Polity Press.

Boehlje, M. D. & King, D. A. (1998). Extension on the brink - Meeting the private sector challenge in the information marketplace. *Journal of Applied Communications*, 82(3), 21-35. Retrieved from http://www.agriculture.purdue.edu/agcomm/AgCom/EXTonBrink/jac.pdf

Boone, K., Meisenbach, T., & Tucker, M. (2000). Agricultural communications changes and challenges. (1st ed.) Ames: Iowa State University Press

Button, K., & Rossera, F. (1991). Barriers to communication: A literature review. *The Annals Regional Science,* (24), 337-357.

Brashear, G., Hollis, G., & Wheeler, M. (2000). Information transfer in the Illinois swine industry: how producers are informed of new technologies. *Journal of Extension (38)*1, p. 1-4.

Cidro D. & Radhakrishna, R. (2006, May). *Usefulness of information sources in the promotion of hybrid rice programs in the Philippines*. Paper presented at the 22nd Annual Conference Proceedings of the Association for International Agriculture Extension Education (AIAEE), Clearwater Beach, Florida.

Cullen, R. (2001). Addressing the digital divide. *Online Information Review*,*25*(5), p. 311-320. doi: 10.1108/14684520110410517.

December, J. (1996). Units of analysis for Internet communication. *Journal of Computer Mediated Communication, 1*. 0. doi: 10.1111/j.1083-6101.1996.tb00173.x.

De Vries, R., Van Den Hoff, B., & De Ridder, J. (2006) Explaining knowledge sharing: The role of team communication styles, job satisfaction, and performance beliefs. *Communication Research, (2)*33, p. 115-135. doi: 10.1177/0093650205285366.

Diekmann, F., & Batte., M. (2009 December). Examining information search strategies of Ohio farmers. *Journal of Extension (47)*6, p.1-14.

Donnermeyer, J. & Hollifield, C. (2003). Digital divide evidence in four rural towns. *IT & Society, Spring*, 107-117.

Douglas, W. (1985). Anticipated interaction and information seeking. *Human Communication Research,* (12), 243-258.

Field, T., Gardiner, H., Lemenager, R., & Herring Suttee. (2006). The future of beef industry information dissemination: a report to the national cattlemen's beef association.

Retrieved from http://www.learningace.com/doc//ncba-future-of-beef-industry-field-et-al-2006

Farooq, S, Muhammed, S., Chaudary, K., & Ashraf, I. (2007). The role of print media in the dissemination of agricultural information among farmers. The Journal of Animal and Plant Sciences, (1), 23, 324-329.

Flaherty L., Pearce K., & Rubin, R. (1998) Internet and face-to-face communication: Not functional alternatives, *Communication Quarterly*, *46*(3), 250-268

Flor, A.G. (2002). *Information and communication opportunities for technology transfer and linkages*. Paper presented at the Expert Consultation on Agricultural Extension, Research-Extension Farmer Interface and Technology Transfer. Food and Agricultural Organization Regional Office for Asia and the Pacific, Bangkok, Thailand.

Gillespie, J. L. (2011). U.S beef producer's current use and perceptions of social media as a communications tool. (Master's thesis)Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf

Hilgard, E. & Bower G. (1966). *Theories of learning*. New York: Appleton-Century-Crofts.

Hoffman, A. (2009). Social media bridges consumer producer gap. Retrieved from http:// www.fb.org/index.php?action=newsroom.focus&year=2009& file=fo0720.html

Iddings, R., & Apps, J. (1990). What influences farmers computer use? *Journal of Extension, 28* (1), 1-4. Retrieved from http://www.joe.org/joe/1990spring/a4.php

Knowles, M., Holton, E., & Swanson, R. (2012). *The adult learner: The definitive classic in adult education and human resource development.* (7th ed.). New York: Routledge

Maddox, S. J., Mustian R. D., & Jenkins, D. (2003, February*). Agricultural information preferences of North Carolina farmers*. Paper presented to the Southern Association of Agricultural Scientists, Mobile, Alabama.

National Career and Technical Education, (2006) Purpose and Audience Analysis. Retrieved from http://www.readwritethink.org/files/resources/lesson_images/lesson948/purpose-audience.pdf

Obahayujie J. & Hillison J. (1988, Spring). Now hear this! *Journal of Extension 26*(1).

Oldenburg B., & Glanz, K. (2008). Diffusion of innovations. In K. Glanz, B. Rimer, K. Viswanath, (Eds.) *Health behavior and health education* (4th ed) (pp. 314-333). San Francisco, California: Jossey-Bass.

Park, T., & Mishra, A. (2003). *Internet usage by farmers. Evidence from a national survey.* Paper presented at the Agricultural & Applied Economics Association annual meeting, Montreal, Canada.

Pearce, K., & Rice, R. (2013). Digital divides from access to activities: comparing mobile and personal computer Internet users. *Journal of Communication, 63*, 721-744. doi: 10.1111/jcom.12045

Patrick, G. F., & Ullerich, S. (1996). Information sources and risks attitudes of large scale farmers, farm managers, and agricultural bankers. *Agribusiness, 12*(5), 461-471.

Ritchie, D. (1991). *Communications concept 2: Information*. Newbury Park, California: Sage

Riesenberg, L., Gor C.O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education 30*(3).7-13.doi: 10.5032/jae.1989.03007

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press

Settle, Q.,Telg, R., Baker, L., Irani., T., Rhoades, E., Rutherford., T. (2012). Social media in education: the relationship between past use and current perceptions. *Journal of Agricultural Education, (53)*3 p. 137-153.

Shannon, C., & Weaver, W. (1948) *The mathematical theory of communication*. Urbana. University of Illinois Press.

Smith, A., Paul, C. J., Goe, R.W., Kenney, M. (2004). *Computer and Internet use by Great Plains farmers*. Unpublished manuscript, Department of Agricultural and Resource Economics, University of California, Davis, CA.

Telg, R., & Irani, T. (2012). *Agricultural communications in action a hands on approach.* New York: Delmar; Clifton Park, NY: Delmar, Cengage Learning.

Vaast, E. & Kaganer, E. (2013). Social media affordances and governance in the workplace: an examination of organizational policies. *Journal of Computer Mediated Communication, 19*, 78-101. doi:10.1111/jccc4.12032

Van den Hooff, B., & De Ridder, J. A. (2004) Knowledge sharing in context: The influence of organizational commitment, communication climate and CMC use on knowledge sharing. *Journal of Knowledge Management, (6)*8, p. 117-130

Vergot P., Isreal G., & Mayo, D. (2005 April). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. Journal of Extension, 43(2).

West, R., & Turner, L.H. (2007). *Introducing communication theory: Analysis and application.* New York, NY: McGraw-Hill.

CHAPTER III. METHODS

The purpose of this study was to determine the perceived level of importance and frequency of use of selected communications tools by Iowa cattle producers. This study also sought to identify the relationships among the types of communication tools used for general and beef industry purposes. The perceived importance and frequency of use of selected communication tools were identified using a web-based instrument through Qualtrics®. Qualtrics® is an online database where researchers generate and distribute surveys (Benton, Pappas, & Pappas, 2011). This chapter will address the population, the survey mode, survey instrument, and limitations relative to this study.

Population and Sample Design

The population for this research was cattle producers who belonged to Iowa Cattlemen's Association (ICA). Producers who received the electronic newsletter provided by the Iowa Cattlemen's Association were the targeted population. The population was targeted because of the Association's interest to determine these producers' main preferences for communication channels. The Iowa Cattlemen's Association provided a list of all producers who received the electronic newsletter (N = 3,021).

Gravetter and Wallnau (2009) indicated that it is often "impossible for researchers to examine every individual in the population of interest" (p. 4). Researchers often select smaller groups from the populations that are more manageable and limit their research to those within that smaller group (Ary, Jacobs, & Sorenson 2010). These smaller groups, referred to as a sample, are a representation of the population and the results of the sample can be generalized back to the population (Gravetter & Wallnau, (2009). From the population of Iowa cattle producers, a random sample was utilized due to time and a budget

constraint as it was not feasible for researchers to examine all the 3,021 members of the ICA who received the electronic newsletter (Gravetter & Wallnau, 2009).

A random sample of 341 members of the Iowa cattlemen's association was needed to achieve a 95 percent confident level and a sampling error of +/- 5 percent as recommended by Ary, Jacobs, and Sorenson, (2010). A sample of 974 was utilized in order to account for power of the statistical test (Gravetter & Wallnau, 2009). This study used the oversample of (n = 975) in hopes to achieve a 35 percent response rate which was found in similar population studies (Diekman & Batte, 2009). The oversample size was found by dividing the needed sample (n = 341) by the expected response rate (35%).

Survey Mode

An electronic mail based, or Internet, instrument was the most feasible and appropriate for data collection. Ary et al. (2010) indicated with an electronic mail survey participants can choose to respond when they want. An electronic based instrument is able to reach a large audience (Ary et al., 2010). Electronic based surveys are also less expensive than using a print mail survey (Ary et al., 2010). Tourangeau, Rips, & Rasinkski, (2000) claimed that respondents are likely to respond more accurately with survey instruments than a face-to-face interview or over the telephone. However, there are still barriers to utilizing web-based surveys.

Dillman et al. (2009) indicated that web-based surveys have low response rates. This limitation was addressed by notifying the participants one week in advance indicating their help would be appreciated for this study. Four reminders were also sent reminding the participants to participate. One disadvantage to email surveys is that respondents may consider the email suspicious (Dillman et al., 2009). Prior to the distribution of the survey,

an introductory email explaining the purpose of the research was sent to the participants of the study in hopes that it would decrease the fear of suspicious email. Another disadvantage to web-based surveys is that people may not have the technology to access the survey (Dillman et al., 2009). As respondents of the study all received the electronic newsletter provided by the Iowa Cattlemen's Association they were expected to have access to the basic capabilities of an electronic based instrument.

The electronic web-based instrument was more convenient for the respondents as they did not have to mail a completed survey to the researchers (Ary et al., 2010). Since respondents were able to answer without conducting a face-to-face interview, they were able to be anonymous while completing the survey thus answering with more accurate answers than if their identity was to be revealed (Tourangeau et al., 2000).

Survey Development

The survey instrument was designed to determine the preferences of communication tools by Iowa cattle producers. The instrument consisted of 120 items framed into three construct areas: 1) traditional print media, 2) electronic media, and 3) social media. Additionally, demographics of Iowa cattle producers were collected. Researchers considered the order of sections as the order of questions are important in an instrument (Groves, Fowler, Couper, Lepkowski, Singer, & Tourangeau, 2009). If the instrument is poorly organized it can confuse the respondents and bias their responses (Rea & Parker, 2012).

The first, second, and third section of the instrument collected producers' perceptions regarding importance and use of traditional media, electronic media, and social media tools used for general and beef industry purposes. Each of the three constructs utilized a four point Likert scale where producers indicated their perceived level of importance and use of

selected communication tools. According to Ary et al. (2010) Likert scaled questions are the most commonly used methods to measure attitudes. The purpose of the Likert-type scale sections were to understand how Iowa cattle producers use traditional print media, electronic media, and social media for general and beef industry purposes. In the demographics section, producers were asked their age, gender, education level, type of operation, and role in cattle operation. Following the recommendations of Groves et al. (2009) the demographic section was placed at the end of an instrument.

Survey Design

The instrument (Appendix A) consisted of a brief introduction that explained the directions for completion and defined important terms to get participants to think similarly (Groves et al., 2009). After the introduction, the instrument consisted of four sections: traditional print media, electronic media, social media, and demographics of Iowa cattle producers.

Introduction

The instrument introduction, thanked participants for their willingness to participate and introduced the purpose of the instrument. The time that it would take for respondents to complete and a statement encouraging participants to answer with the best of their ability was also included in the introduction. General consent was given by respondents when they agreed to voluntarily participate in the survey.

Part 1: Traditional Media

The traditional media construct consisted of nine items that specifically addressed statements about magazines/journals, brochures, and newsletters. The traditional media section consisted of two parts, general usage and beef industry use. Producers were asked to

rate their perceived level of importance and use of selected communication tools for both general and beef industry purposes. Individual items sought participants' responses regarding their perceived level of importance and use in sharing, learning, and communicating using traditional media tools. Sharing, learning, and communicating are all important benefits of communication tools (National Career and Technical Education, 2006). The importance scale included 1) unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. The frequency scale included 1) never, 2) rarely, 3) occasionally, 4) frequently. The traditional media section was developed to address objectives two and three.

Part 2: Electronic Media

The electronic media section consisted of 12 items that specifically addressed statements about websites, electronic newsletters, text messaging, and emails. The electronic media section consisted of two parts, general usage and beef industry use. Producers were asked to rate their perceived level of importance of and usage of electronic communication tools for sharing, learning, and communicating information used for both general and beef industry purposes. The importance scale included 1) unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. The frequency scale included 1) never, 2) rarely, 3) occasionally, 4) frequently. Objectives two and three are addressed from the electronic media section.

Part 3: Social Media

The social media section included nine items that addressed statements regarding perceptions of Facebook, Twitter, YouTube, and other social media applications. The social media section consisted of two parts, general usage and beef industry use. Within the two

parts, producers were asked to rate their perceived level of importance and use of social media tools used for both general and beef industry information on a four point Likert scale. The important scale consisted of 1) unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. The frequency scale also consisted of 1) never, 2) rarely, 3) occasionally, 4) frequently. The social media section was developed to address objectives two and three.

Part 4: Demographics

The fourth section of the instrument requested demographic information of the respondents. The purpose of this section was to better understand the cattle producers who responded to the survey. The demographic section included, age, education level, gender, type of operation, role in cattle operation, county, and smartphone ownership.

Rights and Welfare of the Participants

Prior to beginning research it is important that a study does not violate ethical principles (Ary et al., 2010). Since this research dealt with human subjects, it was important that respondents were protected from harm and that their privacy was not invaded (Ary et al., 2010). Researchers sought and received Institutional Review Board (IRB) approval upon implementing the survey. The IRB document (Appendix B) provided authorization that the study was ethically appropriate, would not cause any harm, and that researchers would protect the privacy of participants. The Communication in the Beef Industry survey did not raise any ethical issues. This research provided opportunity for consent by the participant, did not cause harm, and did not invade the participant's privacy as all recorded responses were kept anonymous.

The questions in the instrument did not cause any discomfort, nor did the survey cause stress to the participants. In the demographic section, participants were asked, their age, gender, role in cattle operation, type of cattle operation, and if they owned a smartphone.

Prior to completing the survey, participants knew that the survey was voluntary and that their answers would be kept anonymous. The participants were also informed they could skip questions if they felt the need and could opt out of the survey at any time.

In the emails to participants, the contact information for the Iowa State University's Office of Responsible Research was given in case the occurrence of a question or a concern arose. By attaining approval from the IRB, it would hopefully increase participation of the survey.

Survey Validity

Ary et al. (2010) claimed that validity is important when developing and evaluating instruments. Content validity is the extent to which instruments measure what they claim to measure (Ary et al., 2010). Participants' interpretation or validity of an instrument can be threatened by construct underrepresentation and construct-irrelevant variance. Construct underrepresentation is identified as having a narrow assessment where important aspects of the construct are not included. Construct irrelevant variance is the extent to which responses are affected by variables that are unimportant to the instrument such as the design of the instrument (Ary et al., 2010). An instrument cannot be considered valid unless it is reliable (Ary et al., 2010). Reliability refers to the consistency to determine if the instrument is measuring what it is supposed to measure (Ary et al., 2010). According to Ary et al. (2010), people who implement evaluating instruments must use techniques to determine if the instrument is consistent and is reliable.

Prior to the survey release, content validity was conducted with a panel of experts consisting of a team of six university faculty with expertise in survey design, communication, animal science industry, and agricultural education. After review, the instrument the suggested editorial changes were made and the panel found the survey valid for the research. Dillman, Smyth, and Christian (2009) indicated that once content validity is established a pilot study must be conducted to test for reliability.

The pilot study was conducted with 36 members of the Board of Directors of the Nebraska Cattlemen Association. This population was selected for its relevance to the target population. Pilot study responses were not included in the final data. In completing the pilot study the researcher's goal was to obtain feedback to help improve the instrument. Internal consistency of the instrument was measured using Cronbach's coefficient (Cronbach's alpha). According to Ary et al. (2010), a Cronbach's alpha test is used when there is no right or wrong answer such as with attitude measurement. Cronbach's alpha was calculated for each of the constructs in the instrument and yielded a reliability of $\alpha = .80$ or higher. Table 1 shows the Cronbach's alpha levels upon completion of the pilot study. According to George and Mallery (2003), an alpha score of <.5 is unacceptable, >.5 is poor, >.6 is questionable, >.7 is acceptable, >.8 is good, and >.9 is excellent, therefore the internal consistency of each construct in the pilot study was determined good or excellent. After establishing content validity and reliability, the instrument was prepared for internet dispersion using Qualtrics®.

Table 1

Instrument Reliability by Construct as Determined in the Pilot Study

Construct	Cronbach's Alpha
General Usage	
Importance of General usage of Traditional Media	.898
Importance of General usage of Electronic Media	.953
Importance of General usage of Social Media	.938

Table 1 (continued)

Construct	Cronbach's Alpha
Frequency of General usage of Traditional Media	.819
Frequency of General usage of Electronic Media	.868
Frequency of General usage of Social Media	.885
Beef Industry	
Importance of Traditional Media usage in Beef Industry	.836
Importance of Electronic Media usage in Beef Industry	.945
Importance of Social Media usage in Beef Industry	.951
Frequency of Traditional Media usage in Beef Industry	.875
Frequency of Electronic Media usage in Beef Industry	.874
Frequency of Social Media usage in Beef Industry	.976

Note: An alpha score of <.5 is unacceptable, >.5 is poor, >.6 is questionable, >.7 is acceptable, >.8 is good, and >.9 is excellent.

Table 2 indicates the Cronbach's alpha level for each construct in the present study.

Table 2

Instrument Reliability by Construct as Determined in the Present Study

Construct	Cronbachs Alpha
General Usage	
Importance of General usage of Traditional Media	.933
Importance of General usage of Electronic Media	.942
Importance of General usage of Social Media	.975
Frequency of General usage of Traditional Media	.884
Frequency of General usage of Electronic Media	.922
Frequency of General usage of Social Media	.945
Beef Industry	
Importance of Traditional Media usage in Beef Industry	.932
Importance of Electronic Media usage in Beef Industry	.952
Importance of Social Media usage in Beef Industry	.976
Frequency of Traditional Media usage in Beef Industry	.917
Frequency of Electronic Media usage in Beef Industry	.938
Frequency of Social Media usage in Beef Industry	.954

Note: An alpha score of <.5 is unacceptable, >.5 is poor, >.6 is questionable, >.7 is acceptable, >.8 is good, and >.9 is excellent.

Data Collection

The Communication in the Beef Industry survey was administered through Qualtrics®. Qualtrics® is an online database where researchers generate and distribute surveys (Benton, Pappas, & Pappas, 2011). During the initial contact to participate, those

emails that came back invalid were replaced until 974 valid email addresses were achieved. Those with valid email addresses made up the sample of 974.

As participants completed the survey and submitted their answers, Qualtrics® tracked the email addresses, removed the email addresses of respondents who participated and removed all identifying information. Only the non-respondents were sent the reminder contact emails. After the surveys were completed, the raw data was downloaded to the researcher's computer for analysis.

Dillman et al. (2009) suggested multiple contact approaches when administering a survey online. By sending multiple contacts it will help to get the message across and may increase response rates (Dillman et al., 2009). Other suggestions for implementing online surveys include contacting respondents with another mode if possible and sending brief emails to participants (Dillman et al., 2009). Besides contacting respondents through brief emails, a text message from the Iowa Cattlemen's Association was sent to participants of this study.

The Iowa cattle producers received the first contact via email with a pre-notification email (Appendix C). This email explained the importance of the research and the need for their participation. The approximate time to complete the survey and that only group data would be reported to ensure confidentiality was also included in this email. This also explained that the survey was voluntary and the information for the Office of Responsible Research was listed in case if participants were to enquiry a question about the research.

The second notification came from the Iowa Cattlemen's communications director. This notification came through the Association's electronic newsletter to increase participation (Appendix C). As a random sample of producers who received the electronic

newsletter was chosen for this study, the notification indicated that a survey might be sent to the producers and that cooperation was requested. The notification in the electronic newsletter also indicated that the survey was voluntary and that the information collected would be beneficial in improving the way the Iowa Cattlemen's' Association communicates issues about the beef industry with its members.

One week after the pre-notification letter, the third contact was sent through Qualtrics® (Appendix C). This letter looked very similar to the pre-notification letter but it contained the link to the survey. The purpose of the study, requesting participation, and acknowledging that participants could end the survey at any time was addressed. Contact information of the researchers and Office of Responsible Research was provided for the respondents in case of questions.

The fourth contact to producers was different than the previous contacts. Iowa Cattlemen's Association Communication director sent a text message to all participants of the study. This text message was distributed to the participants, asking them to check their inbox for a survey that was sent (Appendix C). This contact was sent three hours after the third contact.

A fifth contact was sent to producers through Qualtrics® (Appendix C) one week after the third and fourth contacts. This contact identified the purpose, encouraged participation, and contained contact information for both the researchers and the Office of Responsible Research.

The last and final contact was sent to producers one week after the fifth contact reminder (Appendix C). This contact encouraged participation and included the closing dates of the survey as well as acknowledging that the researchers are only interested in group

data and confidentiality would be assured. Lastly, contact information for the Office of Responsibility and the researchers were listed. The initial six contacts took place over the course of four weeks as indicated in Table 3.

Table 3

Contact Approach and Date of Response Collection

Contact Approach	Date
Pre-notification Letter: Email	Wednesday, Oct. 30, 2013
Second Contact: Electronic Newsletter*	Wednesday, Nov. 5, 2013
Third Contact: Qualtrics®	Wednesday, Nov. 6, 2013
Fourth Contact: Text Message*	Wednesday, Nov. 6, 2013
Fifth Contact: Qualtrics®	Wednesday, Nov. 12, 2013
Sixth Contact: Qualtrics®	Wednesday, Nov. 19, 2013

Note: *= Contact sent by Iowa Cattlemen's Association.

Of the 974 participants, 214 surveys were returned. There were 32 responses that were incomplete, leaving 182 for a response rate of 18.6 percent. Although the response rate was low it was considered suitable for this study. For measurements of opinion, research has shown no effect from low response rates (Langer, 2003). Miller and Carr (1997) indicated that those that respond are a likely an accurate representation of the population and their responses are valuable (Miller & Carr, 1997).

Post Collection Data Processing

Upon the completion of the survey, the data was uploaded to Predictive Analytical Software (PASW) statistics 18, a software package for analyzing statistics. Once uploaded the data was cleaned, saved, and stored in a password protected computer. Cronbach's alpha was computed upon completion of the research. The Cronbach's alpha for each construct generated a score of (>.8) or higher. The Cronbach's alpha for this study was higher than pilot tested and considered good or excellent (George & Mallery, 2003).

Objective One

To define demographics of the population, descriptive statistics including frequencies and percentages were calculated. The variables included gender, age, education level, number of cattle in operation, role in cattle operation, type of cattle operation, and ownership of technology.

Objective Two and Three

To determine participant's level of perceived importance and use of selected communication tools, means and standard deviations were calculated.

Objective Four

To identify differences between participants perceived level of importance of selected communication tools, a one way analysis of variance (ANOVA) was calculated. An ANOVA determines significance between one independent variable and two levels of another independent variable (Ary et al., 2010). One ANOVA compared the perceived importance of communication tools with producer's age; another ANOVA compared the perceived level of importance of communication tools to a producer's role in their cattle operation. A *post hoc* test was performed if a significant difference was found within the means from the ANOVA test. To determine which *post hoc* to calculate, a Levene's test was computed (Carrol & Schneider, 1985). A Tamhane T2 *post hoc* test was computed as there were unequal variances. Tamhane T2 test was also utilized for a conservative way to control for Type I error (Field, 2001). Lee, Sung, Kim, and Jeon, (2012) indicated that Tamhane's T2 test is a "reliable pairwise comparison based on a t-test" (p. 37). The Tamhane T2 *post hoc* test determined significance among the levels of each independent variable. The independent variables were age and role in the respondent's cattle operation.

An independent t-test determined significance between two variables (Ary et al., 2010). An independent t-test was used to determine the significance between producers' perceived level of importance of selected communication tools and the producer's source of main income. A second independent t-test was used to determine producers' perceived level of importance of selected communication tools and producers' smartphone ownership. Both the ANOVA and independent t-tests were used to compare the means of each variable.

Objective 5

To identify differences among participants' perceived level of importance of selected communication tools, a one way analysis (ANOVA) was calculated. One ANOVA compared the frequency of use of selected communication tools with producer's age, while a second ANOVA compared the frequency of use of selected communication tools to a producers' type of cattle operation. A *post hoc* test was performed if a significant difference was found within the means from the ANOVA test. To determine which *post hoc* to perform, a Levene's test was computed. The equality in variances was determined from a Levene's test (Carrol & Schneider, 1985). Since equal variances were determined a Tukey *post hoc* test was computed. Tukey *post hoc* test was used for a conservative way to control Type I error (Field, 2001). According to Urdan, (2010) the Tukey *post hoc* test produces statistically significance better than some other tests. The Tukey *post hoc* test determines statistical significance between one dependent and various levels of an independent variable. The independent variables were age and type of cattle operation.

An independent t-test determines significance between two variables (Ary et al., 2010). An independent t-test was run to determine the significance between producer's frequency of use of selected communication tools and producer's main income. A second

independent t-test was run to determine producer's frequency of use of selected communication tools and producers smartphone ownership. Both the ANOVA and independent t-tests compared the means of each variable.

Effect Size

The simplest method to determine the effect size of an independent t-test is to calculate Cohen's *d* (Cohen, 1977). A Cohen's *d* statistic was calculated using the mean and standard deviation of the two groups. To determine the effect size of an ANOVA, an eta squared (η^2) was calculated by dividing the sum of squares between to the total sum of squares from the ANOVA table. The sum of squares between is a measure of the difference among the group means and is calculated by the variation of each variable mean being tested to the overall grand mean. The grand mean is the total number of all data points divided by the total sample size. The total sum of squares is the squared difference of every data point from the overall mean (Gravetter & Wallanau, 2009).

Response Error

Using data from only those that chose to respond in a survey can introduce error (Miller & Smith, 1983). The material that is collected may not accurately represent the entire population; therefore it is necessary to address non-response error (Miller & Smith, 1983). Non-response error exists when individuals within a sample do not provide usable responses and are different than those who do respond on the characteristics of interest being studied (Linder, Murphy, & Roberts, 2001). Linder et al. (2001) suggested ways to address non-response error. One suggestion was to compare early to late respondents as late respondents are believed to be similar to non-respondents (Linder et al., 2001). Suggestions by Linder et al. (2001) indicated that successive waves should be used to determine the late responses and

were utilized in this study. A wave is indicated by the responses generated by a stimulus (Linder et al., 2011). It is recommended that there be a minimum of 30 responses in a wave (Linder, 2011). Of the 182 useable surveys, 142 (77.2%) of the respondents were classified as early and 42 (22.8%) of the respondents were classified as late respondents.

Early and late respondents were compared on their responses for each construct area, role in cattle operation, type of cattle operation, and main income questions to determine if any statistical significant differences occurred between the two groups. An independent t-test was used to compare the means of the early and late respondents on each construct. No statistically significant differences were found. Table 4 identifies the construct area, mean difference, standard error and the significance level for early and late respondents based on responses in each construct area.

Table 4

Comparison of Early to Late Respondents by Construct Area based on an Independent t-test

Construct	MD	*SE*	*p*
General Usage			
Importance of General usage of Traditional Media	-.123	.087	.159
Importance of General usage of Electronic Media	.114	.123	.355
Importance of General usage of Social Media	.081	.181	.656
Frequency of General usage of Traditional Media	-.123	.087	.159
Frequency of General usage of Electronic Media	.088	.127	.488
Frequency of General usage of Social Media	.168	.167	.318
Beef Industry			
Importance of Traditional Media usage in Beef Industry	-.169	.118	.153
Importance of Electronic Media usage in Beef Industry	-.051	.146	.728
Importance of Social Media usage in Beef Industry	.004	.201	.983
Frequency of Traditional Media usage in Beef Industry	.105	.118	.376
Frequency of Electronic Media usage in Beef Industry	-.070	.147	.631
Frequency of Social Media usage in Beef Industry	.111	.142	.436

Note: $p<.05$

Table 5 identifies the construct area, mean difference, standard error and significance level for each of the variables of interest.

Table 5

Comparison of Early to Late Respondents by Demographics based on an Independent t-test

Variable	MD	*SE*	*p*
Age	-.479	.201	.091
Gender	.011	.072	.879
Role in Cattle Operation	.055	.183	.765
Type of Cattle Operation	-.346	.356	.338
Income	-.139	.090	.129
Smartphone Ownership	-.120	.090	.187

Note:p<.05

No statistically significant differences were shown between early and late respondents based on any of the 12 construct areas, by age, gender, type of operation, and role in cattle operation, income, and smartphone ownership. Since no statistical significant differences were found between early and late respondents based on the results of the independent t-test, one can generalize the results of this study to Iowa cattle producer-members who received the Iowa Cattlemen's Association electronic newsletter (Linder et al., 2001).

Limitations

The present study did face limitations. Although similar trends may be found in comparable populations, the results from this study should not be generalized beyond the population sampled. Additionally, because this study used a web based survey design, a bias may be evident towards respondents who preferred electronic forms of communication. This study is also limited to those respondents who provided responses and only measured the instruments' specific construct areas. It should also be noted that not all producers completely filled out the survey which led to answers being blank resulting in each question having a different number of responses.

References

Ary, D., Jacobs, L. C., & Sorensen, C. (2010). *Introduction to research in education.* (8th ed.). Belmont, CA: Wadsworth.

Carrol, R., & Schneider, H. (1985). A note on levene's test for equality of variances. *Statistics and Probability Letters 3*, 191-194. Retrieved from http://ac.els-cdn.com/0167715285900161/1-s2.0-0167715285900161-main.pdf?_tid=33b42636-8772-11e3-8632-00000aab0f02&acdnat=1390841211_33f48b5ff9435be7caa7c4020ccb169

Diekman, F., & Batte, M., (2009). Examining information search strategies of Ohio farmers. *Journal of Extension, (47)*6.

Dillman, D.A., Smyth, J.D., & Christian, L.M. (2009). *Implementation procedures in internet, mail, and mixed mode surveys: The tailored design method* (4th ed.), pp. 234-299. Hoboken, NJ: John Wiley and Sons, Inc.

Gravetter, F., & Wallnau, L. (2009). *Statistics for the behavioral sciences.* Belmont, California: Wadsworth.

Langer, G. (2003, May/June). About response rates: Some unresolved questions. *Public Perspective*, 16-18. Retrieved from http://www.aapor.org/Content/NavigationMenu/PollampSurveyFAQs/DoResponseRatesMatteR/Response_Rates_-_Langer.pdf

Lee, C., Sung T., Kim, H., & Jeon, C. (2012). Classification of forensic soil evidences by application of THM-PyGCMS and multivariate analysis. *Journal of Analytical and Applied Pyrolysis, 96*, 33-42. doi:10.1016/j.aap.2021.02.017.

Lindner, J., Murphy, T., & Briers, G. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, *42*(4), 43–53.

Miller, G., & Carr, A. (1997). Information and training needs of agricultural faculty related to distance education. *Journal of Applied Communications,81*(1), 1-9. Retrieved from http://journalofappliedcommunications.org

Tourangeau, R., Rips, L. J., & Rasinski, K. A. (2000). *The psychology of survey response*. Cambridge, U.K.: Cambridge University Press.

National Career and Technical Education, (2006). Purpose and Audience Analysis. Retrieved from http://www.readwritethink.org/files/resources/lesson_images/lesson948/purpose-audience.pdf

Rea, L. M., & Parker, R. A. (2012). *Designing and conducting survey research: A comprehensive guide*. John Wiley & Sons.

Urdan, T. (2010) *Statistics in plain English.* (3rd ed.) Routledge: New York.

CHAPTER IV. PERCEPTIONS OF COMMUNICATION TOOLS AS DEFINED BY IOWA CATTLE PRODUCERS

Paper to be submitted to the *Journal of Applied Communications*
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Abstract

Communication is an important aspect of agriculture as "United States farmers are insatiable consumers of information" (Boehle & King, 1998, p. 21). The value of communication cannot be overemphasized as it contributes to the progression of many farmers' information needs (Riesenberg & Gor, 1989). Farmers, have the ability to access numerous communication tools. These communication tools can include face-to-face, print media, and electronic media (Boone, Meseinbach, & Tucker, 2000). Since cattle producers have access to numerous communication tools it is important to understand their perceptions regarding the importance of these communication tools as it will help assist the beef industry in communicating with producers. This study identified the perceived levels of importance of selected communication tools by members of the Iowa Cattlemen's Association who received the association's electronic newsletter. Findings indicated that traditional media and electronic media were important communication channels for producers. Mean differences for producers with smartphones were statistically significantly higher than producers without smartphones. Producers with smartphones felt that electronic and social media were more important than those producers without smartphones. Further research is needed to determine why producers felt traditional and print media communication channels were important.

Keywords: cattle producer, perceptions, traditional media, electronic media, social media, communication tool

Introduction

Communication is defined by Rogers (2003) as a process in which people, create, share, and exchange information in order to reach a mutual understanding. Boehle & King, (1998) indicated that "United States farmers are insatiable consumers of information" as communication is an important aspect of agriculture. The dissemination of information has contributed "immensely to the stagnation or progressiveness of many farm operations" (Riesenberg & Gor, 1989, p. 7); therefore the value of communication should not be overemphasized. Among farm operations, a cattle production enterprise is one such operation where producers utilize a number of communication channels. These communication channels include face- to- face, print media, and electronic media (Boone, Meseinbach, & Tucker, 2000).

The sharing of information between senders and receivers by using speech is described as face-to-face communication and remains the most powerful human interaction (Begley, 2004). Print media includes publications such as, brochures, flyers, and magazines. Print media can be disseminated freely or via subscription and often targets specific groups of farmers which allow companies to more effectively advertise their products (Boone et al., 2000). Print media can be classified into two categories depending on the frequency of the publication (Kipphan, 2001). These two categories include commercial printing and periodicals. Commercial printing is print media that is produced occasionally such as brochures, leaflets, and catalogs. Printed material that appears more frequently is defined as periodicals and includes newspapers, journals, and magazines (Kipphan, 2001). Print media attracts consumers when the information within the print source is relevant to the life of the consumer (Farooq, Muhammed, Chaudary, & Ashraf, 2007). Furthermore, print media can

encourage the adoption of technology by providing benefits of a specific technology (Farooq et al., 2007).

The Internet and other technologies used to access information are examples of popular forms of electronic media (Boone et al., 2000). Basu and Banerjee, (2011) believed that Internet technology can strengthen research and increase the user's linkage to more information. Increasing the usage of the Internet is important as it can build customer relationships (Heldal, Sjovold, & Heldal, 2004). The Internet has allowed users to create and share informational content without having to rely on traditional forms of communication (Seo & Thorson, 2012). Kim and Haridakis (2009) studied the role of Internet for interacting and indicated that, not only does the Internet provide new ways of communicating but also provides a constant flow of information. This allows users to have a variety of information provided to them (Nasi & Rasanen, 2013). Morris and Ogan (1996) indicated that the Internet is nearly impossible to ignore. People without access to electronic forms of communication channels are still aware of the benefits electronic forms of communication provide such as creating and exchanging user content.

Internet based applications that are built from Web 2.0 technologies and allow users to create and exchange content are known as social media (Vaast, & Kaganer, 2013). This personalized form of mass media, has grown vastly among producers in the agricultural industry (Hoffman, 2009). The impact of social media tools is evident as numerous corporations utilize the Internet for communication purposes; however, users of new media change (Baym, 2010). The users of new media can depend on a persons, employment, time, and age (Iddings & Apps, 1990; Smith, Paul, Goe, & Kenney, 2004). One user of new media is farmers. Iddings & Apps (1990) suggested that learning new media for a farmer is

challenging as “cows must be milked, the fields cultivated, rations mixed, and hay put up” (para 8). The time required to learn from a computer is substantial (Iddings & Apps, 1990). Smith et al. (2004) indicated that users who worked off-farm had a greater tendency to utilize the Internet. Age is another demographic upon which Internet usage can depend. Smith et al., (2004) indicated that a person’s age had a negative effect on computer usage. The older the person the less likely they were to use a computer. Baym (2010) indicated that the complexity, understanding, and awareness of the technology are all related to the use of communication tools.

Research by Pearce and Rice (2013) on the digital divide indicated that the Internet and social media can have positive impacts for those fortunate enough to have access to it. However, unfortunately, a gap still exists between those that have access to electronic communications and those that do not. This gap is termed the digital divide (Cullen, 2001). Donnermeyer and Hollifield, (2003) indicated a gap in broadband Internet connection among rural and suburban populations existed. A person’s demographic differences and skills represent barriers to Internet usage, and may increase or decrease the digital divide that exists between populations. Donnermeyer and Hollifield (2003) indicated that the rural and urban divide will decrease but be “replaced by other technologies still in the developmental phase” (p.113). Field et al., (2006), suggested that opportunities “must exist for clientele, when, where, how and in what form is most expeditious for them” (p. 17). A farmer is one person that uses communication technologies that are most expeditious for them (Park & Mishra, 2003).

Communication tool preferences for farmers have been examined by numerous researchers (Gillespie, 2011; Smith, Paul, Goe, & Kenney, 2004; Vergot, Isreal, & Mayo,

2005). A recent study by Gillespie (2011) targeted beef producers who belonged to the Drover's Cattle Network. Participants in that study owned at least 100 cows, 100 stockers, or fed 500 plus cattle. It was concluded that beef producers preferred print publications and the Internet while social media was the least preferred method of communication. Gillespie (2011) found that the size of the operation did not matter. However, this is contradictory to the research of Vergot III, Israel, & Mayo (2005).

Vergot III, Israel, & Mayo (2005) surveyed beef producers in 12 counties in the Northwest Florida Extension District regarding their preferred method of receiving industry-related information. Preferences varied from producer to producer in each district depending on district and size of the operation, but print media was still the preferred communication channel. With this finding, Vergot et al. (2005) suggested using multiple channels of communication when communicating to producers.

Since farmers have access to numerous sources of information, it is imperative to understand their perceptions regarding the importance of these communication tools as it will help to identify where a digital divide exists. Identifying the digital divide will help to determine how to manage gaps and assist the beef industry in communicating with the Iowa cattle producers who received the Iowa cattlemen's association electronic newsletter. If the goal of technology is to satisfy the information needs of the consumer, the technology needs to be flexible in order to adapt to the producer's lifestyle (Field et al., 2006). Nasi and Rasanen (2013) stated, "although the Internet provides an easy access to information, one should not make the assumption that it automatically replaces the old media" (p. 77). Additionally, Field et al., (2006) posited, "it is reasonable to assume that future beef producers will desire to move beyond the limits of their communities of place and profession

to engage in a variety of virtual tools and applications" (p.10). Is it then reasonable to assume that all beef producers are identical in their perceived importance of communication tool usage?

Theoretical Framework

The theoretical framework for this study was Rogers (2003) Diffusion of Innovations. The Diffusion of Innovations theory explains the how, why, and at what rate new innovations spread through social systems (Rogers, 2003). The Diffusion of Innovations theory "presumes that an idea, practice or object has a perceived channel, time, and mode of being adopted by individual organizations" (Mwombe, Mugivane, Adolwa, Nderitu, 2014, p. 249). Diffusion of Innovations is comprised of three different aspects which aid in the acceptance of a new idea. These three aspects include the innovation decision process, the rate of adoption, and adopter categories.

The innovation decision process is the process in which individual's progress through a series of phases regarding a new idea. The steps of the innovation decision process include knowledge, persuasion, decision, implementation, innovation and confirmation (Rogers, 2003). When an individual is exposed to a new communication tool, knowledge about the innovation is gained (Oldenburg & Glanz, 2008). People can play a passive role when exposed to the awareness or knowledge stage of an innovation (Rogers, 2003). In the persuasion stage, an individual seeks out information about the new idea and then decides to form an attitude about the innovation. The decision stage is where individuals engage in activities that will ultimately lead them to adopt or reject the innovation (Wilson, & Dowlatabadi, 2007). When producers find a communication channel important, they may decide to use it. The implementation stage occurs when the individuals put the innovation to

use. As producers use the innovation they decide if it is important to them and if the innovation aligns with their values (Rogers, 2003). In the confirmation stage individuals seek reinforcement of their perception of the innovation and confirm its use in their life (Wilson, & Dowlatabadi, 2007).

Producers adopt innovations at different times; this is defined as the rate of adoption (Rogers, 2003). Producers' rate of adoption and their perceived importance of the innovation are not necessarily the same. A producer's readiness to adopt an innovation depends on the interest, evaluation, and trial (Mwombe et al., 2014). The rate of adoption is described using five attributes which include relative advantage, compatibility, complexity, trialability, and observability. Roberts, Hall, Gill, Shinn, and Jaure (2009) indicated that much research has dealt with an innovations relative advantage and compatibility as these are important in the adoption process.

When an innovation is better than other innovations experienced before it, the innovation has a relative advantage (Wilson & Dowlatabadi, 2007). If producers see that print media has a relative advantage over electronic media they will more than likely find print media to be important. An innovation needs to be compatible with the adopter. Compatibility refers to how the innovation aligns with a person's values, beliefs, or needs (Rogers, 2003; Wilson & Dowlatabadi, 2007). Producers may find that a specific communication tool is not compatible to their life; therefore it might not be important to them.

Complexity refers to the difficulty incurred when learning to use an innovation (Rogers, 2003). If an effort is required to adopt the innovation the innovation may not be adopted as quickly as other innovations (Wilson & Dowlatabadi, 2007). If producers find the

innovation or communication channel hard to use, they may not adopt it and therefore may not find it to be important. Trialability, is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). If producers are able to test out the innovation before fully adopting the innovation it will have an impact on the innovations adoption rate (Wilson & Dowlatabadi, 2007). When producers test out the innovation they will be able to see if it is important to their needs. As producers use innovations, they may find that the results of the innovation are visible; this is termed observability (Wilson & Dowlatabadi, 2014). Producers may see how important communication tools are to others which may cause them to adopt that specific communication tool. Understanding the rate of adoption will help to identify how quickly producers evaluate communication tools in order to see their importance.

Determining why and how quickly producers adopt communication tools will help to identify which adopter category they belong (Oldenburg & Glanz, 2008). Rogers (2003) defined the adopter categories as innovators, early adopters, early majority, late majority, and laggards. Innovators are the first adopters of an innovation as they may also be the inventor of an innovation (Rogers, 2003). After innovators have invented or adopted an innovation, then the early adopters accept the innovation. Early adopters are characterized as locals of the community and are respected within a given social system. Early adopters are identified as having shared characteristics such as profession, industry and location (Madden, Savage, & Coble-Neal, 2000). The early majority must anticipate a high level of good from the innovation, even if it has limited use (Madden et al., 2000). Rogers (2003) indicated that the early majority "may deliberate for some time before completely adopting a new idea" (p. 284). The next adopter category, the late majority, is characterized as skeptical, but still tend

to pursue new innovations. The last adopters of an innovation are the laggards (Rogers, 2003). The laggards are characterized as isolates and their decisions are based upon what has been previously done in the past (Rogers, 2003).

Purpose and Objectives

Since cattle producers have access to various forms of communication sources it is important to understand their perceptions of communication tools. The purpose of this study was to determine the perceived level of importance of selected communication tools used in personal and beef industry communication by members of the Iowa Cattlemen's Association who received the electronic newsletter. This study aligns with the American Association for Agricultural Education Research Priority Areas, Priority 6: Vibrant, Resilient Communities, specifically, objective four which stated the importance to "determine the effects of technology use and interpersonal and mass communication methods on community dynamics and citizen engagement" (Doerfert, 2011, p. 10). This research will further draw into consideration how industry representatives can communicate better with beef producers. With this purpose in mind, the following research objectives were developed:

1.) Identify demographics of the members of the Iowa Cattlemen's Association who received the associations electronic newsletter, specifically, gender, age, education, number of cattle in operation, role in cattle operation, type of cattle operation, and ownership of technology.
2.) Determine participants level of perceived importance of selected communication tools.
3.) Identify differences between the perceived level of importance of selected communication tools used for general (non-industry related) and beef industry

purposes by selected respondents demographics; specifically, age, role in cattle operation, main income, and smartphone ownership.

Methods

This study used descriptive survey methodology to determine Iowa cattle producers perceptions of selected communication tools. The population of this study consisted of cattle producers who were members of the Iowa Cattlemen's Association (N = 3021) and received the Iowa Cattlemen's Association electronic newsletter. A random sample was generated using recommendations of Ary, Jacob and Sorenson (2010). Given the population (N = 3021) a random sample of n=341 was needed in order to achieve a 95 percent confidence level with a sampling error of +/- 5 percent. This study used an oversized sample (n = 974) in attempt to obtain a thirty five percent response rate. The sample size (n = 974) was computed by dividing the needed sample (n = 341) by the expected 35 percent response rate which was similar to studies of similar populations (Diekmann & Batte, 2009; Maddox, Mustian, & Jenkins, 2003). Researchers expected a low response rate as similar studies with common populations have indicated low response rates (Ascough II, Hoag, Frasier, & McMaster; Gillespie, 2011; Weigel, & Barlass, 2003).

The target population was selected as the Iowa Cattlemen's Association was interested in the producer-members perceived importance and use of communication tools. The electronic instrument was distributed to producers using Qualtrics®. Qualtrics® is an online database where researchers can generate surveys (Benton, Pappas, & Pappas, 2011). The electronic questionnaire was distributed using the Tailored Design Method (Dillman, Smyth, & Christian, 2009) and consisted of six constructs regarding producers' perceptions of importance. The six constructs consisted of traditional print media, electronic media, and

social media for both personal and beef industry purposes. Within the six constructs contained nine to 12 items that addressed the importance of specific components of traditional print media, electronic media, and social media used for general and beef industry purposes. Respondents were asked to rate their perceived importance of communication tools for general and beef industry communication purposes on a scale from one to four. The summated rating scale included: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. Dillman, Smyth and Christian (2009) stated "the optimal sequence for web surveys has not, we believe, been determined yet" (p. 279). The timing sequence would depend on the design of the survey and the population (Dillman, Smyth & Christian, 2009). Producers were contacted four times as per the recommendation of Dillman, Smyth, and Christian (2009).

Content validity of the instrument was established by a team of six university faculty members with expertise in communications, survey design, the animal science industry, and agricultural education. After reviewing the instrument, panel members suggested areas of editorial improvement to the primary researcher. Revisions were made and the panel found the survey valid for this research. Following the suggestions of Dillman, Smyth, and Christian, (2009) the initial electronic version of the instrument was pretested through a pilot study to test for reliability. The pilot study population consisted of 39 members of the Nebraska Cattlemen board of directors. This population was selected because of its similarity to the target population. In completion of the pilot study, internal consistency of the instrument was determined using Cronbach's Alpha. Cronbach's alpha measures the internal consistency of a scale or test (Tavakol & Dennick 2011). An alpha score of <.5 is unacceptable, >.5 is poor, >.6 is questionable, >.7 is acceptable, >.8 is good and >.9 is

excellent (George & Malloy, 2003). The internal consistency of each construct for this pilot study was >.8 or higher and was deemed acceptable for this research. Upon completion of the present study, Cronbach's Alpha was determined again, and each construct area rated higher than the pilot results (>.8) and was determined good or excellent for this research.

Non-response error was addressed following the suggestions of Linder, Murphy and Roberts (2001). Linder, et al. (2001) recommended comparing early to late respondents, as late respondents are often similar to non-respondents. Successive waves of respondents were used to determine late responses as recommended by Linder et al. (2001). The response generated by a stimulus is referred to as a wave and it is recommended that there be a minimum of 30 responses (Linder et al., 2001). Comparisons of early to late respondents on age, gender, role in cattle operation, type of cattle operation, main income, and smartphone ownership were determined using an independent t-test. No statistical significance was found between the early and late respondents on the primary variables of interest. Therefore one can generalize these results to Iowa Cattle Producers who received the Iowa Cattlemen's association electronic newsletter (Linder et al., 2001).

Of the 974 participants, 214 surveys were returned. Thirty-two questionnaires were incomplete leaving 182 useable surveys for a response rate of 18.6 percent. The response rate was suitable for this study even if it was determined low. Langer (2003) indicated that "recent published research has shown no substantial effect of lower response rates from measurements of opinion" (p. 17). Miller and Carr (1997) stated that even with low response rates, those that responded were the actual target audience and therefore their responses are considered valuable and more accurate than non-responses. Additionally, higher response rates do not automatically indicate stronger data (Langer, 2003). Dillman

(2007) indicated that response rates may increase when using a mixed method to reach audiences that have low computer usage rates. The response rate of this research may have increased if researchers would have used a mixed mode design to reach the target audience.

Data were analyzed using PASW Statistics 18, a software package used for statistical analysis. The statistics analyzed for the objectives of this study included frequencies and percentages. Construct means, standard deviations, ANOVA, and independent samples t-tests were also utilized. Frequencies, means, and standard deviations were used to describe perceptions of Iowa Cattle producers regarding the importance of selected communication tools. An ANOVA and independent t-tests were run to compare means of each variable. If a significant difference in means was determined with ANOVA, *post hoc* testing was used to determine significant differences in the means of the demographic groups. A Levene's test was used to determine which *post hoc* test to perform. A Levene's test determines the equality in variances (Carrol & Schneider, 1985). The Levene's test showed unequal variances in both age and role in cattle operation. Since there were variances in the mean scores of specific variables, the Tamhane T2 *post hoc* test was computed. Tamhane T2 test was also utilized for a conservative way to control for Type I error (Field, 2001). Tamhanes's T2 test is a "reliable pairwise comparison based on a t-test" (Lee, Sung, Kim, & Jeon, 2012, p. 37).

The simplest method to determine the effect size of an independent t-test is to calculate Cohen's *d* (Cohen, 1977). A Cohen's *d* was calculated using the mean and standard deviation of the two groups. To determine the effect size of an ANOVA an eta squared (η^2) was calculated by dividing the sum of squares between to the total sum of squares from the ANOVA table. The sum of squares between is a measure of the difference among the

group means and is calculated by the mean of each variable being tested to the overall grand mean. The grand mean is the total number of all data points divided by the total sample size. The total sum of squares is the squared difference of every data point from the overall mean (Gravetter & Wallanau, 2009). Age level, role in cattle operation, income, and smartphone ownership and were selected to test as they determined to be statistically significant within some specific variable.

Limitations

Based on the design of this study, limitations were evident. The results of this study should not be generalized beyond the population sampled. In using electronic mail for this web-based survey this study may be biased towards respondents who preferred electronic forms of communication. This study was limited to data submitted by respondents and only measured the specific construct areas within the survey. It should also be noted that not all producers completely filled out the survey as some answers were left blank; this led to questions not all having the same number of responses.

Results

Objective one described the demographics of the Iowa cattle producers who received the Iowa Cattlemen's Association electronic newsletter. Of the 182 producers who participated in this survey 73.1 percent were male (*n* =133) 17.6 percent were female (*n* =32), and 9.3 percent (*n* =17) chose not to disclose their gender. Respondents ranged in age from 19 to 82 with a mean age of 50.31 years (SD = 14.22). Most of the respondents were in the 50-64 year (n = 48, 41%) age range. The participants of this study were mainly owners/operators (*n* =142, 86.6%) of their farms. A majority of farmers reported having only one type of operation (*n* =128, 70.3%), 19.8% (*n* =36) reported multiple types of operations,

and 9.9% (*n* =18) producers chose not to report. Producers with more than one type of operation were mostly cow/calf and feedlot producers (*n* =13, 7.1%). Various combinations were also reported that consisted of cow/calf, feedlot, show cattle, seedstock, and stocker/backgrounder operations.

For many producers' their main income was from their operation, 58.8% (*n* =107) while 30.2% (*n* =55) of producers had an income source outside their operation. Twenty respondents (11.0%) chose not to respond to this item. Producers were also asked about technology they used. Over one-half of the producers (*n* = 92, 50.5%) indicated that they owned a smartphone and 11.5% (*n* = 21) chose not to report. Of the producers who owned a smartphone, few of them (*n* =15, 8.2%) used it to fill out the survey instrument, whereas nearly three-fourths of the producers (*n* =136) used a laptop/desktop computer, and only 6.6% (*n* =11) used a tablet. Of the 182 producers who completed this survey, 11.0% (*n* =20) chose not to report the type of technology used. Table 1 summarizes demographics for the Iowa cattle producers who received the Iowa Cattlemen's Association electronic newsletter.

Table 1

Demographics of Iowa Cattle Producer-Members who Received the Iowa Cattlemen's Association Electronic Newsletter

	f	%	Range	*M*	Mode	*SD*
Gender (n=165)						
Male	133	73.1				
Female	32	17.6				
Age (n=117)			19-82	50.31	37	14.22
18-35	21	18.0				
36-49	27	23.0				
50-64	48	41.0				
65 +	21	18.0				
Education Level (n=166)						
High School or Less	30	18.0				
Associates Degree	24	14.5				
Bachelor's Degree	65	39.2				
Master's Degree	11	6.6				

Table 1 (continued)

	f	%	Range	*M*	Mode	*SD*
Doctoral Degree	3	1.8				
Certificate or Formal Education	33	19.9				
Size of Operation (n=139)						
<100	64	46.0				
101-249	26	18.7				
250-499	18	13.0				
500-999	11	8.0				
1000+	20	14.3				
Role in Cattle Operation (n=164)						
Owner/Operator	142	86.6				
Owner/Non Operator	6	3.7				
Herd Manager	4	2.4				
Farmhand	2	1.2				
Other	10	6.1				
Type of Operation (n=127)						
Cow/Calf	69	54.3				
Feedlot	22	17.3				
Show Cattle	6	4.7				
Seedstock	21	16.5				
Stocker/Backgrounder	3	2.4				
Other	6	4.7				

Note: Percentages may not add up to 100 due to rounding. Size of operation categories adapted from "U.S beef producer's current use and perceptions of social media as a communications tool" by J. Gillespie, 2011, (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf. Age range categories adapted from "Beginning Farmers and Ranchers at a Glance" by United States Department of Agricultural Economic Research Service, 2013, Retrieved from http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/988138/eb-22.pdf

Objective two determined the perceived level of importance of selected communication tools. Traditional media included magazines, journals, brochures and newsletters. Electronic media included websites, electronic newsletters, text messaging, and email. Social media included Facebook, Twitter, and other social media platforms such as LinkIn, Youtube, Pinterest, and Flickr. The Iowa Cattlemen's Association members perceived electronic media as moderately important to obtain general information (M=3.18, SD = 0.66). Social media to obtain general (M =1.98, SD =.96) and beef industry information (M =1.99, SD =1.02) was very unimportant to the Iowa cattle producers who

received the Iowa Cattlemen's Association electronic newsletter. However social media indicated the largest variance in responses to obtain general and beef industry information. For obtaining beef industry information the Iowa cattle producers who received the Iowa Cattlemen's Association electronic newsletter felt that both traditional print media (M = 3.00, SD = 0.64) and electronic media (M =3.06, SD = 0.75) were moderately important. The construct mean score, standard deviation, and number of items in each construct are indicated in Table 2.

Table 2

Mean and Standard Deviation Scores for the Importance of Communication Tools by Construct as perceived by Iowa Cattle Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.18	0.67
Importance TM to Obtain General Information	9	2.90	0.66
Importance of SM to Obtain General Information	9	1.98	0.96
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.06	0.75
Importance of TM to Obtain Beef Industry Information	9	3.00	0.64
Importance of SM to Obtain Beef Industry Information	9	1.99	1.02

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert type scale was used: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important.

Objective three sought to determine differences between participants' perceived level of importance of selected communication tools in obtaining general and beef industry information by selected demographics. The ANOVA test was conducted to compare the effect of producer's age on each construct. There was a significant effect on producers' age and their usage of electronic media to obtain general information at the $p<.05$ level [$F(3,107) = 2.90$, $p = .038$]. Table 3 identifies the sum of squares, degrees of freedom, mean square, F statistic, and significance for each construct.

Table 3

One-way ANOVA to Determine Equality of Means Regarding the Perceived Importance of Communication Tools by Age Group

Construct	*SS*	*df*	*MS*	*F*	*p*
TMGI	0.811	3	0.270	0.535	.659
	55.615	*110*	*0.506*		
TMBI	1.310	3	0.437	1.070	.365
	44.047	*108*	*0.408*		
EMGI	3.416	3	1.139	2.903	.038*
	41.969	*107*	*0.392*		
EMBI	2.824	3	0.941	1.888	.137
	48.355	*97*	*0.499*		
SMGI	4.718	3	1.573	1.728	.166
	90.985	*100*	*0.910*		
SMBI	0.887	3	0.296	0.274	.844
	107.901	*100*	*1.079*		

Note: Between groups= xxx, within groups= *xxx*. *$p<.05$. TMGI= traditional media to obtain general information; TMBI=traditional media to obtain beef industry information; EMGI=electronic media to obtain general information; EMBI=electronic media to obtain beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain beef industry information.

The Tamhane T2 *post hoc* test was calculated to determine significant differences between specific age groups. The Tamhane T2 *post hoc* test indicated that the mean scores of producers aged 18-35 (M = 3.488, SD = .374) were statistically different from respondents aged 50-64 (M = 3.063, SD = .670) in their rating of the perceived importance of electronic media to obtain general information. Producers aged 18-35 rated their importance of electronic media to obtain general information higher than producers aged 50-64 as indicated by a positive mean difference (MD = .445). To interpret the effect size of an eta squared (η^2) Cohen (1988) indicated that (.01) is a small effect, (.05) is a medium effect, and (.13) is a large effect. The size of the relationship between electronic media to obtain general

information for producers aged 18-35 and producers aged 50-64 indicated a medium effect size (η^2 = .075) (Cohen, 1988). Table 4 identifies the mean difference, standard error, significance, and the lower and upper bound values of producers ages 18-35 as compared with producers age 50-64.

Table 4

Tamhane Post hoc test to determine equality of means by age 18-35 and 50-64

Construct	MD	*SE*	*p*	η^2	Lower Bound	Upper Bound
EMGI	.445	.129	.006	.075	.094	.796

Note: $p<.05$. EMGI=electronic media to obtain for general information

The ANOVA indicated a significant effect between producers' role in their operation for the importance of electronic media to obtain beef industry information [$F(4, 141) = 2.92$, $p = .023$]. Table 5 identifies the standard error, degrees of freedom, mean difference, *F* statistic and significance by role in cattle operation.

Table 5

One-way ANOVA to Determine Equality of Means Regarding the Perceived Importance of Communication Tools by Role in Cattle Operation

Construct	*SS*	*df*	*MS*	F	*p*
TMGI	4.277	4	1.069	2.415	.051
	69.069	*156*	*.443*		
TMBI	2.295	4	.574	1.514	.201
	57.992	*153*	*.379*		
EMGI	3.383	4	.846	1.881	.117
	67.901	*151*	*.450*		
EMBI	6.514	4	1.628	2.926	.023*
	78.475	*141*	*.557*		
SMGI	1.564	4	.391	.402	.188
	140.165	*144*	*.973*		
SMBI	6.487	4	1.622	1.560	.807
	149.710	*144*	*1.040*		

Table 5 (continued)

Note: Between groups= xxx, within groups= *xxx.* $^{*}p<.05$. TMGI= traditional media to obtain general information; TMBI= traditional media to obtain beef industry information; EMGI=electronic media to obtain beef industry information; EMBI=electronic media to obtain beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain beef industry information.

A Tamhane T2 *post hoc* test indicated that the mean score for the perceived importance of electronic media to obtain beef industry information was statistically different for owners and operators ($M = 2.99$, $SD = .749$) and the role defined as *other* ($M = 3.63$, $SD = .393$). Producers who described themselves as *other* were those that were not owner/operators, owner/non-operators, herd managers, or farmhands. The mean difference between owners and operators and the role of *other* producers was negative. This indicated that producers who identified themselves as the role of *other* rated electronic media to obtain beef industry information higher than owners and operators (MD = -.643). A medium effect size was indicated ($\eta^2 = .076$). Table 6 identifies the mean difference, standard error, significance, lower and upper bound of owners and operators as compared with the other role.

Table 6

Tamhane Post hoc test to Determine Equality of Means by Owners/operators and Other Category

Construct	MD	SE	*p*	η^2	Lower Bound	Upper Bound
EMBI	-.643	.147	.008	.076	-1.140	-.146

Note: $p<.05$ level. EMBI=electronic media to obtain beef industry information.

An independent t-test indicated a statistically significant difference between producers' whose main incomes were from their operation and those producers' whose income was outside of their operation. The mean difference for producers whose main incomes were from their operation and those outside of their operation were statistically

significantly different in their perceived importance of electronic media to obtain beef industry information (p = .029). Producers' with incomes outside of their operation rated electronic media to obtain beef industry information more important than producers' whose income was from their operation (MD = -.290). To evaluate the effect size of this independent t-test Cohen's *d* was calculated. To interpret a Cohen's *d* statistic (0.2) is a small effect, (.05) is a medium effect and (.8) is a large effect (Cohen, 1988). The statistical difference between a producers' source of income for their perceived importance of electronic media to obtain beef industry information indicated a small effect size (d = 0.397). Table 7 identifies the mean difference, standard error, significance, Cohens *d* statistic, and the lower and upper bound for producer's main income.

Table 7

Independent t-test to Determine Mean Differences of Perceived Importance of Communication Tools by Producers Source of Income.

Construct	MD	*SE*	*p*	*d*	Lower Bound	Upper Bound
EMBI	-.290	.131	.029	0.397	-.551	-.030

Note: p<.05 level. EMBI=electronic media to obtain beef industry information.

An independent t-test indicated statistically significant difference between producers who owned smartphones and those that did not. For smartphone owners, the mean difference for the perceived importance of electronic media to obtain general and beef industry information was statistically significantly higher (p = .001). Producers who owned a smartphone rated the importance of electronic media to obtain general information higher than those producers who did not own a smartphone (MD =.459). This same finding was true for smartphone owners regarding electronic media to obtain beef industry information. The effect size for smartphone users and non-users in their use of electronic media to obtain general information indicated a medium effect size (d = .711). The mean difference for the

importance of social media to obtain general and beef industry information was found to be statistically significantly higher (p =.001) among those producers who owned a smartphone and those that did not. Producers who owned a smartphone believed that social media for general usage was slightly more important that those who did not own a smartphone (MD =.531). This same finding was true for smartphone owners regarding social media to obtain beef industry information. The effect size for smartphone users and non-users for social media to obtain general information was found to be medium (d = .573). Table 8 identifies, mean difference, standard error, significance, Cohen's d statistic, and lower and upper bound or smartphone ownership.

Table 8

Independent t-test to Determine Mean Differences Between the Perceived Importance of Communication Tools by Smartphone Ownership

Construct	MD	*SE*	*p*	*d*	Lower Bound	Upper Bound
EMGI	.459	.109	.001*	.711	.242	.677
EMBI	.475	.127	.001*	.647	.222	.728
SMGI	.531	.152	.001*	.573	.229	.832
SMBI	.579	.160	.001*	.596	.263	.895

Note: *p <.05, EMGI=electronic media to obtain general information; EMBI=electronic media to obtain beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain beef industry information.

Conclusions, Implications, and Recommendations

Several conclusions can be drawn from the findings of this study. First, it can be concluded that the Iowa cattle producer-members who received the Iowa Cattlemen's Association electronic newsletter appeared to be confident in obtaining general information from electronic media sources. This supports the work of Morris and Ogan (1996) who

claimed that the Internet has become a familiar communication channel and is impossible to ignore. Even, when individuals are unable to access communication channels like the Internet they have still heard about its positive effects (Morris & Ogan, 1996). Specifically, producer-members aged 18-35 seemed to be in the confirmation stage of the innovation decision process in obtaining general information from electronic media sources.

Second it can be concluded that respondents whose primary employment was off-farm had a higher tendency to perceive expeditious forms of communication as important. Expeditious communication technologies are important to producers as it allows them to receive information regardless of their location (Park & Mishra, 2003). The perceived importance of expeditious forms of communication could be explained by a producer's job. When a producer engages in off-farm employment, he/she may be required to travel and use various forms of communication such as electronic media. Furthermore, by having a job outside of the cattle industry a producer may be short on time and need quicker access to beef industry information, therefore finding electronic communication tools important. This study supports findings from Smith et al. (2004) who claimed that "off farm employment has a positive effect on the Internet" (p. 491).

A similar trend regarding the importance of electronic media to obtain beef industry information was found among producers who categorized themselves as *other*. Producers who identified themselves as *other* appeared to have a strong interest in electronic media to access beef industry information. These conclusions are also congruent to Vergot III et al. (2005) who indicated that preferences for communication channels varied by producer depending on their demographic characteristics.

As this population perceived electronic media to be important for communication, one must remember that the perceived importance may change overtime depending on the needs of the cattle producer. Vergot III (2005) recommended using multiple forms of communication to reach cattle producers. Therefore, this study has implications for how the Iowa Cattlemen's Association should communicate with its members. As the Iowa Cattlemen's Association distributes information it is important the association reaches their members. It is recommended that the Iowa Cattlemen's Association communicate with their members using both print and electronic forms of communication.

This study also has implications for how beef industry partners should communicate with cattle producers. Beef industry partners should communicate the value of products using electronic and print forms of communication. Since this population of Iowa cattle producers found these communication channels to be important, they would be more likely to view the advertisements. Additionally, if members of the Iowa Cattlemen's' Association who received the electronic newsletter preferred print and electronic forms of communication, all producers should communicate with each other using both print media and electronic forms of communication.

Further research by scholars is needed to determine why producers felt traditional and electronic communication sources were important. Additionally, industry specialists and agricultural communications researchers should identify how middle aged (50-64) producers adapt to newer technologies. As more innovations are adopted, the importance of both electronic media and social media may increase within the agriculture industry. Gillespie (2011) indicated that two factors preventing social media adoption is time and interest. Could it be that Iowa cattle producers who received the Iowa Cattlemen's Association

electronic newsletter are not interested in social media? An additional examination by researchers is needed to determine if the usage of communication tools affect this populations perceived importance of communication tools.

References

Ary, D., Jacobs, L. C., & Sorensen, C. (2010). Introduction *to research in education.* (8th ed.). Belmont, CA: Wadsworth.

Ascough, J., Hoag, D., Frasier, W., & McMaster, G. (1999). Computer use in agriculture: An analysis of great plains producers. *Computers and Electronics in Agriculture, 23*, 189-204. doi: 10.1016/S0168-1699(99)00044-

Basu, T., & Banerjee, S. (2011). Impact of Internet on rural development in India: a case study. *Amity Journal of Media & Communication 2*(1), 12-18. Retrieved from http://eds.b.ebscohost.com/ehost/pdfviewer/pdfviewer

Benton, M. C., Pappas, J., & Pappas, E. (2011). WordPress+ qualtrics: A plugin supporting research and new pedagogy to develop personal sustainability via 360° evaluation. *Proceedings of the Americans Conference on Information Systems.* Detroit, Michigan.

Begley, K. (2004). Face to face communication, making human connections in a technology-driven world. Retrieved from http://www.axzopress.com/downloads/pdf/1560526998pv.pdf

Boone, K., Meisenbach, T., & Tucker, M. (2000). Agricultural communications changes and challenges. (1st ed.) Ames: Iowa State University Press

Boehlje, M. D., & King, D. A. (1998). Extension on the brink - Meeting the private sector challenge in the information marketplace. *Journal of Applied Communications, 82*(3), 21-35. Retrieved from http://escop.ncsu.edu/comattach/3_Extension%20on%20the%20Brink%20-%20Meeting%20the%20Private%20Sector%20Challenge%20In%20the%20Information%20Marketplace.pdf

Carrol, R., & Schneider, H. (1985). A note on levene's test for equality of variances. *Statistics and Probability Letters 3*. 191-194. Retrieved from http://ac.els-cdn.com/0167715285900161/1-s2.0-0167715285900161-main.pdf?_tid=33b42636-8772-11e3-8632-00000aab0f02&acdnat=1390841211_33f48b5ff9435be7caa7c4020ccb169d

Cohen, J. (1977). Statistical *power analysis for the behavioral sciences* (Rev. ed.) New York: Academic Press.

Cohen, J. (1988). Statistical *power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.

Cullen, R. (2001). Addressing the digital divide. *Online Information Review,25*(5), p. 311-320. doi: 10.1108/14684520110410517.

Diekman, F., & Batte, M., (2009). Examining information search strategies of Ohio farmers. *Journal of Extension, (47)*6.

Dillman, D.A., Smyth, J.D., & Christian, L.M. (2009). Implementation *procedures in Internet, mail, and mixed mode surveys: The tailored design method* (4th ed.), pp. 234-299. Hoboken, NJ: John Wiley and Sons, Inc.

Doerfert, D.L. (Ed.) (2011). National *research agenda: American Association for Agricultural Educations research priority areas for 2011-2015.* Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications.

Donnermeyer, J. & Hollifield, C. (2003). Digital divide evidence in four rural towns. *IT & Society, Spring*, 107-117.

Farooq, S, Muhammed, S., Chaudary, K., & Ashraf, I. (2007). The role of print media in the dissemination of agricultural information among farmers. The Journal of Animal and Plant Sciences, (1), 23, 324-329.

Field, T., Gardiner, H., Lemenager, R., & Herring-Suttee. (2006). The future of beef industry information dissemination: a report to the national cattlemen's beef association. Retrieved from http://www.learningace.com/doc//ncba-future-of-beef-industry-field-et-al-2006

George, D., & Mallery, P. (2003). SPSS *for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Boston: Allyn & Bacon.

Gillespie, J.L. (2011). U.S beef producer's current use and perceptions of social media as a communications tool. (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf

Hoffman, A. (2009). Social media bridges consumer producer gap. Retrieved from http:// www.fb.org/index.php?action=newsroom.focus&year=2009& file=fo0720.html

Iddings, R., & Apps, J. (1990). What influences farmers computer use? *Journal of Extension, 28* (1), 1-4. Retrieved from http://www.joe.org/joe/1990spring/a4.php

Kipphan, H. (Ed.). (2001). Handbook *of print media: technologies and production methods*. New York: Springer.

Langer, G. (2003, May/June). About response rates: Some unresolved questions. *Public Perspective*, 16-18. Retrieved from http://www.aapor.org/Content/NavigationMenu/PollampSurveyFAQs/DoResponseRatesMatteR/Response_Rates_-_Langer.pdf

Lee, C., Sung T., Kim, H., & Jeon, C. (2012). Classification of forensic soil evidences by application of THM-PyGCMS and multivariate analysis. *Journal of Analytical and Applied Pyrolysis, 96*, 33-42. doi:10.1016/j.aap.2021.02.017.

Linder, J., Murphy, T., & Briers, G. (2001). Handling Nonresponse in social science research. *Journal of Agricultural Education, 42*(4), 43-53. doi: 10.5032/jae.2001.04043

Madden, G. Savage, S. & Coble-Neal, G. (2000). Internet adoption and use. *Prometheus: Critical Studies in Innovation 18*(2), 160-173.doi: 10.1080/713692061

Maddox, S. J., Mustian R. D., & Jenkins, D. (2003, February*). Agricultural information preferences of North Carolina farmers*. Paper presented to the Southern Association of Agricultural Scientists, Mobile, Alabama.

Mertler C., & Vannatta R., (2002). *Advanced and multivariate statistical methods: Practical application and interpretation* (2nd ed.) Los Angeles: Pyrczak Publishing

Miller, G., & Carr, A. (1997). Information and training needs of agricultural faculty related to distance education. *Journal of Applied Communications, 81*(1), 1-9. Retrieved from http://journalofappliedcommunications.org/

Morris, M., & Ogan, C. (1996). The Internet as mass medium. *Journal of Computer Mediated Communication, 1*(4), 0. doi: 10.1111/j.1083-6101.1996.tb00174.x

Mwombe, S., Mugivane, F., Adolwa, I., & Ndertitu, H. (2014). Evaluation of information and communication technology utilization by small holder banana farmers in Gatanga district, Kenya. *The Journal of Agricultural Education and Extension, 20*(2), 247-261. doi: 10.1080/1389224X.2013.788454.

Nasi, M., & Rasanen, P. (2013).Changing media preferences? Comparing the perceived importance of television newspapers and the Internet in Finland. *Nordicom Review, 34*(2), 77-92. Retrieved from http://www.nordicom.gu.se/common/publ_pdf/391_nasi_rasanen.pdf

Oldenburg B., & Glanz, K. (2008). Diffusion of innovations. In K. Glanz, B. Rimer, K. Viswanath, (Eds.) *Health behavior and health education* (4th ed) (pp. 314-333). San Francisco, California: Jossey-Bass.

Park, T., & Mishra, A. (2003). Internet *usage by farmers. Evidence from a national survey.* Paper presented at the Agricultural & Applied Economics Association annual meeting, Montreal, Canada.

Riesenberg, L., & Gor, C.O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education, 30*(3),7-13. doi: 10.5032/jae.1989.03007

Roberts, T, Hall, J., Gill, E., Shinn, G., & Jaure, P. (2009). Engaging Hispanic students in agricultural education and the FFA: A 3-year case study. *Journal of Agricultural Education, 3*(50), 69-80. doi: 10.5032/jae.2009.03069

Rogers, E.M. (2003). Diffusion *of innovations* (5th ed.). New York: Free Press

Smith, A., Paul, C. J., Goe, R.W., & Kenney, M. (2004). Computer *and Internet use by Great Plains farmers*. Unpublished manuscript, Department of Agricultural and Resource Economics, University of California, Davis, CA.

Tavakol, M., & Dennick, R. (2011). Making sense of cronbachs alpha. *International Journal of Medicine Education, 2,* 53-55. doi: 10.5116/ijme.4dfb.8dfd

United States Department of Agriculture Economic Research Service. (2013). Beginning farmers and ranchers at a glance (Economic Brief Number 22). Retrieved from http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/988138/eb-22.pdf

Vergot P., Isreal G., & Mayo, D. (2005, April). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension, 43*(2).

Weigel, K., & Barlass, K. (2003). Results of a producer survey regarding crossbreeding on US dairy farms. *Journal of Dairy Science, 12*(86), 4148-4154. doi: 10.3168/jds.S0022-0302(03)74029-6

Wilson, C., & Dowlatabadi, H. (2007). Models of decision making and residential energy use. The Annual Review of Environment and Resources, 32, 169-203. doi: 10.1146/annurev.energy.32.053006.141137

CHAPTER V. IOWA CATTLE PRODUCERS' FREQUENCY OF USE OF COMMUNICATION TOOLS FOR PERSONAL AND BEEF INDUSTRY PURPOSES

Paper to be submitted to the *Journal of Applied Communications*
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Abstract

New technologies have profoundly affected the agricultural industry in the twentieth century. Within the agriculture industry numerous forms of communication exist. Forms of communication accessible to cattle producers and industry leaders include face-to-face, print media, and electronic media. With several communication tools available to producers it is imperative to understand their usage of these communication tools. Understanding the usage of communication tools by cattle producers will help beef industry partners, beef breed associations, and the overall beef industry to better communicate with producers. Nonetheless, if electronic forms of communication provide quick access to information, one should not always make the assumption that it will replace print media forms of communication. This study identified the usage of communication tools by producer-members of the Iowa Cattlemen's Association. Findings of this study suggest that print media was used most often by cattle producers age 50-64. Furthermore, producers who owned smartphones accessed electronic forms of communication more frequently than producers who did not own smartphones. In order to reach cattle producers it is imperative that the cattle industry recognize various forms of communication used most often by cattle producers. Further research is needed to determine why producers utilize specific communication tools.

Keywords: communication tool, cattle producer, frequency, electronic media, social media, traditional print media

Introduction

New technologies have profoundly affected the agricultural industry specifically in the twentieth century (Lasley, Padgitt, & Hanson, 2001). The impact of these technologies has been shown to be beneficial to farm operations in obtaining information (Lasley et al., 2001). However, there has been much speculation about the impact newer technologies have on previous forms of communication such as print media (Nasi & Rasanen, 2013). One possible impact of new technology is the decrease in usage of print media for general communication purposes (Nasi & Rasanen, 2013). Nonetheless, communication and the value it holds should not be overemphasized (Riesenberg & Gor, 1989). Agricultural operations have the opportunity to utilize numerous forms of communication channels. Forms of communication that are accessible to agriculture operations include face-to-face, print media, and electronic media (Boone, Meisenbach, & Tucker, 2000).

Face-to-face communication is the "exchanging of information, thoughts, and feelings when the participants are in the same physical space" (Begly, 2004, p. 6). Face-to-face communication is a powerful form of communication. However, other types of communication are important as well. Magazines, journals, newspapers, brochures, and flyers are examples of traditional print media. Gillespie (2011) and Vergot III, Isreal, and Mayo (2005) research indicated that traditional print media tended to be the main source of information for farmers. Electronic media includes Internet and other technologies used to access information (Boone, Meisenbach, & Tucker, 2000). The Internet is among one of the electronic communication channels that farmers can use to quickly access this type of information (Boone, Meisenbach, & Tucker, 2000). Research by Pearce and Rice (2013) on the digital divide indicated that the electronic communication channels can have positive

impacts for those who are fortunate to have access to them. The gap that exists between producers who have access to electronic communication tools and those that do not is termed digital divide.

Research by Donnermeyer and Hollifield (2003) on the digital divide indicated that the rural population lagged behind the urban population in the adoption of Internet. They also identified several barriers that could explain the digital divide. Some of the barriers to technology adoption include lack of understanding and the complexity of newer technologies (Donnermeyer & Hollifield, 2003). Another barrier to technology adoption is time (Iddings & Apps, 1990). Time is a valuable resource and is essential for those in rural populations when learning how to use new technologies. As rural populations gain access to technologies, they are able to obtain information that is "essential for empowering rural communities" (Basu and Banerjee, 2011, p.12). Even with a lag in Internet usage, research has indicated that producers in rural populations utilize other communication channels (Gillespie, 2011; Vergot, Isreal, & Mayo, 2005).

Gillespie (2011) identified preferred sources and usage of communication tools by cattle producers who were members of the Drover's cattle network. Producers in the Gillespie (2011) study indicated a preference for print publications and the Internet while social media was the least preferred communication channel. However half of the respondents indicated that they had used social media while the other half indicated a lack of time or knowledge as a barrier to using social media. Gillespie (2011) reported that the size of the operation did not matter for producers' preferred usage of communication tools. This is contradictory to the research of Vergot et al. (2005) who indicated a difference in preferred communication channels by size of operation.

Cattle producers in 12 counties in the Northwest Florida extension district were studied for their usage of communication channels. Results of the study indicated that preferences of the producers varied by county, yet the preferred method of communication were print media. In order to communicate with producers in the 12 counties Vergot et al (2005) suggested using multiple communication channels as well as mass media to target beef producers.

One avenue that mass media has used to connect to consumers is the Internet (Morris & Ogan, 1996). The Internet has become "a core global communications technology for business" (Smith, Paul, Goe, & Kenney, 2004, p. 481). Morris and Ogan (1996) stated that the Internet is impossible to ignore and it has become a familiar communication channel. However, Smith et al. (2004) claimed that a person's age has a negative effect on computer and Internet usage. The older the farmer the less likely they are to use computers. Nevertheless, the Internet has become a tremendous asset to agriculture (Basu, & Banerjee, 2011). The Internet provides new opportunities for producers to conduct business; therefore producers, regardless of age should continue utilizing the Internet (Park & Mishra, 2003). By utilizing the Internet farmers will have the opportunity to make informed decisions about farming practices in their operations (Basu & Banerjee, 2011).

A vastly growing type of Internet mass media used in the agriculture industry is social media (Hoffman, 2009). Social media is an Internet-based application that creates and exchanges user content at the individual level (Kaplan & Haenlein, 2010). Social media has "pervaded many aspects of organizing and [has] generated new ways of connecting with customers collaborating and innovating" (Vaast & Kaganer, 2013, p. 78). Social media has presented opportunities for industries as they can mobilize resources and test out new ideas

with users of social media (Vaast & Kaganer, 2013). The American Farm Bureau Federation found that 92 % of young producers (aged 18-35) used computers, while 46 % of those producers also used a social media platform. According to Hoffman (2009) utilizing social media and working with both critics and consumers can be challenging and uncomfortable. However, if doubters are going to understand the farmers' role in agriculture, the farmer must use social media to tell their story (Hoffman, 2009).

As numerous communication tools have become available to producers it is imperative to understand their usage of the communication tools. Understanding the usage of communication tools will allow the beef industry to better communicate to producers and manage the digital divide that exists between Iowa Cattlemen's Association members. As the Internet may provide easy access to information, one should not make the assumption that it has completely replaced traditional print media (Nasi & Rasaen, 2013). Furthermore, if a variety of tools are available to producers, is it reasonable to assume they will use them (Field, Gardiner, Lemenager, Long, & Suttee, 2006)? Lastly, is it practical for one to assume that Iowa Cattlemen's Association members are similar to other previously studied agricultural producer groups in their usage of communication tools?

Theoretical Framework

Rogers' (2003) theory of Diffusion of Innovations serves as framework for this study. Oldenburg and Glanz (2008) stated that diffusion is a process by which an innovation is communicated over time among members of a social system. The Diffusion of Innovations theory is comprised of three dimensions: rate of adoption, the innovation decision process, and the adopter categories (Rogers, 2003).

Individuals adopt different innovations at different times (Oldenburg & Glanz, 2008). There are five core attributes that determine the characteristics of an innovation (Wejnert, 2002). These five core attributes include, relative advantage, compatibility, complexibility, trialability, and observability (Oldenburg & Glanz, 2008). Rogers (2003) defined relative advantage as "the degree to which an innovation is perceived as being better that the idea it supersedes" (p. 229). If an innovation is perceived to be better than previous innovations, the innovation will be adopted (Oldenburg & Glanz, 2008).

Relative advantage is a strong predictor of an innovation's rate of adoption (Rogers, 2003). If the innovation is compatible to the adopter's norms and beliefs, an innovation may be adopted (Oldenburg & Glanz, 2008). Greenhalgh, Robert, Macfarlane, Bate, and Kyriakidou (2004) indicated that innovations may be adopted more easily if adopters can adapt or change the innovation to suit their own needs. Complexity of an innovation can become a barrier to an invention as well (Rogers, 2003). Innovations that are easier to use are adopted more quickly in the social system (Oldenburg & Glanz, 2008). Innovations in which "intended users can experiment on a limited basis are adopted and assimilated more easily" (Oldenburg & Glanz, 2008, p. 320). If an innovator is able to experiment with the innovation on a limited basis the innovation is said to have trialability (Oldenburg & Glanz, 2008). If benefits from using the innovation are noticeable and easily identifiable, the innovation has observability (Rogers, 2003).

The diffusion of innovations theory has embedded within it the innovation decision process. This is a process where individuals first gain knowledge to assist in forming a decision to eventually adopt or reject an innovation (Rogers, 2003). The innovation decision process consists of five key stages which include knowledge, persuasion, decision,

implementation, and confirmation (Rogers, 2003). Theses stages describe "the types of activities undergone by the individual during the innovation decision process" (Seligman, 2006). When an individual gains knowledge about an innovation's existence she/he is in the knowledge stage of the decision process (Seligman, 2006). Most individuals expose themselves to innovations that fit personal needs and interests (Rogers, 2003).

If the innovation fits an adapter's needs the individual will form an attitude about the innovation–this is called the persuasion stage (Seligman, 2006). According to Seligman (2006), attitudes are formed with influence from the adopter's peers. If the adopter's peers have a favorable attitude toward the innovation, the adopter may also gain a favorable attitude about the innovation (Seligman, 2006). When an individual forms an opinion about the innovation and decides to adopt or reject it, she/he is said to be in the decision stage (Seligman, 2006). When the innovation is adopted, the adopter puts the innovation to use; this is called the implementation stage (Rogers, 2003). The confirmation stage is the final stage in which the adopter "seeks reinforcement of his adoption or rejection decision" (Seligman, 2006, p. 117).

Rogers (2003) defined innovativeness as "the degree to which an individual is relatively earlier in adopting new ideas than other members of the social system" (p. 267). Rogers (2003) categorized adopters based on an individual's innovativeness. Five adopter categories were identified and include: innovators, early adopter, early majority, late majority, and laggards (Rogers, 2003). Innovators are described as venturesome, interested in new ideas, and tend to be the first to adopt an innovation in a given social system (Rogers, 2003). The innovator plays an important role in the adoption process. Early adopters are respected by others in the social system (Rogers, 2003). Early adopters perceive a high level

of value from the innovation even if it has limited use (Madden, Savage, & Coble-Neal, 2000). The third adopter category is the early majority. Described as deliberate (Rogers, 2003), members of the early majority interact frequently with members of the social system and adopt prior to the average individual (Rogers, 2003). Late adopters are known as skeptical as they adopt new ideas just after the average member of the social system (Rogers, 2003). If the innovation follows the social systems norms, the late adopters often feel pressured to adopt the innovation (Rogers, 2003). The final category of adopters is known as the laggards. Laggards are described as traditional and are generally the last in a social system to adopt a new technology. If the laggard is assured that the innovation will not fail, it will be adopted. This tends to take place after everyone else in the social system has adopted. Identifying adopter categories will help to explain the rate at which the technology is adopted by beef producers in this study.

Purpose and Objectives

Lasley et al. (2001) claimed that "throughout the twentieth century there has been a dazzling array of new agricultural technologies" (p. 109). Since there are a variety of communication technologies it is imperative to understand how producers use these technologies. The purpose of this study was to determine the frequency of use of selected communication tools used in respondents' personal and beef industry-related communication. The American Association for Agricultural Education Research Priority Area 6: Vibrant, Resilient Communities aligns with this research. Specifically, objective four states the importance to "determine the effects of technology use and interpersonal and mass communication methods on community dynamics and citizen engagement" (Doerfert, 2011,

p. 10). This study will help to determine beef producer communication preferences. With this purpose in mind, the following objectives were established:

1.) Identify demographics of the members of the Iowa Cattlemen's Association who received the association's electronic newsletter, specifically, gender, age, education, number of cattle in operation, role in cattle operation, type of cattle operation, and ownership of technology.
2.) Determine participants frequency of use of the selected communication tools.
3.) Identify differences between the use of selected communication tools for general (non-industry related) and beef industry purposes by selected respondent's demographics; specifically age, type of cattle operation, source of income, and smartphone ownership.

Methods

A descriptive survey was used in this study to determine Iowa cattle producers frequency of use of selected communication tools. The population of this study consisted of cattle producers (*N*=3021) who were members of the Iowa Cattlemen's Association and received the association's electronic newsletter. The targeted population was selected because the Iowa Cattlemen's Association was interested in their perceived importance and use of communication tools. A random sample of (*n* = 341) was initially selected to achieve a 95 % confidence level with a sampling error of +/- 5 % as recommended by Ary, Jacobs, and Sorenson (2010). A sample of 974 was utilized in order to account for power of the statistical test (Gravetter & Wallnau, 2009). An oversized sample (*n*=974) was also utilized in this study in an effort to acquire a thirty-five percent response rate which was common of

studies of similar populations (Diekmann & Batte, 2009). The sample sized used was computed by dividing the targeted sample size by the desired response rate.

The electronic questionnaire was distributed to producers using Qualtrics®, an online database where researchers can generate surveys (Benton, Pappas, & Pappas, 2011). The questionnaire was distributed through four email contacts as recommended by the Tailored Design Method (Dillman, Smyth, & Christian, 2009). The electronic survey consisted of questions grouped into six constructs regarding the use of traditional print media, electronic media, and social media for both general and beef industry communication purposes. The usage of communication tools for both general and beef industry communication purposes was rated by each respondent on a scale from one to four. The summated rating scale included: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Six university faculty members with expertise in communications, survey design, the animal science industry, and agricultural education served as a panel of experts to establish content validity of the instrument. Suggestions from the panel were used to improve the wording of the survey questions. Once editorial revisions were made the panel determined that the instrument was valid. To test for reliability, following the suggestions of Dillman, Smyth, and Christian (2009), the researchers pretested the instrument through a pilot study. Thirty-nine members of a nearby state cattlemen's association board of directors served as a pilot study. The population for the pilot study was selected due to its resemblance to the target population. Cronbach's alpha was calculated to determine internal consistency of the piloted instrument. An alpha score of >.9 is excellent, >.8 is good, >.7 is acceptable, >.6 is questionable, >.5 is unacceptable (George & Mallory, 2003). Pilot study results indicated an alpha score of (α >.8) or higher for all six constructs and was determined to be good (George

& Mallory, 2003). Cronbach's alpha was also used to test internal consistency of the instrument at the completion of the present study. Each construct's internal consistency rated higher than the pilot tested instrument ($\alpha > .8$) and was also determined to be good (George & Mallory, 2003) for this study.

Linder, Murphy, and Briers (2001) gave specific suggestions as to how to handle non-response error in survey research. A comparison of early and late respondents based on primary demographics was conducted as suggested by Linder et al. (2001). The primary variables of interest in this research included age, gender, role in cattle operation, type of cattle operation, main income, and smartphone ownership. An independent *t*-test was utilized to compare early to late respondents in each of the demographic variables and no significant differences were found therefore determining appropriateness to generalize the results to producers who belong to the Iowa Cattlemen's Association and received the electronic newsletter.

Of the 214 questionnaires returned, 182 were useable resulting in a response rate of 18.6 %. The response rate was determined acceptable for this research even though it was low. With surveys that measure opinion, Langer (2003) indicated that recent research showed no considerable effect by low response rate. According to Miller and Carr (1997) responses from the actual target audience are considered more accurate and valuable than non-responses from a study with a low response rate. The response rate may have increased if researchers would have utilized a mixed mode design. Dillman (2007) indicated that applying a mixed method to reach audiences may be appropriate to increase response rate.

PASW Statistics 18, a statistical software package was used to analyze data from this study. Frequencies and percentages were used to analyze the objectives for this study. Data

also was analyzed to determine construct means, and standard deviations. A one-way analysis of variance (ANOVA) and *t*-tests were used to determine significant differences between group means by selected demographic variables. If the ANOVA revealed a significant difference between means, a *post hoc* test was used to determine significance between the demographic groups. To determine which *post hoc* test was to be utilized a Levene's test was performed. The Levene's test identified equality in variances (Carrol & Schneider, 1985). Equal variances were identified with the age and type of operation variables. Since equal variances were assumed, a Tukey *post hoc* test was computed. A Tukey *post hoc* test is "more likely to produce statistically significance differences than some other tests" (Urdan, 2010, p. 110).

To determine the effect size of an independent *t*-test the Cohen's *d* statistic was calculated (Cohen, 1977; Gravetter & Wallnau, 2009). The mean and standard deviation of the two groups were used to calculate Cohen's *d*. The simplest method to determine the effect size of an ANOVA is to calculate eta squared (η^2) (Gravetter & Wallnau, 2009) which was used in this study. To calculate the eta squared (η^2) researchers used the sum of squares between and the total sum of squares from the ANOVA table. The difference among the two group means is a measure of the sum of squares (Ary et al., 2010). The sum of squares is calculated by the mean of each variable to the overall grand mean. The total number of data points divided by the sample size is the grand mean (Gravetter & Wallnau, 2009).

Based on the design of this study, limitations were present. This study should be generalized only to the population sampled. Additionally, since this was a web- based survey, this study may have been biased towards Iowa cattle producers who preferred electronic forms of communication. It should be noted that not all producers filled out the

survey in its entirety. That led to some answers being blank giving each question a different amount of responses. This study is also limited to the data gathered and to the constructs that make up the survey.

Results

Objective one sought to describe participant demographics. Of the 182 producers who participated in this study, 17.6 % (*n* =32) were female, 73.1 % (*n* = 133) were male, and 9.3 % (*n* = 17) chose not to answer. The age of the respondents ranged from 19 to 82 years old with a mean age of 50.31 years (*SD* = 14.22). The majority of respondents were between the ages of 50 and 64 (*n* = 48, 41%). Most of the producers were owner/operators (*n* =142, 86.6%) and had only one type of operation (*n* = 128, 70.3%). Cattle producers with more than one type of cattle operation were mostly cow/calf and feedlot producers (*n* =13, 7.1%). Other combinations included cow/calf, feedlot, show cattle, seedstock, and stocker/backgrounder operations. A majority of producers cattle operations consisted of less than 100 head (*n* = 64, 46.0%), with few producers reporting 101-249 head (*n* = 26, 18.7%).

A majority of producers received their income from their cattle operation (*n* = 107, 58.8%). Only 18 % (*n* =30) of the producers had not received a degree beyond a high school diploma. Most participants held a bachelor's degree (*n* = 65, 39.2%). Ninety-two producers (50.5%) indicated that they owned a smartphone; although only a small percentage (*n* = 15, 8.2%) utilized it to fill out the survey instrument. The majority of producers (*n* = 136, 74.2%) used a laptop/desktop computer to fill out the electronic survey instrument. A summary of producer demographics is indicated in Table 1.

Table 1

Demographics of Iowa Cattle Producer-Members who Received the Iowa Cattlemen's Association Electronic Newsletter.

	f	%	Range	*M*	Mode	*SD*
Gender (n=165)						
Male	133	73.1				
Female	32	17.6				
Age (n=117)			19-82	50.31	37	14.22
18-35	21	18.0				
36-49	27	23.0				
50-64	48	41.0				
65 +	21	18.0				
Education Level (n=166)						
High School or Less	30	18.0				
Associates Degree	24	14.5				
Bachelor's Degree	65	39.2				
Master's Degree	11	6.6				
Doctoral Degree	3	1.8				
Certificate or Formal Education	33	19.9				
Size of Operation (n=139)						
<100	64	46.0				
101-249	26	18.7				
250-499	18	13.0				
500-999	11	8.0				
1000+	20	14.3				
Role in Cattle Operation (n=164)						
Owner/Operator	142	86.6				
Owner/Non Operator	6	3.7				
Herd Manager	4	2.4				
Farmhand	2	1.2				
Other	10	6.1				
Type of Operation (n=127)						
Cow/Calf	69	54.3				
Feedlot	22	17.3				
Show Cattle	6	4.7				
Seedstock	21	16.5				
Stocker/Backgrounder	3	2.4				
Other	6	4.7				

Note: Percentages may not add up to 100 due to rounding. Size of operation categories adapted from "U.S beef producer's current use and perceptions of social media as a communications tool" by J. Gillespie, 2011, (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf. Age range categories adapted from "Beginning Farmers and Ranchers at a Glance" by United

Table 1 (continued)

States Department of Agricultural Economic Research Service, 2013, Retrieved from http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/988138/eb-22.pdf

Objective two determined participant's frequency of use of selected communication tools. Journals, magazines, newsletters, brochures, and flyers were considered examples of print media. Text messaging, email, websites, and electronic newsletters were considered examples of electronic media. Social media included such platforms as Facebook, Twitter, YouTube, LinkedIn and Pinterest. Electronic media was used occasionally by producers (M = 3.02, SD = .702) for general purposes while social media was rarely used (M = 1.75, SD = .872). Participants indicated that for beef industry purposes traditional media was used to gain information more frequently (M = 2.96, SD = .638) than other communication channels. Table 2 displays the construct mean scores and standard deviations of the usage of selected communication tools by construct.

Table 2

Mean and Standard Deviation Scores for the Frequency of Use of Communication Tools by Construct as Perceived by Iowa Cattle Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.02	0.70
Frequency of Use of TM to Obtain General Information	9	2.98	0.60
Frequency of Use of SM to Obtain General Information	9	1.75	0.87
Beef Industry			
Frequency of Use of TM to Obtain Beef Industry Information	9	2.96	0.63
Frequency of Use of EM to Obtain Beef Industry Information	12	2.85	0.77
Frequency of Use of SM to Obtain Beef Industry Information	9	1.68	0.87

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert type scale was used: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Objective three sought to determine the differences between communication tools used for general and beef industry purposes by selected respondent demographics. The

ANOVA was conducted to compare the effect of producer's age on each construct. There was a significant effect between producers' age and their usage of traditional media to obtain general information at the $p < .05$ level [$F(3,110) = 3.88$, $p = .011$]. Table 3 identifies the sum of squares, degrees of freedom, mean squares, F statistic, and significance for each construct from the ANOVA test.

Table 3

One-way ANOVA to Determine Equality of Means Regarding the Frequency of Usage of Communication Tools by Age Group

Construct	*SS*	*df*	*MS*	*F*	*p*
TMGI	3.747	3	*1.24*	3.88	.011*
	35.365	*110*	*0 .32*		
TMBI	1.594	3	0.53	1.42	.239
	38.706	*104*	*0.37*		
EMGI	3.339	3	1.113	2.33	.078
	50.963	*107*	*0.467*		
EMBI	1.697	3	0.566	0.96	.412
	60.280	*103*	*0.585*		
SMGI	2.810	3	0.937	1.19	.316
	80.744	*103*	*0.784*		
SMBI	2.249	3	0.750	0.97	.408
	76.995	*110*	*0.770*		

Note: Between groups= xxx, within groups= *xxx.* *p <.05. TMGI= traditional media to obtain general information; TMBI= traditional media to obtain beef industry information; EMGI=electronic media to obtain general information; EMBI=electronic media to obtain beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain general information.

To determine differences between specific age groups, a Tukey *post hoc* test was used to determine significance. The Tukey *post hoc* test indicated that the mean score for producers aged 18-35 ($M = 2.71$, $SD = .486$) and respondents aged 50-64 ($M = 3.13$, $SD = .552$) was statistically different in their rating for the use of traditional media to obtain general information. Producers aged 50-64 rated traditional media to obtain general

information higher than producers aged 18-35 as indicated by a negative mean difference (MD = -.422). According to Cohen (1988) for interpreting an eta squared (η^2) statistic, (.01) is a small effect, (.05) is a medium effect, and (.13) is a large effect. The statistical significant difference between producers aged 18-35 and 50-64 had a medium effect size (η^2= .095) (Cohen, 1988). The mean difference, standard error, significance, and lower and upper bound intervals of producers aged 18-35 as compared with producers aged 50-64 are identified in Table 4.

Table 4

Tukey Post hoc test to Determine Equality of Means by age 18-35 and 50-64

Construct	MD	*SE*	*p*	η^2	Lower Bound	Upper Bound
TMGI	-.422	.148	.027	.095	-.809	-.035

Note: TMGI=traditional media to obtain general information. $p < 05$.

Post hoc comparisons using the Tukey HSD indicated that the mean score for producers aged 18-35 (*M* = 2.71, *SD* = .486) and producers aged 65 and up (*M* = 3.23, *SD* = .610) was significantly different in their rating of traditional media to obtain general information. Specifically producers aged 65 and up rated their use of traditional media to obtain general information higher than producers aged 18-35. This difference showed a medium effect size (η^2 = .095). Table 5 identifies the mean difference, standard error, significance, and lower and upper bound intervals of producers aged 18-35 as compared with producers aged 65 and up.

Table 5

Tukey Post hoc test to Determine Equality of Means by age 18-35 and 65 +

Construct	MD	*SE*	*p*	η^2	Lower Bound	Upper Bound
TMGI	-.519	.179	.023	.095	-.988	-.051

Note: TMGI=traditional media to obtain general information. p <.05.

The ANOVA indicated a significant effect on the type of cattle operation and the use of electronic media to obtain general information at the p <.05 level [$F(5,116) = 2.44$, $p = .038$]. The sum of squares, degrees of freedom, mean square, *F* statistic, and significance of the type of cattle operation is indicated in Table 6.

Table 6

One- way ANOVA to Determine Equality of Means Regarding the Frequency of Usage of Communication Tools by Type of Cattle Operation

Construct	*SS*	*df*	*MS*	*F*	*p*
TMGI	0.442	5	*0.088*	0.24	.943
	42.095	*115*	*0.366*		
TMBI	0.157	5	0.031	0.07	.996
	47.373	*113*	*0.419*		
EMGI	5.630	5	1.126	2.44	.038*
	53.526	*116*	*0.461*		
EMBI	5.731	5	1.146	1.86	.105
	69.904	*114*	*0.613*		
SMGI	3.262	5	0.652	0.92	.468
	78.998	*112*	*0.705*		
SMBI	2.347	5	0.469	0.65	.657
	81.460	*114*	*0.715*		

Note: Between groups= xxx, within groups= *xxx*. *p <.05. TMGI= traditional media to obtain general information; TMBI= traditional media to obtain beef industry information; EMGI=electronic media to obtain general information; EMBI=electronic media to obtain beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain general information.

A *post hoc* comparison using the Tukey HSD test indicated that the mean score for cow/calf producers ($M = 3.07$, $SD = .670$) was statistically different than show cattle producers ($M = 2.11$, $SD = .619$). Cow/calf producers rated their use of electronic media to obtain general information higher than show cattle producers (MD = .958) and indicated a medium ($\eta^2 = .095$) effect size (Cohen, 1988). Table 7 identifies the mean difference,

standard error, significance, and lower and upper bound intervals for cow/calf producers and show cattle operators.

Table 7

Tukey Post hoc test to Determine Equality of Means by Cow/calf and Show Cattle Operators

Construct	MD	*SE*	*p*	η^2	Lower Bound	Upper Bound
EMGI	.958	.315	.034	.095	.045	1.87

Note: EMGI=electronic media to obtain general information. $p < .05$.

The mean difference between producers whose main income was from their operation compared with producers whose income was outside of their operation was statistically significant in use of traditional media to obtain general information as indicated by an independent *t*-test ($p = .014$). Producers with an income outside of their operation rated their use of traditional media to obtain general information significantly higher than those producers whose income was primarily from their operation (MD = -.254). The Cohen's (1988) scale indicated the effect was small ($d = .420$). The mean difference, standard error, significance, lower and upper bound intervals for producers main income is specified in Table 8.

Table 8

Independent t-test to Determine Mean Differences of the Usage of Communication Tools by Producers Source of Income

Construct	MD	*SE*	*p*	*d*	Lower Bound	Upper Bound
TMGI	-.254	.102	.014	.420	-.458	-.052

Note: TMGI=traditional media to obtain general information. $p < .05$

An independent *t*-test indicated statistically significance differences between producers who owned smartphones and those who did not. The mean difference for producers who owned smartphones and those who did not own smartphones was statistically significant in electronic media to obtain general and beef industry information ($p = .014$). If producers owned smartphones they used electronic media to obtain general and beef industry

information more than producers who did not own smartphones (MD = .623; MD = .543) respectively. The statistical difference for users of smartphones versus non smartphone users indicated a large effect size (d = .972), while the difference in smartphone users versus nonusers for electronic media use in the beef industry had a medium effect size (d = .725) (Cohen, 1988).

Of the producers who owned smartphones a statistically significant difference was found for usage of social media to obtain general and beef industry information (p = .001). If producers owned smartphones, they used social media to obtain both general (MD = .604) and beef industry (MD = .641) information more than producers who did not own smartphones. A medium effect size (d = .756) for the statistically significant difference between producers who owned smartphones versus those who did not in terms of social media to obtain general information was noted. Additionally, the statistically significant difference between producers who owned a smartphone versus those who did not in terms of social media to obtain beef industry information indicated a large effect size (d = .811) (Cohen, 1988). Table 9 shows the mean difference, standard error, significance, and lower and upper bound of the t-test of smartphone ownership.

Table 9

Independent t-test to determine Mean Differences Between the Usage of Communication Tools by Smartphone Ownership

Construct	MD	*SE*	*P*	*d*	Lower Bound	Upper Bound
EMGP	.623	.107	.001*	.972	.409	.837
EMBI	.543	.126	.001*	.725	.292	.794
SMGP	.604	.127	.001*	.756	.353	.856
SMBI	.641	.125	.001*	.811	.392	.890

Note: Between groups= xxx, within groups= *xxx*. *p <.05. TMGI= traditional media to obtain general information; TMBI= traditional media to obtain beef industry information; EMGI=electronic media to obtain general information; EMBI=electronic media to obtain

Table 9 (continued)

beef industry information; SMGI=social media to obtain general information; SMBI=social media to obtain general information.

Conclusions/Implications/Recommendations

Several conclusions can be drawn from this study. First producer-members seem to have a strong interest in the use of traditional media to obtain beef industry information. This study supports the findings of Gillespie (2011) and Vergot et al. (2005) which indicated farmers preferred print media publications. Specifically, older producers aged 50 and up utilized traditional print media more often than younger aged (18-35) producers. Several barriers could explain this difference such as the lack of understanding, complexity, and lack of awareness of newer technologies (Donnermeyer & Hollifield, 2003). Rogers (2003) Diffusion of Innovations suggested that the rate of adoption also could explain the difference of the use of communication tools by a producer's age. Interestingly over half of the respondents were 50 and older, it could be that older producers found print media to be more convenient, compatible to their lifestyle, and easier to use as compared with other technologies (Rogers, 2003). Producers who found communication technologies complex may not have adopted them as quickly as easier forms of communication (Rogers, 2003). If producers have not adopted complex communication technologies they may be considered late adopters (Rogers, 2003).

It can be concluded that social media to obtain both general and beef industry information did not spark the curiosity of the participants. This conclusion can be explained by the attributes of an innovation. Producers may have found social media too complex to use, and it may not be compatible to their lifestyle (Rogers, 2003). If producers did not find social media compatible to their lifestyle they may not have used it as often as other

communication channels. This research study supports Gillespie (2011) who indicated that social media was the least preferred method of communication for producers in the Drover's Cattle Network. A person's age and time were considered essential for a person's adoption of new media communication channels (Iddings & Apps, 1990; Smith et al., 2005). Smith et al. (2005) indicated that a person's age has a negative effect on computer usage. As a person's age increases, the less likely they are to use a computer. The average age for a producer in this study was 50 and they may not have plugged into social media tools. By not plugging into social media tool, producers may not find social media to be important. Even though participants did not seem to have a very strong interest in social media, the producers who used social and electronic media were likely to own smartphones. Owning a smartphone allows cattle producers to have a mobile access point to utilize social and electronic media. Furthermore smartphones, an electronic form of communication, are an expeditious form of communication (Park & Mishra, 2003). The producer-members who have adopted smartphones may be the early adopters of the society and may have adopted the smartphones before other members of the society (Rogers, 2003).

One must remember that the use of a communication channel may change depending on the needs of the cattle producer. Additionally, the producers who utilized print media in this study may not utilize print media in the future. This research has several implications for how beef industry partners and the Iowa Cattlemen's Association should communicate with beef producers. It is important for beef businesses to reach their audience. The results of this study suggest that beef industry partners should communicate by utilizing traditional print media as a primary strategy. Gillespie (2011) indicated that if producers realize the same information is available online and through social media tools, the use of social media and

electronic communication channels may increase. Therefore, the Iowa Cattlemen's Association and other beef industry organizations should communicate utilizing both electronic and print media forms of communication. If the Iowa Cattlemen's Association uses both electronic and print media, it will help to reach all Iowa Cattlemen's Association members giving them easy access to learn information.

Since social media was the least preferred communication channel, it is recommended that social media platforms be advertised in print media. This will allow beef producers to gain awareness, and form opinions about social media which may increase its usage for both general and beef industry information. It is also recommended that producers utilize smartphones which will give them easy access to information. Tech-savvy producers or other beef industry leaders currently using social media should teach workshops to producers on how to use social media and the benefits it provides. These workshops may increase the use of social media by cattle producers. Beef industry representatives and partners should provide social media tutorials on beef association webpages for those producers who utilize the Internet.

Future research by industry specialists and scholars is needed to determine why producers use electronic media for general usage but use print media for beef industry information. An additional study by researchers regarding social media use by cattle producers is needed. Could it be that Iowa Cattlemen's Association members are not interested in social media or do not have the time to learn how to use it? An examination of the use of smartphones by cattle producers should be warranted. A study on smartphones will discover why producers who own smartphones utilize electronic media and social media more often than producers who do not own smartphones. As communication technologies

are advancing and becoming prevalent in society it will be imperative for future research to examine the impact of these new technologies on producers.

References

Ary, D., Jacobs, L. C., & Sorenson, C. (2010). *Introduction to research in education*. Belmont, CA: Wadsworth, Cengage Learning.

Basu, T., & Banerjee, S. (2011). Impact of Internet on rural development in India: a case study. *Amity Journal of Media & Communication 2*(1), 12-18. Retrieved from http://eds.b.ebscohost.com/ehost/pdfviewer/pdfviewer

Begley, K. (2004). Face to face communication, making human connections in a technology-driven world. Retrieved from http://www.axzopress.com/downloads/pdf/1560526998pv.pdf

Boone, K., Meisenbach, T., & Tucker, M. (2000). Agricultural communications changes and challenges. (1st ed.) Ames: Iowa State University Press

Carrol, R., & Schneider, H. (1985). A note on levene's test for equality of variances. *Statistics and Probability Letters 3*, 191-194. Retrieved from http://ac.els-cdn.com/0167715285900161/1-s2.0-0167715285900161-main.pdf?_tid=33b42636-8772-11e3-8632-00000aab0f02&acdnat=1390841211_33f48b5ff9435be7caa7c4020ccb169d

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (Rev. ed.) New York: Academic Press.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.

Cullen, R. (2001). Addressing the digital divide. *Online Information Review*, *25*(5), 311-320. doi: 10.1108/14684520110410517.

Diekman, F., & Batte, M., (2009). Examining information search strategies of Ohio farmers. *Journal of Extension, 47*(6).

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Implementation procedures in Internet, mail, and mixed mode surveys: The tailored design method* (4th ed., pp. 234-299). Hoboken, NJ: John Wiley and Sons, Inc.

Doerfert, D. L. (Ed.) (2011). *National research agenda: American Association for Agricultural Educations research priority areas for 2011-2015.* Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications.

Donnermeyer, J., & Hollifield, C. (2003, Spring). Digital divide evidence in four rural towns. *IT & Society, 1*(4), 107-117. Retrieved from http://csi.ufs.ac.za/resres/files/Donnermeyer.pdf

Field, T., Gardiner, H., Lemenager, R., Long, B., & Herring-Suttee (2006). The future of beef industry information dissemination: a report to the national cattlemen's beef association. Retrieved from http://www.learningace.com/doc//ncba-future-of-beef-industry-field-et-al-2006

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Boston: Allyn & Bacon.

Gillespie, J. L. (2011). U.S beef producer's current use and perceptions of social media as a communications tool. (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf

Gravetter, F., & Wallnau, L. (2009). *Statistics for the behavioral sciences.* Belmont, California: Wadsworth.

Greenhalgh, T., Robert, G., Macfarlane F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *The Millbank Quarterly (4)*82, 581-629. doi: 0.1111/j.0887-378X.2004.00325.x

Hoffman, A. (2009). Social media bridges consumer producer gap. Retrieved from http:// www.fb.org/index.php?action=newsroom.focus&year=2009& file=fo0720.html

Iddings, R., & Apps, J. (1990). What influences farmers computer use? *Journal of Extension, 28* (1), 1-4. Retrieved from http://www.joe.org/joe/1990spring/a4.php

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons53*, 59 – 68. Retrieved from http://ac.els-cdn.com/S0007681309001232/1-s2.0-S0007681309001232-main.pdf?_tid=aab9e5c4-8d4c-11e3-9855-00000aab0f26&acdnat=1391484797_8eb9718702c454c677d3c03e58c822de

Langer, G. (2003, May/June). About response rates: Some unresolved questions. *Public Perspective*, 16-18. Retrieved from http://www.aapor.org/Content/NavigationMenu/PollampSurveyFAQs/DoResponseRatesMatteR/Response_Rates_-_Langer.pd

Lasley, P., Padgitt, S., & Hanson, M. (2001). Telecommunication technology and its implications for farmers and extension services. *Technology in Society, 23*, 109-120. doi: 10.1016/S0160-791X(00)00039-7

Linder, J., Murphy, T., & Briers, G. (2001). Handling Nonresponse in social science research. *Journal of Agricultural Education, 42*(4), 43-53. doi: 10.5032/jae.2001.04043

Madden, G. Savage, S. & Coble-Neal, G. (2000). Internet adoption and use. *Prometheus: Critical Studies in Innovation, 18*(2), 160-173.doi: 10.1080/713692061

Maddox, S. J., Mustian R. D., & Jenkins, D. (2003, February). *Agricultural information preferences of North Carolina farmers*. Paper presented to the Southern Association of Agricultural Scientists, Mobile, Alabama.

Miller, G., & Carr, A. (1997). Information and training needs of agricultural faculty related to distance education. *Journal of Applied Communications, 81*(1), 1-9. Retrieved from http://journalofappliedcommunications.org/

Morris, M., & Ogan, C. (1996). The Internet as mass medium. *Journal of Computer Mediated Communication, 1*(4), 0. doi: 10.1111/j.1083-6101.1996.tb00174.x

Nasi, M., & Rasanen, P. (2013). Changing media preferences? Comparing the perceived importance of television newspapers and the Internet in Finland. *Nordicom Review, 34*(2), 77-92. Retrieved from http://www.nordicom.gu.se/common/publ_pdf/391_nasi_rasanen.pdf

Oldenburg B., & Glanz, K. (2008). Diffusion of innovations. In K. Glanz, B. Rimer, K. Viswanath, (Eds.) *Health behavior and health education* (4th ed) (pp. 314-333). San Francisco, California: Jossey-Bass.

Park, T., & Mishra, A. (2003). *Internet usage by farmers. Evidence from a national survey.* Paper presented at the Agricultural & Applied Economics Association annual meeting, Montreal, Canada.

Riesenberg, L., & Gor, C.O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education, 30*(3), 7-13. doi: 10.5032/jae.1989.03007

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Seligman, L. (2006). Sensemaking throughout adoption and the innovation-decision process. *European Journal of Innovation Management (1)*9, 108-118. doi: 10.1108/14601060610640050.

Smith, A., Paul, C. J., Goe, R. W., & Kenney, M. (2004). *Computer and Internet use by Great Plains farmers*. Unpublished manuscript, Department of Agricultural and Resource Economics, University of California, Davis, CA.

Tavakol, M., & Dennick, R. (2011). Making sense of cronbachs alpha. *International Journal of Medicine Education, 2,* 53-55. doi: 10.5116/ijme.4dfb.8dfd

Urdan, T. (2010) *Statistics in plain english.* (3rd ed.) Routledge: New York.

Vaast, E. & Kaganer, E. (2013). Social media affordances and governance in the workplace: an examination of organizational policies. *Journal of Computer Mediated Communication 19*. 78-101.doi:10.1111/jccc4.12032.

Vergot P., Isreal G., & Mayo, D. (2005, April). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension, 43*(2), 1-8. Retrieved from http://www.joe.org/joe/2005april/rb6.php

Wejnert, B. (August 2002). Integrating models of diffusion of innovations: a conceptual framework. *Annual Review of Sociology 28*, 297-326. doi: 10.1146/annurev.soc.28.110601.141051

CHAPTER VI. SUMMARY, MAJOR FINDINGS, CONCLUSIONS, IMPLICATIONS, RECOMMENDATIONS, AND FURTHER RESEARCH

Summary

The purpose of this study was to determine the Iowa Cattlemen's Association producer-members perceptions regarding the importance and frequency of use of selected communication tools for obtaining general and beef industry information. The objectives of this study were to:

1.) Identify demographics of the members of the Iowa Cattlemen's Association who received the associations' electronic newsletter; specifically, gender, age, education, number of cattle in operation, role in cattle operation, type of cattle operation, and ownership of technology.
2.) Determine participants level of perceived importance of selected communication tools.
3.) Determine participants frequency of use of selected communication tools.
4.) Identify differences between the perceived level of importance of selected communication tools used for general (non-industry related) and beef industry purposes by selected respondents demographics; specifically age, role in cattle operation, source of income, and smartphone ownership.
5.) Identify differences between the use of selected communication tools for general (non-industry related) and beef industry purposes by selected respondents' demographics; specifically age, type of cattle operation, source of income, and smartphone ownership.

This study consisted of Iowa cattle producers who received the Iowa Cattlemen's Association electronic newsletter (N=3,021). A random sample was taken from this

population. The random sample consisted of 974 Iowa cattle producers. A web-based instrument was distributed to these participants through Qualtrics®. Qualtrics® is an online database where researchers can create and distribute surveys (Benton, Pappas, & Pappas, 2011). The instrument consisted of 120 items framed into four basic sections: traditional print media, electronic media, social media, and demographics of the participants. The instrument was tested for content validity through a panel of experts, and a pilot study was conducted on 36 Nebraska Cattlemen board of directors. Once editorial changes were made to the instrument it was deemed appropriate for this study.

The survey instrument was provided electronically to 974 cattle producers in the state of Iowa, with a total of 182 useable questionnaires returned which resulted in a response rate of 18 percent. The initial data was imported from Qualtrics into Predictive Analytical Software (PASW) Statistics 18. Mean and standard deviations were used in this study to analyze group data. A one -way analysis (ANOVA) and independent t-test were used to determine statistical significance between two variable means (Ary et al., 2010). Tamhane *post hoc*, and Tukey *post hoc* tests were used to determine statistical significance among the selected demographic groups (Ary, et al, 2010). Eta squared and Cohen's *d* was used to determine the strength of the relationship between two variable means (Gravetter & Wallnau, 2009).

Major Findings

Objective 1: Demographics of Producers

Demographics revealed that Iowa cattle producers were mostly male (n = 133, 70.3%) and in the 50-64 age range (*n* = 128, 70.3%). The typical producer held a bachelor degree (*n* = 65, 39.2%) and was the owner and operator (*n* = 142, 86.6%) of their farm. Most

respondents were cow/calf operators (n = 69, 54.3%). The size of the operations varied, however most all of the producers had less than 100 head of cattle (n = 64, 46%). Over half (n= 92, 50.5%) of the producers owned a smartphone while a majority of producers used a desktop or a laptop computer to complete the survey (n = 136, 74.7%).

Objective 2: Participant's level of perceived importance of selected communication tools.

The Iowa Cattlemen's Association members who received the associations' electronic newsletter perceived electronic communication tools as moderately important (M = 3.18, SD = 0.66). Social media for both general purposes (M = 1.98, SD = .96) and beef industry purposes (M =1.99, SD =1.02) was considered very unimportant to participants of this study. Traditional media was considered moderately important for participants (M = 3.00, SD = 0.64).

Objective 3: Participant's frequency of use of selected communication tools.

Electronic media for general purposes was occasionally used (M = 3.02, SD = .70) by the Iowa Cattlemen's Association members who received the electronic newsletter. The use of traditional media to obtain beef industry information was more common (M = 2.96, SD = .63) for participants than any other communication tool.

Objective 4: Differences between perceived levels of importance of selected communication tools used for general and beef industry purposes by selected respondents demographics.

A statistically significant difference was found between producers aged 18-35 (M = 3.488, SD = .374) and 50-64 (M = 3.063, SD = .670) in the importance of electronic media to obtain general information. Producers aged 18-35 rated their perceived level of the importance of electronic media to obtain general information higher than producers aged 50-

64 as indicated by a positive mean difference and medium effect size (MD = .445, p = .006, η^2 = .075).

The mean score for owners and operators (M = 2.99, SD = .749) was statistically different than the role of *other* (M = 3.63, SD = .393) in the importance of electronic media to obtain beef industry purposes. Producers who identified themselves as the role of *other* rated their perceived level of importance of electronic media for beef industry purposes more important than producers who were owners/operators as indicated by a negative mean difference and a medium effect size (MD = -.643, p = .008, η^2 = .076). Producers who described themselves as *other* were those that were not owner/operators, owner/non operators, herd managers, or farmhands.

The mean score for producers who owned smartphones was statistically different than producers who did not own smartphones for the importance of electronic media for general use (MD = .459, p = .001, d = .711). If producers owned smartphones they perceived electronic media to obtain general information as more important than those producers who did not own a smartphone as indicated by a positive mean difference (MD = .459). The mean score for producers who owned smartphones was statistically different than producers who did not own smartphones for the importance of social media to obtain general information (MD = .531, p = .001, d = .573). If producers owned smartphones, they perceived social media more important to obtain general information than producers who did not own a smartphone as indicated by a positive mean difference (MD = .531).

Objective 5: Differences between frequency of use of selected communication tools used for general and beef industry purposes by selected respondents demographics.

The mean score for producers aged 18-35 (M = 2.71, SD = .486) was statistically different than producers aged 50-64 (M = 3.13, SD = .552) for the use of traditional media to obtain general information. Producers aged 50-64 rated their use of traditional media to obtain general information higher than producers aged 18-35 as indicated by a negative mean difference and a medium effect size (MD = -.422, p = .027, η^2 = .095). Traditional media to obtain general information was also found to be statistically significant between producers aged 18-35 (M = 2.71, SD = .486) and 65 and up (M = 3.23, SD = .610). Producers who were 65 and up rated their use of traditional media for general purposes higher than producers aged 18-35 as indicated by a negative mean difference and a medium effect size (MD = -.519, p = .023, η^2 = .095).

The mean scores of cow/calf producers (M = 3.07, SD = .670) and show cattle operators (M = 2.11, SD = .619) were statistically different for use of electronic media to obtain general information. Cow/calf producers rated their use of electronic media for general purposes higher than show cattle producers as indicated by a positive mean difference and a medium effect size (MD = .958, p = .034 η^2 = .095).

The mean difference between producers who owned smartphones and those that did not was statistically significant in four construct areas. The four construct areas include electronic media to obtain general information (MD = .623, p = .001, d = .972), electronic media to obtain beef industry information (MD = .543, p = .001, d = .725). Additionally, social media to obtain general information (MD = .604, p = .001, d = .756), and social media to obtain beef industry information (MD = .641, p = .001, d = .811) indicated statistically

significant mean differences for producers who owned smartphones and those that did not. If producers owned smartphones, they used electronic and social media to obtain general and beef industry information more than producers who did not own smartphones as indicated by positive mean differences.

Other Demographics

This study did not indicate statistically significant differences in the mean scores of producer's gender, education level, and size of operation. Therefore, gender, education level, and size of operation did not have an effect on producer's perceived importance or use of selected communication tools.

Conclusions and Discussion

The following conclusions were drawn based on the findings of this research:

1.) Respondents appeared to have a strong interest in the use of traditional print media to obtain beef industry information.
2.) Respondents appeared to be confident in obtaining general information from electronic media sources.
3.) Social media to obtain general and beef industry information did not spark the curiosity of the participants.
4.) As producers adopt new technologies their perceptions of their importance of electronic and social media increase.
5.) Producers who used electronic and social media were likely to own smartphones.
6.) Respondents who engaged in off-farm employment perceived expeditious forms of communication as important.

7.) Producers who identified themselves as *other* (non cow/calf, feedlot, seedstock, and show cattle operators), appeared to have a higher level of interest in electronic media to access beef industry information.

8.) Producer-members in this study aged 18-35 appeared to be in the confirmation stage of the innovation decision process in obtaining general information from electronic media sources.

9.) Respondents aged 50-64 found print media for obtaining beef industry information compatible to their lifestyle.

Print media includes words, pictures, and diagrams that convey information and attracts consumers when information within it is relevant to the consumer (Farooq, Muhammad, Chauhdary, & Ashraf, 2007). Print media was the most preferred communication source for Ohio farmers as indicated by Diekmann and Batte (2009). Furthermore, producers in the Drover's Cattle Network preferred print media sources over other communication channels (Gillespie, 2011). The present research elucidates these findings as print media was used most often to obtain beef industry information by members of the Iowa cattlemen's association who received the electronic newsletter. Since producers utilized traditional print media to obtain information for beef industry purposes, one could imply that traditional print media offers different aspects for producers that electronic media does not. Specifically as traditional print media was used most often by producers aged 50-64 to obtain general information; one can imply that producers aged 50-64 relied more on traditional print media forms of communication. Producers aged 50-64 appeared to be in the confirmation stage and may have felt that print media was more compatible to their lifestyle than other forms of communication (Rogers, 2003).

Respondents appeared to be confident in obtaining general information from electronic media. According to December (2006) electronic media has been a popular form of communication where users exchange information. This study supports findings from Morris and Ogan (1996) which indicated that the Internet is a familiar communication channel and almost impossible to ignore. One could imply that for producers aged 18-35 electronic media offers faster access to obtain general information rather than searching through traditional print media sources. Furthermore, producers who were in the ages of 18-35 appeared to be in the confirmation stage of the innovation decision process.

Even with the Internet being a familiar place for Iowa Cattlemen's Association members who received the electronic newsletter, it appears that the respondents did not have a very strong interest in social media. This supports the findings of Gillespie's (2011) research which indicated that producer-members of the Drovers' cattle network did not prefer social media as a communication tool. One could conclude that beef industry organizations have not fully implemented social media platforms. If producers do not find social media to be important and if it was the least used communication channel, it could be that producers do not have the time, or do not know how to use the social media applications. Cattle producers were in the knowledge or persuasion stage of the innovation decision process and have not yet fully formed an attitude about the innovation to adopt it (Rogers, 2003). Cattle producers may also find social media more complex than other sources of communication (Rogers, 2003).

The lack of understanding surrounding the use of electronic communication technology can further be explained by a person's age, time, and experience (Iddings & Apps, 1990). According to Smith, Paul, Goe, and Kenney (2004) a person's age had a

negative effect on computer usage; the older the person, the less likely they were to use a computer. Since a majority of producers in this study were 50 and older, they may not use computers which would decrease the use of the Internet and social media applications. If producers determined that a technology was too complex, they may not use it as often as other communication channels that were considered compatible to their lifestyle (Rogers, 2003).

Park and Mishra (2003) indicated that expeditious forms of communication are important as a producer can receive information at any location. As a producer is at work or travels for their job, it is beneficial they still receive information. When a producer is at work the most expeditious form of communication might be their computer where they are able to access electronic information. This study is congruent to Smith et al. (2004) who posited that as a person works off farm their use of the internet increases.

It is imperative that the perceived importance and usage of communication tools by cattle producers continue to be studied. Baym (2010) indicated that as technology is advancing people's preferred modes of communication may continue to change. If social media continues to gain an acceptance in the agriculture industry it will be significant to understand the recognition of social media by cattle producers (Gillespie, 2011). Understanding the preferred communication channels among cattle producers will help the beef industry better communicate with its producers.

Implications

Based on the conclusions of this research implications can be drawn.

1.) This study has implications for how the Iowa Cattlemen's Association should communicate to its members.

2.) This study also has implications for how other beef industry representatives should communicate with Iowa cattle producers.

3.) This study has implications for how cattle producers should communicate with each other.

Recommendations

The following recommendations were made from findings of this communication in the beef industry study:

1.) The Iowa Cattlemen's Association should communicate using print media forms of communication as a primary source to reach audiences aged 50-64.

2.) To reach audiences aged 18-49 electronic forms of communication should be used by the Iowa Cattlemen's Association.

3.) Beef industry partners should communicate using electronic forms of communication to reach audiences aged 18-35.

4.) Print media forms of communication should be utilized by beef industry representatives to reach audiences aged 50-64 and 65+.

5.) Social media platforms should be advertised within print media and electronic media forms of communication to enhance the perceived importance and use of social media.

6.) Producers with smartphones, producers who are tech savvy, and other industry leaders currently using social media should teach workshops to those producers who do not understand social media.

7.) For those producers who are already utilizing electronic forms of communication, beef industry representatives and beef industry partners should provide social media tutorials on beef association webpages.

Vergot III, Isreal, and Mayo (2005) indicated that it is important for information to reach target audiences. Since preferred modes of communication for beef producers varied by age, multiple modes of communication should be implemented (Vergot et al., 2005). Therefore, to effectively educate and reach Iowa Cattlemen's Association members, the age of producers should be considered. If beef industry representatives want to reach their target audiences, preferred modes of communication should be addressed (Risenberg & Gor, 1989).

Gillespie (2011) suggested advertising social media applications through print media communication channels since print media communication channels are important to producers. Similarly, producers in the present study also preferred print media as a main communication channel. If producers see that they are able to receive the same content through social media applications the use of social media applications may increase (Gillespie, 2011). Additionally to increase social media use it is recommended that producers who are tech savvy and early adopters, educate the laggards or late majority who may not be as tech savvy or may not understand social media applications (Rogers, 2003). Those who are tech savvy will be able to increase the knowledge of the social media tools and persuade producers to adopt social media tools (Rogers, 2003).

Finally for those producers who already utilize electronic forms of communication, beef representatives and beef industry partners should provide social media tutorials on beef association webpages. If producers are currently using electronic forms of communication, providing examples on how to access social media tools may increase the awareness of the

social media platform. As producer's knowledge of social media increases it may lead producers into the persuasion stage (Rogers, 2003). If producers can learn how to navigate social media the perceived complexity of social media may decrease causing more producers to adopt social media (Rogers, 2003).

Further Research

The following recommendations for further research are offered based on the findings of this study.

1.) A similar study should be conducted by scholars to determine why producers use electronic media to obtain general information but use print media to obtain beef industry information? Is it because obtaining beef industry information through print media is more convenient to producers?

2.) Research conducted by industry specialists are needed to determine why producers do not prefer social media for a communication purposes. Do producers know about social media for beef industry purposes, or do they not have the time to use it?

3.) An exploration study by researchers on cattle producers' smartphone ownership may be warranted. Why do producers with smartphones utilize electronic media and social media more than producers who do not own smartphones? Is it because producers have quicker access to the Internet and social media platforms? These questions may be answered in a study conducted on ownership of smartphones by cattle producers.

4.) An investigation study by industry representatives and scholars on how producers aged 50-64 and 65+ adapt to new technologies may be desirable. Furthermore, how producers like to learn about new technologies may be necessary. The results of this

study may help increase the use of social media among Iowa Cattlemen's Association members.

The information that the Iowa Cattlemen's Association distributes has the ability to shape the Iowa cattle industry. Through effective use of information technology the Iowa Cattlemen's Association can better educate Iowa cattle producers. As generations of cattle producers change, so might producers' preferred modes of communication. In order to effectively communicate with producers, the Iowa Cattlemen's Association should incorporate new modes of communication. Therefore, it may be necessary to research preferred communication channels in future years in order to adequately serve and educate Iowa cattle producers.

References

Ary, D., Jacobs, L. C., & Sorenson, C. (2010). *Introduction to research in education*. Belmont, CA: Wadsworth, Cengage Learning.

Benton, M. C., Pappas, J., & Pappas, E. (2011). WordPress+ qualtrics: A plugin supporting research and new pedagogy to develop personal sustainability via 360° evaluation. *Proceedings of the Americans Conference on Information Systems.* Detroit, Michigan.

Diekman, F., & Batte, M., (2009). Examining information search strategies of Ohio farmers. *Journal of Extension, (47)*6.

December, J. (1996). Units of analysis for internet communication. *Journal of Computer Mediated Communication, 1*. 0. doi: 10.1111/j.1083-6101.1996.tb00173.x.

Farooq, S, Muhammed, S., Chaudary, K., & Ashraf, I. (2007). The role of print media in the dissemination of agricultural information among farmers. The Journal of Animal and Plant Sciences, (1), 23, 324-329.

Flaherty L., Pearce K., & Rubin, R. (1998) Internet and face-to-face communication: Not functional alternatives, *Communication Quarterly*, *46*(3), 250-268

Morris, M., & Ogan, C. (1996). The internet as mass medium. *Journal of Computer Mediated Communication, 1*(4), 0. doi: 10.1111/j.1083-6101.1996.tb00174.x

Iddings, R., & Apps, J. (1990). What influences farmers computer use? *Journal of Extension, 28* (1), 1-4. Retrieved from http://www.joe.org/joe/1990spring/a4.php

Gillespie, J. L. (2011). U.S beef producer's current use and perceptions of social media as a communications tool. (Master's thesis) Retrieved from http://dc.library.okstate.edu/utils/getfile/collection/theses/id/4066/filename/4067.pdf

Gravetter, F., & Wallnau, L. (2009). *Statistics for the behavioral sciences.* Belmont, California: Wadsworth.

Smith, A., Paul, C. J., Goe, R.W., & Kenney, M. (2004). *Computer and internet use by Great Plains farmers*. Unpublished manuscript, Department of Agricultural and Resource Economics, University of California, Davis, CA.

Riesenberg, L., & Gor, C.O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education, 30*(3),7-13. doi**:** 10.5032/jae.1989.03007

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press

Vergot P., Isreal G., & Mayo, D. (2005, April). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension, 43*(2).

APPENDIX A. SURVEY INSTRUMENT

Welcome!

Information is an integral part of agriculture and is a valuable resource, but advancements in technology are changing the way people can access this information. Today, communications tools such as websites, text messaging, Facebook, and Twitter are allowing the beef industry to expand and disseminate information much quicker than before.

The main purpose of this research is to determine Iowa beef producers' current uses and perceptions of communication tools used in the beef industry. This survey contains four parts. We are interested in your perceptions and usage of communication in two areas 1) your general usage of traditional print media, electronic media, and social media, and 2) your usage as a beef producer to gain information of the beef industry using traditional print media, electronic media, and social media. Part three of the survey is a basic demographic section

Your feedback is essential. Your knowledge and experiences are needed by taking 10 minutes of your time to answer the following questions. You are encouraged to answer all questions as this will provide us with Iowa beef producers communication preferences so that we can better assist you and your needs as a producer.

Would you like to participate in this research study?

- ❍ Yes
- ❍ No

Traditional Media

General Use of Traditional Media

Traditional print media has been considered important in many aspects of life. Traditional print media includes magazines, journals, brochures, newsletters, and other print direct mail items.

Please indicate how important traditional print media is to you in your everyday life.

I feel that it is important to use _____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Magazines/journals to share new information	❍	❍	❍	❍
Magazines/journals to communicate new information	❍	❍	❍	❍
Magazines/journals to learn new information	❍	❍	❍	❍
Brochures to share new information	❍	❍	❍	❍
Brochures to communicate new information	❍	❍	❍	❍
Brochures to learn new information	❍	❍	❍	❍
Newsletters to share new information	❍	❍	❍	❍
Newsletters to	❍	❍	❍	❍

communicate new information Newsletters to learn new information	❍	❍	❍	❍

Please indicate how frequently you view or use the following.

	Never	Rarely	Occasionally	Frequently
Magazines/journals to share new information	❍	❍	❍	❍
Magazines/journals to communicate new information	❍	❍	❍	❍
Magazines/journals to learn new information	❍	❍	❍	❍
Brochures to share new information	❍	❍	❍	❍
Brochures to communicate new information	❍	❍	❍	❍
Brochures to learn new information	❍	❍	❍	❍
Newsletters to share new information	❍	❍	❍	❍
Newsletters to communicate new information	❍	❍	❍	❍
Newsletters to learn new information	❍	❍	❍	❍

Usage of Traditional Media in Beef Industry

Traditional print media has been considered important in many aspects of life. Traditional print media includes magazines, journals, brochures, newsletters and other print direct mail items.

Please indicate how important traditional print media is to you in your work with the beef industry

I feel that it is important to use_____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Magazines/journals to share new information about the beef industry	❍	❍	❍	❍
Magazines/journals to communicate information about the beef industry	❍	❍	❍	❍
Magazines/journals to learn new information about the beef industry	❍	❍	❍	❍
Brochures to share new information about the beef industry	❍	❍	❍	❍
Brochures to communicate information about the beef industry	❍	❍	❍	❍
Brochures to learn new information about the beef	❍	❍	❍	❍

industry				
Newsletters to share new information about the beef industry	❍	❍	❍	❍
Newsletters to communicate new information about the beef industry	❍	❍	❍	❍
Newsletters to learn new information about the beef industry	❍	❍	❍	❍

Please indicate how frequently you view or use the following.

	Never	Rarely	Occasionally	Frequently
Magazines/journals to share new information about the beef industry	❍	❍	❍	❍
Magazines/journals to communicate information about the beef industry	❍	❍	❍	❍
Magazines/journals to learn new information about the beef industry	❍	❍	❍	❍
Brochures to share	❍	❍	❍	❍

new information about the beef industry				
Brochures to communicate information about the beef industry	❍	❍	❍	❍
Brochures to learn new information about the beef industry	❍	❍	❍	❍
Newsletters to share new information about the beef industry	❍	❍	❍	❍
Newsletters to communicate information about the beef industry	❍	❍	❍	❍
Newsletters to learn new information about the beef industry.	❍	❍	❍	❍

Electronic Media

General Usage of Electronic Media

Electronic media has been considered important in many aspects of life. Electronic Media includes websites, email-blasts, and text messaging and other electronic communication devices.

Please indicate how important electronic media is to you in your everyday life.

I feel that it is important to use _____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Websites to share information	❍	❍	❍	❍
Websites to communicate new information	❍	❍	❍	❍
Websites to learn new information	❍	❍	❍	❍
Electronic newsletters to share new information	❍	❍	❍	❍
Electronic newsletters to communicate new information	❍	❍	❍	❍
Electronic newsletters to learn new information	❍	❍	❍	❍

Text Messages to share information with individuals	❍	❍	❍	❍
Text messages to communicate information with individuals	❍	❍	❍	❍
Text messages to learn new information from individuals	❍	❍	❍	❍
E-mails to share information	❍	❍	❍	❍
E-mails to communicate information	❍	❍	❍	❍
E-mails to learn new information	❍	❍	❍	❍

Please indicate how frequently you view the following.

	Never	Rarely	Occasionally	Frequently
Websites to share information	❍	❍	❍	❍
Websites to	❍	❍	❍	❍

communicate new information				
Websites to learn new information	❍	❍	❍	❍
Electronic newsletters to share new information	❍	❍	❍	❍
Electronic newsletters to communicate new information	❍	❍	❍	❍
Electronic newsletters to learn new information	❍	❍	❍	❍
Text Messages to share information with individuals	❍	❍	❍	❍
Text messages to communicate information with individuals	❍	❍	❍	❍
Text messages to learn new information from	❍	❍	❍	❍

individuals				
E-mails to share information	❍	❍	❍	❍
E-mails to communicate information	❍	❍	❍	❍
E-mails to learn new information	❍	❍	❍	❍

Usage of Electronic Media in the Beef Industry

Electronic media has been considered important in many aspects of life. Electronic Media includes, websites, email-blasts, and text messaging and other electronic communication

Please indicate how important electronic media is to you in your work with the beef industry.

It is important for me to use _____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Websites to share information about the beef industry	❍	❍	❍	❍
Websites to communicate information about the beef industry	❍	❍	❍	❍
Websites to learn new information	❍	❍	❍	❍

about the beef industry				
Electronic newsletters to share information about the beef industry	❍	❍	❍	❍
Electronic newsletters to communicate information about the beef industry	❍	❍	❍	❍
Electronic newsletters to learn new information about the beef industry	❍	❍	❍	❍
Text Messages to share information about the beef industry	❍	❍	❍	❍
Text messages to communicate information about the beef industry	❍	❍	❍	❍
Text messages to share information about the beef	❍	❍	❍	❍

industry				
E-mails to share information about the beef industry	❍	❍	❍	❍
E-mails to communicate information about the beef industry	❍	❍	❍	❍
E-mails to learn new information about the beef industry	❍	❍	❍	❍

Please indicate how frequently you use the following.

	Never	Rarely	Occasionally	Frequently
Websites to share information about the beef industry	❍	❍	❍	❍
Websites to communicate information about the beef industry	❍	❍	❍	❍
Websites to learn new information about the beef	❍	❍	❍	❍

industry				
Electronic newsletters to share information about the beef industry	❍	❍	❍	❍
Electronic newsletters to communicate information about the beef industry	❍	❍	❍	❍
Electronic newsletters to learn new information about the beef industry	❍	❍	❍	❍
Text Messages to share information about the beef industry	❍	❍	❍	❍
Text messages to communicate information about the beef industry	❍	❍	❍	❍
Text messages to learn new information about the beef	❍	❍	❍	❍

industry				
E-mails to share information about the beef industry	❍	❍	❍	❍
E-mails to communicate information about the beef industry	❍	❍	❍	❍
E-mails to learn new information about the beef industry	❍	❍	❍	❍

Social Media

General Usage of Social Media

Social media has been considered important in many aspects of life. Social Media includes, Facebook, Twitter, YouTube, LinkedIn, Pinterest and other communication tools that are online.

Please indicate how important social media is to you in your everyday life.

I feel that it is important to use _____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Facebook to share new information	❍	❍	❍	❍
Facebook to communicate new information	❍	❍	❍	❍
Facebook to learn new information	❍	❍	❍	❍
Twitter to share new information	❍	❍	❍	❍
Twitter to communicate/ "tweet" new information	❍	❍	❍	❍
Twitter to learn new information	❍	❍	❍	❍
Other social media	❍	❍	❍	❍

(LinkedIn, YouTube, Pinterest, Flickr) to share new information				
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to communicate information	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to learn new information	❍	❍	❍	❍

Please indicate how frequently you use the following.

	Never	Rarely	Occasionally	Frequently
Facebook to share new information	❍	❍	❍	❍
Facebook to communicate new information	❍	❍	❍	❍
Facebook to learn new information	❍	❍	❍	❍
Twitter to share new information	❍	❍	❍	❍
Twitter to communicate/ "tweet" new information	❍	❍	❍	❍
Twitter to learn new information	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to share new information	❍	❍	❍	❍
Other social media (LinkedIn,	❍	❍	❍	❍

YouTube, Pinterest, Flickr) to communicate information Other social media (LinkedIn, YouTube, Pinterest, Flickr) to learn new information	❍	❍	❍	❍

Usage of Social Media in the Beef Industry

Social media has been considered important in many aspects of life. Social Media includes, Facebook, Twitter, YouTube, LinkedIn, Pinterest and other communication tools that are online.

Please indicate how important social media is to you with your work in the beef industry.

I feel that it is important to use _____.

	Very Unimportant	Moderately Unimportant	Moderately Important	Very Important
Facebook to share new information about the beef industry	❍	❍	❍	❍
Facebook to communicate new information about the beef industry	❍	❍	❍	❍
Facebook to learn new information about the beef industry	❍	❍	❍	❍
Twitter to share new information about the beef industry	❍	❍	❍	❍
Twitter to communicate/ "tweet" new information about the beef	❍	❍	❍	❍

industry				
Twitter to learn new information about the beef industry	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to share new information about the beef industry	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to communicate information about the beef industry	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to learn new information about the beef industry	❍	❍	❍	❍

Please indicate how frequently you use the following.

	Never	Rarely	Occasionally	Frequently
Facebook to share new information about the beef industry	❍	❍	❍	❍
Facebook to communicate new information about the beef industry	❍	❍	❍	❍
Facebook to learn new information about the beef industry	❍	❍	❍	❍
Twitter to share new information about the beef industry	❍	❍	❍	❍
Twitter to communicate/ "tweet" new information about the beef industry	❍	❍	❍	❍
Twitter to learn new information about the beef	❍	❍	❍	❍

industry				
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to share new information about the beef industry	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to communicate information about the beef industry	❍	❍	❍	❍
Other social media (LinkedIn, YouTube, Pinterest, Flickr) to learn new information about the beef industry	❍	❍	❍	❍

Demographic Data

What is your gender?

- ❍ Male
- ❍ Female

What is your age?

What is the highest level of education you have received?

- ❍ High school degree or less
- ❍ Associate degree
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ Doctoral degree
- ❍ Certificate or formal education beyond high school

What is the average number of cattle you have in your operation annually?

Please define your primary role in your cattle operation?

- ❍ Owner/Operator
- ❍ Owner/Non-operator
- ❍ Herd Manager
- ❍ Farmhand
- ❍ Other (Please Specify) _____

Do you have more than one primary type of cattle operation?

- ❍ Yes
- ❍ No

Please select your primary type of cattle operation

- ❍ Cow/Calf
- ❍ Feedlot
- ❍ Show Cattle
- ❍ Seedstock
- ❍ Stocker/Backgrounder
- ❍ Other

Please identify all of your primary types of cattle operation?

- ❑ Cow/Calf
- ❑ Feedlot
- ❑ Show Cattle
- ❑ Seedstock
- ❑ Stocker/Backgrounder
- ❑ Other (please specify) _____

In what county of Iowa is your operation?

- Adair
- Adams
- Allamakee
- Appanoose
- Audubon
- Benton
- Black Hawk
- Boone
- Bremer
- Buchanan
- Buena Vista
- Butler
- Calhoun
- Carroll
- Cass
- Cedar
- Cerro Gordo
- Cherokee
- Chickasaw
- Clarke
- Clay
- Clayton
- Clinton
- Crawford
- Dallas
- Davis
- Decatur
- Delaware
- Des Moines
- Dickenson
- Dubuque
- Emmet
- Fayette
- Floyd
- Franklin
- Fremont
- Greene
- Grundy
- Guthrie
- Hamilton
- Hancock
- Hardin
- Harrison
- Henry
- Howard
- Humboldt
- Ida
- Iowa
- Jackson
- Jasper
- Jefferson
- Johnson
- Jones
- Keokuk
- Kossuth
- Lee
- Linn
- Louisa
- Lucas
- Lyon
- Madison
- Mahaska
- Marion
- Marshall
- Mills
- Mitchell
- Monroe
- Montgomery
- Muscatine
- O’Brien
- Osceola
- Page
- Palo Alto County
- Plymouth
- Pocahontas
- Polk
- Pottawattamie
- Poweshiek
- Ringgold
- Sac
- Scott
- Shelby
- Sioux
- Story
- Tama
- Taylor
- Union
- Van Buren
- Wapello
- Warren
- Washington
- Wayne
- Webster
- Winnebago
- Winneshiek
- Woodbury
- Worth
- Wright

Is your main income outside of your cattle operation?

- ❍ Yes
- ❍ No

Do you own a smartphone?

- ❍ Yes
- ❍ No

What type of technology are you using to complete this survey?

- ❍ Tablet
- ❍ Desktop/Laptop Computer
- ❍ Smartphone

Thank you for being a part of this study, your input and knowledge is valuable as a producer. Thank you for your time.

APPENDIX B. INSTITUTIONAL REVIEW BOARD APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 7/25/2013

To: Jaclyn F Tweeten
223E Curtiss Hall

CC: Dr. Thomas H Paulsen
217 Curtiss Hall
Wade Miller
206 Curtiss Hall

From: Office for Responsible Research

Title: Iowa Cattle Producers Perceptions Regarding Social Media Relevant to the Beef Industry

IRB ID: 13-335

Study Review Date: 7/24/2013

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

  Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

  Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX C. CONTACT LETTERS

Pre-Notification Email: First Contact

To: Iowa Cattlemen's Association Members

You are being contacted because you have been selected to participate in a study regarding perceptions and usage of communication tools used in the beef industry.

Information is an integral part of agriculture and is a valuable resource, but advancements in technology are changing the way people can access this information. Today, communications tools such as websites, text messaging, Facebook, and Twitter are allowing the beef industry to expand and disseminate information much quicker than before. The main purpose of this research is to determine Iowa beef producers' current uses and perceptions of communication tools used in the beef industry.

Please watch for an email that will be sent to you in the upcoming days from Dal Grooms, titled "Iowa Cattlemen's Association Communications Survey" that will contain the link to the survey. To access the survey, click on the link directly from the email. Once opened, this survey will take approximately 10 minutes to complete. This research is important as it will provide us with Iowa beef producers' communication preferences so that we can better assist you and your needs as a beef producer.

In this study we are solely interested in group data and not individual data so confidentiality will be ensured. Personal and contact information will be automatically removed from the responses to ensure complete anonymity. The data collected in this study will be used to partially fulfill the requirements for the Master of Science degree in Agricultural Education at Iowa State University.

Please remember that your participation in this research is voluntary. You may choose to withdraw from participation in this study at any time by closing out of the questionnaire. If you have any questions please feel free to contact me at jtweeten@iastate.edu or (507) 459-5048, Dal Grooms, dal@iabeef.org or (515) 296-2266 ext. 216, or Dr. Thomas Paulsen, tpaulsen@iastate.edu or (515) 294-0047. If you have any questions about the rights of research subjects or research related injury please contact the Institution Review Board Administrator, (515) 294-4566, IRB@iastate.edu or Director, (515) 294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa, 50011.

Thank you for your cooperation we look forward to receiving your responses.

Sincerely,

Ms. Jaclyn Tweeten
Graduate Student
Iowa State University
Ames, Iowa, 50010

Ms. Dal Grooms
Communications Director
Iowa Cattlemen's Association
Ames, Iowa 50014

Dr. Thomas Paulsen
Assistant Professor
Iowa State University
Ames, Iowa 50010

Electronic Newsletter Contact: Second Contact

Survey may be headed your way

The Iowa Cattlemen's Association is cooperating with a survey project being conducted by an Iowa State University Masters Degree candidate. Her name is Jaclyn Tweeten, and about 1,000 ICA producers will receive an email requesting their cooperation this week. She is gathering data about beef cattle producers use of communications tools.

Your participation in the project is voluntary, but we hope you will reply to the survey. We feel the information gathered will give us guidance on moving forward in our efforts to tell you about beef cattle issues.

If you have questions about this process, contact Dal Grooms, or call 515-296-2266.

First Questionnaire Email: Third Contact

To: Iowa Cattlemen Association Members

You have been selected to participate in a study regarding perceptions and usage of communication tools used in the beef industry.

Information is an integral part of agriculture and is a valuable resource, but advancements in technology are changing the way people can access this information. Today, communications tools such as websites, text messaging, Facebook, and Twitter are allowing the beef industry to expand and disseminate information much quicker than before. The main purpose of this research is to determine Iowa beef producers' current uses and perceptions of communication tools used in the beef industry.

Thank you for your interest and willingness to participate in this study regarding perceptions and usage of communication channels. Your feedback will be essential in improving this survey prior to its release. Your knowledge and experiences are needed by taking 10 minutes of your time to answer the following questions.

This survey contains four parts. We are interested in your perceptions and usage of communication in two areas; 1) your general usage of traditional print media, electronic media, and social media and 2) your usage as a beef producer to gain information of the beef industry using traditional print media, electronic media, and social media. Part three of the survey is a basic demographic section. Here is a link to the survey, to access it click on the link.

This link is uniquely tied to this survey and your email address. Please do not forward this message.

<Insert Link Here>

In this study we are solely interested in group data and not individual data so confidentiality will be ensured. Personal and contact information will be automatically removed from the responses to ensure complete anonymity. The data collected in this study will be used to partially fulfill the requirements for the Master of Science degree in Agricultural Education at Iowa State University.

Please remember that your participation in this research is voluntary. You may choose to withdraw from participation in this study at any time by closing out of the questionnaire. If you have any questions please feel free to contact me at jtweeten@iastate.edu or (507) 459-5048, Dal Grooms, dal@iabeef.org or (515) 296-2266 ext. 216, or Dr. Thomas Paulsen, tpaulsen@iastate.edu or (515) 294-0047. If you have any questions about the rights of

research subjects or research related injury please contact the Institution Review Board Administrator, (515) 294-4566, IRB@iastate.edu or Director, (515) 294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa, 50011.

Thank you for your cooperation we look forward to receiving your responses.

Sincerely,

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Ms. Dal Grooms
Communications Director
Iowa Cattlemen's Association
Ames, Iowa 50014

Dr. Thomas Paulsen
Assistant Professor
Iowa State University
Ames, Iowa 50010

Text Message to Participants: Fourth Contact

Message: Plz check your email for an Iowa Cattlemen's communication survey sent earlier today. We're working w/ ISU student on this prjct & your input is critical.

First Reminder Email: Fifth Contact

To: Iowa Cattlemen Association Members

Last week, you should have received an invitation to participate in a study that explores the perceptions and usage of communication tools used within the beef industry. If you have already completed the survey please accept our sincere thanks.

If you have not yet completed the survey, please do so as it will provide us with Iowa Cattle Producers' preferred channels of communication so that we may further assist Iowa Cattlemen in the beef industry. Your feedback is essential. Your knowledge and experiences are needed by taking 10 minutes of your time to answer the following questions.

This survey contains four parts. We are interested in your perceptions and usage of communication in two areas; 1) your general usage of traditional print media, electronic media, and social media, and 2) your usage as a beef producer to gain information of the beef industry using traditional print media, electronic media, and social media.

Part three of the survey is a basic demographic section. Here is a link to the survey, to access it click on the link.

This link is uniquely tied to this survey and your email address. Please do not forward this message.

In this study we are solely interested in group data and not individual data so confidentiality will be ensured. Personal and contact information will be automatically removed from the responses to ensure complete anonymity. The data collected in this study will be used to partially fulfill the requirements for the Master of Science degree in Agricultural Education at Iowa State University.

Please remember that your participation in this research is voluntary. You may choose to withdraw from participation in this study at any time by closing out of the questionnaire. If you have any questions please feel free to contact me at jtweeten@iastate.edu or (507) 459-5048, Dal Grooms, dal@iabeef.org or (515) 296-2266 ext. 216, or Dr. Thomas Paulsen, tpaulsen@iastate.edu or (515) 294-0047. If you have any questions about the rights of research subjects or research related injury please contact the Institution Review Board Administrator, (515) 294-4566, IRB@iastate.edu or Director, 515-294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa, 50011.

Thank you for your cooperation we look forward to receiving your responses.

Sincerely,

Ms. Jaclyn Tweeten
Graduate Student
Iowa State University
Ames, Iowa 50010

Ms. Dal Grooms
Communications Director
Iowa Cattlemen's Association
Ames, Iowa 50010

Dr. Thomas Paulsen
Assistant Professor
Iowa State University
Ames, Iowa 50010

Second/ Final Reminder Email: Sixth Contact

To: Iowa Cattlemen's Association Members

Last week, you should have received a follow up email to participate in a study that explores the perceptions and usage of communication tools used within the Iowa beef industry. If you have already completed the survey please accept our sincere thanks.

If you have not yet completed the survey, please do so as it will provide us with your preferred channels of communication so that we may further assist you in the beef industry. This survey will close on Friday November 22nd , 2013 at 5 p.m. Your knowledge and experiences are needed by taking 10 minutes of your time to answer the following questions.

<Insert Link Here>

This link is uniquely tied to this survey and your email address. Please do not forward this message.

Please remember that your participation in this research is voluntary. You may choose to withdraw from participation in this study at any time by closing out of the questionnaire. If you have any questions please feel free to contact me at jtweeten@iastate.edu or (507) 459-5048, Dal Grooms, dal@iabeef.org or (515) 296-2266 ext. 216, or Dr. Thomas Paulsen, tpaulsen@iastate.edu or (515) 294-0047. If you have any questions about the rights of research subjects or research related injury please contact the Institution Review Board Administrator, (515) 294-4566, IRB@iastate.edu or Director, (515) 294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa, 50011.

Thank you for your cooperation we look forward to receiving your responses.

Sincerely,

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Ms. Dal Grooms
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Dr. Thomas Paulsen
Assistant Professor
Iowa State University
Ames, Iowa 50010

APPENDIX D. SPSS OUTPUT FOR STATISTICAL SIGNIFICANCE

Importance of Communication Tools

One-way Analysis (ANOVA) to Determine the Equality of Means Regarding the Perceived Importance of Communication Tools by Respondents Age

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Traditional Media to obtain general information	Between Groups	.811	3	.270	.535	.659
	Within Groups	55.615	110	.506		
	Total	56.426	113			
Traditional Media to obtain beef industry information	Between Groups	1.310	3	.437	1.070	.365
	Within Groups	44.079	108	.408		
	Total	45.389	111			
Electronic Media to obtain general information	Between Groups	3.416	3	1.139	2.903	.038
	Within Groups	41.969	107	.392		
	Total	45.385	110			
Electronic Media to obtain beef Industry information	Between Groups	2.824	3	.941	1.888	.137
	Within Groups	48.355	97	.499		
	Total	51.180	100			
Social Media To obtain general Information	Between Groups	4.718	3	1.573	1.728	.166
	Within Groups	90.985	100	.910		
	Total	95.703	103			
Social Media to obtain beef industry information	Between Groups	.887	3	.296	.274	.844
	Within Groups	107.901	100	1.079		
	Total	108.788	103			

Post Hoc Test to Determine Equality of Means Regarding the Importance of Communication Tools by Respondents Age

Dependent Variable	(I) Age Categories	(J) Age Categories	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Traditional Media to obtain general information	18-35	36-49	.11255	.16842	.986	-.3509	.5760
		50-64	-.10093	.14510	.982	-.4984	.2966
		65 +	.01140	.25181	1.000	-.7062	.7290
	36-49	18-35	-.11255	.16842	.986	-.5760	.3509
		50-64	-.21348	.16275	.728	-.6579	.2309
		65 +	-.10115	.26238	.999	-.8410	.6387
	50-64	18-35	.10093	.14510	.982	-.2966	.4984

			36-49	.21348	.16275	.728	-.2309	.6579
			65 +	.11233	.24805	.998	-.5962	.8209
	65 +		18-35	-.01140	.25181	1.000	-.7290	.7062
			36-49	.10115	.26238	.999	-.6387	.8410
			50-64	-.11233	.24805	.998	-.8209	.5962
Traditional Media to obtain beef industry information	18-35		36-49	.02410	.20506	1.000	-.5430	.5912
			50-64	.03069	.18572	1.000	-.4883	.5497
			65 +	-.26483	.20102	.730	-.8243	.2947
	36-49		18-35	-.02410	.20506	1.000	-.5912	.5430
			50-64	.00658	.15702	1.000	-.4228	.4360
			65 +	-.28893	.17485	.488	-.7710	.1931
	50-64		18-35	-.03069	.18572	1.000	-.5497	.4883
			36-49	-.00658	.15702	1.000	-.4360	.4228
			65 +	-.29552	.15171	.303	-.7155	.1244
	65 +		18-35	.26483	.20102	.730	-.2947	.8243
			36-49	.28893	.17485	.488	-.1931	.7710
			50-64	.29552	.15171	.303	-.1244	.7155
Social Media to obtain general information	18-35		36-49	-.03796	.31118	1.000	-.8999	.8240
			50-64	.43824	.26849	.513	-.3177	1.1942
			65 +	.11373	.35375	1.000	-.8746	1.1021
	36-49		18-35	.03796	.31118	1.000	-.8240	.8999
			50-64	.47621	.23728	.271	-.1797	1.1321
			65 +	.15169	.33069	.998	-.7745	1.0779
	50-64		18-35	-.43824	.26849	.513	-1.1942	.3177
			36-49	-.47621	.23728	.271	-1.1321	.1797
			65 +	-.32452	.29088	.856	-1.1591	.5101
	65 +		18-35	-.11373	.35375	1.000	-1.1021	.8746
			36-49	-.15169	.33069	.998	-1.0779	.7745
			50-64	.32452	.29088	.856	-.5101	1.1591
Social Media to obtain beef industry information	18-35		36-49	.06798	.34946	1.000	-.8994	1.0353
			50-64	.18781	.29069	.988	-.6306	1.0062
			65 +	-.04159	.34481	1.000	-1.0031	.9199
	36-49		18-35	-.06798	.34946	1.000	-1.0353	.8994
			50-64	.11983	.28056	.999	-.6572	.8969
			65 +	-.10957	.33631	1.000	-1.0411	.8219
	50-64		18-35	-.18781	.29069	.988	-1.0062	.6306
			36-49	-.11983	.28056	.999	-.8969	.6572
			65 +	-.22940	.27475	.958	-1.0024	.5436
	65 +		18-35	.04159	.34481	1.000	-.9199	1.0031
			36-49	.10957	.33631	1.000	-.8219	1.0411
			50-64	.22940	.27475	.958	-.5436	1.0024

Electronic Media to obtain general information	18-35	–	36-49	.26053	.17176	.589	-.2163	.7373
			50-64	.44550*	.12911	.006	.0946	.7964
			65 +	.10652	.14164	.974	-.2898	.5028
	36-49	–	18-35	-.26053	.17176	.589	-.7373	.2163
			50-64	.18497	.18108	.894	-.3125	.6825
			65 +	-.15401	.19022	.963	-.6788	.3708
	50-64	–	18-35	-.44550*	.12911	.006	-.7964	-.0946
			36-49	-.18497	.18108	.894	-.6825	.3125
			65 +	-.33899	.15282	.176	-.7596	.0817
	65 +	–	18-35	-.10652	.14164	.974	-.5028	.2898
			36-49	.15401	.19022	.963	-.3708	.6788
			50-64	.33899	.15282	.176	-.0817	.7596
Electronic Media to obtain beef industry information	18-35	–	36-49	.49441	.21279	.146	-.0980	1.0869
			50-64	.31398	.15802	.276	-.1188	.7467
			65 +	.19071	.21770	.948	-.4258	.8072
	36-49	–	18-35	-.49441	.21279	.146	-1.0869	.0980
			50-64	-.18043	.20790	.949	-.7588	.3979
			65 +	-.30370	.25622	.813	-1.0169	.4095
	50-64	–	18-35	-.31398	.15802	.276	-.7467	.1188
			36-49	.18043	.20790	.949	-.3979	.7588
			65 +	-.12327	.21293	.993	-.7269	.4803
	65 +	–	18-35	-.19071	.21770	.948	-.8072	.4258
			36-49	.30370	.25622	.813	-.4095	1.0169
			50-64	.12327	.21293	.993	-.4803	.7269

Note. * The mean difference is significant at the 0.05 level.

One-way ANOVA to Determine Equality of Means Regarding the Perceived Importance of Communication Tools by Role in Cattle Operation

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Traditional Media to obtain general information	Between Groups	4.277	4	1.069	2.415	.051
	Within Groups	69.069	156	.443		
	Total	73.346	160			
Traditional Media to obtain beef industry information	Between Groups	2.295	4	.574	1.514	.201
	Within Groups	57.992	153	.379		
	Total	60.287	157			
Electronic Media to obtain general information	Between Groups	3.383	4	.846	1.881	.117
	Within Groups	67.901	151	.450		
		71.284	155			

Electronic Media to obtain beef industry information	Between Groups	6.514	4	1.628	2.926	.023
	Within Groups	78.475	141			
	Total	84.989	145			
Social Media to obtain general information	Between Groups	1.564	4	.391	.402	.188
	Within Groups	140.165	144	.973		
	Total	141.729	148			
Social Media to obtain beef industry information	Between Groups	6.487	4	1.622	1.560	.188
	Within Groups	149.710	144	1.040		
	Total	156.197	148			

Post hoc test to determine Equality of Means Regarding the Perceived Importance of Communication Tools by Role in Cattle Operation

Dependent Variable	(I) Role in Cattle Operation	(J) Role in Cattle Operation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Traditional Media to obtain General Information	Owner/Operator	Owner/Non Operator	.07767	.41298	1.000	-1.8399	1.9952
		Herd Manager	1.03137	.32042	.366	-1.1763	3.2391
		Farmhand	-.16307	.44795	1.000	-48.4700	48.1439
		Other	.10360	.17183	1.000	-.4918	.6990
	Owner/Non Operator	Owner/Operator	-.07767	.41298	1.000	-1.9952	1.8399
		Herd Manager	.95370	.51668	.659	-1.0181	2.9255
		Farmhand	-.24074	.60411	1.000	-4.7349	4.2534
		Other	.02593	.44024	1.000	-1.7829	1.8348
	Herd Manager	Owner/Operator	-1.03137	.32042	.366	-3.2391	1.1763
		Owner/Non Operator	-.95370	.51668	.659	-2.9255	1.0181
		Farmhand	-1.19444	.54504	.813	-8.1913	5.8025
		Other	-.92778	.35487	.404	-2.6824	.8268
	Farmhand	Owner/Operator	.16307	.44795	1.000	-48.1439	48.4700
		Owner/Non Operator	.24074	.60411	1.000	-4.2534	4.7349
		Herd Manager	1.19444	.54504	.813	-5.8025	8.1913
		Other	.26667	.47321	1.000	-21.3727	21.9061
	Other	Owner/Operator	-.10360	.17183	1.000	-.6990	.4918

		Owner/Non Operator	-.02593	.44024	1.000	-1.8348	1.7829
		Herd Manager	.92778	.35487	.404	-.8268	2.6824
		Farmhand	-.26667	.47321	1.000	-21.9061	21.3727
Traditional Media to obtain beef industry information	Owner/Operator	Owner/Non Operator	-.21888	.26206	.919	-.9426	.5048
		Herd Manager	.44779	.36659	.739	-.5645	1.4601
		Farmhand	.05890	.44733	1.000	-1.1764	1.2942
		Other	.14779	.20589	.952	-.4208	.7164
	Owner/Non Operator	Owner/Operator	.21888	.26206	.919	-.5048	.9426
		Herd Manager	.66667	.44400	.563	-.5594	1.8928
		Farmhand	.27778	.51269	.983	-1.1380	1.6935
		Other	.36667	.32425	.790	-.5287	1.2621
	Herd Manager	Owner/Operator	-.44779	.36659	.739	-1.4601	.5645
		Owner/Non Operator	-.66667	.44400	.563	-1.8928	.5594
		Farmhand	-.38889	.57320	.961	-1.9718	1.1940
		Other	-.30000	.41334	.950	-1.4414	.8414
	Farmhand	Owner/Operator	-.05890	.44733	1.000	-1.2942	1.1764
		Owner/Non Operator	-.27778	.51269	.983	-1.6935	1.1380
		Herd Manager	.38889	.57320	.961	-1.1940	1.9718
		Other	.08889	.48638	1.000	-1.2542	1.4320
	Other	Owner/Operator	-.14779	.20589	.952	-.7164	.4208
		Owner/Non Operator	-.36667	.32425	.790	-1.2621	.5287
		Herd Manager	.30000	.41334	.950	-.8414	1.4414
		Farmhand	-.08889	.48638	1.000	-1.4320	1.2542
Electronic Media to obtain general information	Owner/Operator	Owner/Non Operator	-.18056	.23896	.999	-1.2363	.8752
		Herd Manager	-.50000	.27993	.899	-3.7778	2.7778
		Farmhand	-.63889	.25693	.919	-20.5059	19.2281
		Other	-.45556	.16646	.169	-1.0264	.1153
	Owner/Non Operator	Owner/Operator	.18056	.23896	.999	-.8752	1.2363
		Herd Manager	-.31944	.35838	.995	-2.0452	1.4063
		Farmhand	-.45833	.34072	.958	-2.9699	2.0533
		Other	-.27500	.27890	.986	-1.2851	.7351
	Herd Manager	Owner/Operator	.50000	.27993	.899	-2.7778	3.7778
		Owner/Non Operator	.31944	.35838	.995	-1.4063	2.0452

		Farmhand	-.13889	.37060	1.000	-3.1071	2.8293
		Other	.04444	.31471	1.000	-1.9710	2.0599
	Farmhand	Owner/Operator	.63889	.25693	.919	-19.2281	20.5059
		Owner/Non Operator	.45833	.34072	.958	-2.0533	2.9699
		Herd Manager	.13889	.37060	1.000	-2.8293	3.1071
		Other	.18333	.29444	1.000	-4.4147	4.7814
	Other	Owner/Operator	.45556	.16646	.169	-.1153	1.0264
		Owner/Non Operator	.27500	.27890	.986	-.7351	1.2851
		Herd Manager	-.04444	.31471	1.000	-2.0599	1.9710
		Farmhand	-.18333	.29444	1.000	-4.7814	4.4147
Electronic Media to obtain beef industry information	Owner/Operator	Owner/Non Operator	.35648	.47740	.999	-1.8570	2.5700
		Herd Manager	-.67130	.20369	.457	-2.5833	1.2407
		Farmhand	-.71296	.29920	.930	-24.5516	23.1257
		Other	-.64352*	.14704	.008	-1.1405	-.1466
	Owner/Non Operator	Owner/Operator	-.35648	.47740	.999	-2.5700	1.8570
		Herd Manager	-1.02778	.51039	.602	-3.1612	1.1057
		Farmhand	-1.06944	.55545	.676	-3.5585	1.4196
		Other	-1.00000	.49054	.608	-3.1476	1.1476
	Herd Manager	Owner/Operator	.67130	.20369	.457	-1.2407	2.5833
		Owner/Non Operator	1.02778	.51039	.602	-1.1057	3.1612
		Farmhand	-.04167	.34944	1.000	-5.5660	5.4826
		Other	.02778	.23282	1.000	-1.2503	1.3059
	Farmhand	Owner/Operator	.71296	.29920	.930	-23.1257	24.5516
		Owner/Non Operator	1.06944	.55545	.676	-1.4196	3.5585
		Herd Manager	.04167	.34944	1.000	-5.4826	5.5660
		Other	.06944	.31975	1.000	-10.0468	10.1857
	Other	Owner/Operator	.64352*	.14704	.008	.1466	1.1405
		Owner/Non Operator	1.00000	.49054	.608	-1.1476	3.1476
		Herd Manager	-.02778	.23282	1.000	-1.3059	1.2503
		Farmhand	-.06944	.31975	1.000	-10.1857	10.0468
Social Media to obtain	Owner/Operator	Owner/Non Operator	.36439	.36288	.988	-1.2446	1.9734
		Herd Manager	-.22821	.63785	1.000	-8.4739	8.0174

general information		Farmhand	.49402	.18828	.797	-3.7063	4.6944
		Other	-.13098	.32041	1.000	-1.3449	1.0829
	Owner/Non Operator	Owner/Operator	-.36439	.36288	.988	-1.9734	1.2446
		Herd Manager	-.59259	.72331	.998	-5.3892	4.2040
		Farmhand	.12963	.38959	1.000	-1.5456	1.8048
		Other	-.49537	.46797	.976	-2.1260	1.1352
	Herd Manager	Owner/Operator	.22821	.63785	1.000	-8.0174	8.4739
		Owner/Non Operator	.59259	.72331	.998	-4.2040	5.3892
		Farmhand	.72222	.65342	.991	-6.4981	7.9426
		Other	.09722	.70297	1.000	-5.0673	5.2618
	Farmhand	Owner/Operator	-.49402	.18828	.797	-4.6944	3.7063
		Owner/Non Operator	-.12963	.38959	1.000	-1.8048	1.5456
		Herd Manager	-.72222	.65342	.991	-7.9426	6.4981
		Other	-.62500	.35038	.708	-2.0064	.7564
	Other	Owner/Operator	.13098	.32041	1.000	-1.0829	1.3449
		Owner/Non Operator	.49537	.46797	.976	-1.1352	2.1260
		Herd Manager	-.09722	.70297	1.000	-5.2618	5.0673
		Farmhand	.62500	.35038	.708	-.7564	2.0064
Social Media to obtain general information	Owner/Operator	Owner/Non Operator	.16001	.42488	1.000	-1.7544	2.0744
		Herd Manager	.34520	.48120	1.000	-5.5158	6.2062
		Farmhand	.64149*	.08919	.000	.3874	.8956
		Other	-.72517	.40268	.659	-2.1637	.7133
	Owner/Non Operator	Owner/Operator	-.16001	.42488	1.000	-2.0744	1.7544
		Herd Manager	.18519	.62941	1.000	-2.7776	3.1480
		Farmhand	.48148	.41541	.971	-1.4906	2.4536
		Other	-.88519	.57163	.795	-2.8239	1.0535
	Herd Manager	Owner/Operator	-.34520	.48120	1.000	-6.2062	5.5158
		Owner/Non Operator	-.18519	.62941	1.000	-3.1480	2.7776
		Farmhand	.29630	.47286	1.000	-6.2891	6.8817
		Other	-1.07037	.61465	.779	-3.9323	1.7916
	Farmhand	Owner/Operator	-.64149*	.08919	.000	-.8956	-.3874
		Owner/Non Operator	-.48148	.41541	.971	-2.4536	1.4906
		Herd Manager	-.29630	.47286	1.000	-6.8817	6.2891

	Other	-1.36667	.39268	.067	-2.8097	.0764
Other	Owner/Operator	.72517	.40268	.659	-.7133	2.1637
	Owner/Non Operator	.88519	.57163	.795	-1.0535	2.8239
	Herd Manager	1.07037	.61465	.779	-1.7916	3.9323
	Farmhand	1.36667	.39268	.067	-.0764	2.8097

Note *. The mean difference is significant at the 0.05 level.

Frequency of Communication Tools

One-way analysis (ANOVA) to Determine Equality of Means Regarding the Frequency of Use of Communication Tools by Respondents Age

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Traditional Media to obtain general information	Between Groups	3.747	3	1.24	3.88	.011*
	Within Groups	35.365	110	.321		
	Total	39.112	113			
Traditional Media to obtain beef industry	Between Groups	1.594	3	.531	1.42	.239
	Within Groups	38.706	104			
	Total	40.300	107			
Electronic Media to obtain general information	Between Groups	3.339	3	1.113	2.33	.078
	Within Groups	50.963	107	0.467		
	Total	54.326	110			
Electronic Media to obtain beef industry information	Between Groups	1.697	3	0.566	0.96	.412
	Within Groups	60.280	103	0.585		
	Total	61.977	106			
Social Media to obtain general information	Between Groups	2.810	3	0.937	.225	.636
	Within Groups	80.744	103	0.784		
	Total	83.554	106			
Social Media to obtain beef in industry information	Between Groups	2.249	3	.750	0.97	.408
	Within Groups	76.995	110	.770		
	Total	79.244	113			

Post Hoc Test to determine equality of means regarding the Frequency of Use of Communication Tools by Respondents Age

Dependent Variable	(I) Age Categories	(J) Age Categories	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Traditional Media to obtain general information	18-35	36-49	-.20452	.16636	.610	-.6385	.2295
		50-64	-.42229*	.14835	.027	-.8093	-.0353
		65 +	-.51963*	.17953	.023	-.9880	-.0513
	36-49	18-35	.20452	.16636	.610	-.2295	.6385
		50-64	-.21777	.13807	.396	-.5780	.1424
		65 +	-.31511	.17113	.260	-.7616	.1313
	50-64	18-35	.42229*	.14835	.027	.0353	.8093
		36-49	.21777	.13807	.396	-.1424	.5780
		65 +	-.09734	.15368	.921	-.4983	.3036
	65 +	18-35	.51963*	.17953	.023	.0513	.9880
		36-49	.31511	.17113	.260	-.1313	.7616
		50-64	.09734	.15368	.921	-.3036	.4983

Traditional Media to obtain beef industry information	18-35	_	36-49	-.14102	.18413	.870	-.6218	.3398
			50-64	-.10402	.16181	.918	-.5265	.3185
			65 +	-.37725	.19061	.202	-.8749	.1204
	36-49		18-35	.14102	.18413	.870	-.3398	.6218
		_	50-64	.03700	.15697	.995	-.3729	.4469
			65 +	-.23623	.18652	.586	-.7233	.2508
	50-64		18-35	.10402	.16181	.918	-.3185	.5265
		_	36-49	-.03700	.15697	.995	-.4469	.3729
			65 +	-.27323	.16452	.350	-.7028	.1563
	65 +		18-35	.37725	.19061	.202	-.1204	.8749
		_	36-49	.23623	.18652	.586	-.2508	.7233
			50-64	.27323	.16452	.350	-.1563	.7028
Electronic Media to obtain general information	18-35		36-49	.29778	.20428	.467	-.2354	.8309
		_	50-64	.39372	.18175	.139	-.0806	.8681
			65 +	.01462	.21851	1.000	-.5557	.5849
	36-49		18-35	-.29778	.20428	.467	-.8309	.2354
		_	50-64	.09594	.17148	.944	-.3516	.5435
_			65 +	-.28316	.21005	.535	-.8314	.2650
	50-64		18-35	-.39372	.18175	.139	-.8681	.0806
		_	36-49	-.09594	.17148	.944	-.5435	.3516
			65 +	-.37910	.18821	.189	-.8703	.1121
	65 +		18-35	-.01462	.21851	1.000	-.5849	.5557
		_	36-49	.28316	.21005	.535	-.2650	.8314
			50-64	.37910	.18821	.189	-.1121	.8703
Electronic media to obtain general information	18-35		36-49	.28622	.22753	.592	-.3080	.8804
		_	50-64	.21439	.20631	.727	-.3244	.7532
			65 +	-.03505	.25237	.999	-.6941	.6240
	36-49		18-35	-.28622	.22753	.592	-.8804	.3080
		_	50-64	-.07182	.18924	.981	-.5660	.4224
_			65 +	-.32127	.23861	.536	-.9444	.3019
	50-64		18-35	-.21439	.20631	.727	-.7532	.3244
		_	36-49	.07182	.18924	.981	-.4224	.5660
			65 +	-.24944	.21847	.665	-.8200	.3211
	65 +		18-35	.03505	.25237	.999	-.6240	.6941
		_	36-49	.32127	.23861	.536	-.3019	.9444
			50-64	.24944	.21847	.665	-.3211	.8200

Social media to obtain general information	18-35		36-49	.21333	.26562	.853	-.4803	.9070
			50-64	.38737	.23877	.371	-.2362	1.0109
			65 +	.03580	.28766	.999	-.7154	.7870
	36-49		18-35	-.21333	.26562	.853	-.9070	.4803
			50-64	.17404	.22175	.861	-.4051	.7531
			65 +	-.17753	.27369	.916	-.8923	.5372
	50-64		18-35	-.38737	.23877	.371	-1.0109	.2362
			36-49	-.17404	.22175	.861	-.7531	.4051
			65 +	-.35157	.24773	.490	-.9985	.2954
	65 +		18-35	-.03580	.28766	.999	-.7870	.7154
			36-49	.17753	.27369	.916	-.5372	.8923
			50-64	.35157	.24773	.490	-.2954	.9985
Social media to obtain beef industry information	18-35		36-49	.18691	.27124	.901	-.5218	.8956
			50-64	.32572	.24634	.551	-.3179	.9693
			65 +	-.02469	.29249	1.000	-.7889	.7395
	36-49		18-35	-.18691	.27124	.901	-.8956	.5218
			50-64	.13881	.22069	.922	-.4378	.7154
			65 +	-.21160	.27124	.863	-.9203	.4971
	50-64		18-35	-.32572	.24634	.551	-.9693	.3179
			36-49	-.13881	.22069	.922	-.7154	.4378
			65 +	-.35042	.24634	.488	-.9940	.2932
	65 +		18-35	.02469	.29249	1.000	-.7395	.7889
			36-49	.21160	.27124	.863	-.4971	.9203
			50-64	.35042	.24634	.488	-.2932	.9940

Note * The mean difference is significant at the 0.05 level.

One-way analysis (ANOVA) to determine Equality of Means Regarding the Frequency of use of Communication Tools by Respondents Type of Cattle Operation

		Sum of Squares	*df*	Mean Square	*F*	Sig.
Traditional	Between Groups	0.442	5	0.088	0.241	.943

Media to obtain general information	Within Groups	42.095	115	0.366		
	Total	42.537	120			
Traditional Media to obtain beef industry	Between Groups	0.157	5	.0311	0.071	.996
	Within Groups	47.373	113	0.419		
	Total	47.530	1118			
Electronic Media to obtain general information	Between Groups	5.630	5	1.113	2.44	.038
	Within Groups	53.526	116	0.467		
	Total	59.156	121			
Electronic Media to obtain beef industry information	Between Groups	5.731	5	0.566	1.86	.105
	Within Groups	69.904	114	0.585		
	Total	75.635	119			
Social Media to obtain general information	Between Groups	3.262	5	0.937	0.92	.468
	Within Groups	78.998	112	0.784		
	Total	82.260	117			
Social Media to obtain beef in industry information	Between Groups	2.347	5	0.469	0.65	.657
	Within Groups	81.460	114	0.715		
	Total	83.807	119			

Post hoc Test to Determine Equality of Means Regarding the Frequency of Use by Age

Dependent Variable	(I) TYPE OP	(J) TYPE OP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Traditional Media to obtain general information	Cow Calf	Feedlot	.12915	.15158	.957	-.3102	.5685
		Show Cattle	-.03805	.28063	1.000	-.8514	.7753
		Seedstock	.05084	.15443	.999	-.3967	.4984
		Stocker/Backgrounder	.25084	.35715	.981	-.7843	1.2860
		Other	.01010	.25798	1.000	-.7376	.7578
	Feedlot	Cow Calf	-.12915	.15158	.957	-.5685	.3102
		Show Cattle	-.16720	.30106	.994	-1.0398	.7054
		Seedstock	-.07831	.18903	.998	-.6262	.4696
		Stocker/Backgrounder	.12169	.37342	1.000	-.9606	1.2040
		Other	-.11905	.28007	.998	-.9308	.6927
	Show Cattle	Cow Calf	.03805	.28063	1.000	-.7753	.8514
		Feedlot	.16720	.30106	.994	-.7054	1.0398
		Seedstock	.08889	.30251	1.000	-.7879	.9657
		Stocker/Backgrounder	.28889	.44184	.986	-.9917	1.5695

		Other	.04815	.36635	1.000	-1.0137	1.1100
	Seedstock	Cow Calf	-.05084	.15443	.999	-.4984	.3967
		Feedlot	.07831	.18903	.998	-.4696	.6262
		Show Cattle	-.08889	.30251	1.000	-.9657	.7879
		Stocker/Backgrounder	.20000	.37459	.995	-.8857	1.2857
		Other	-.04074	.28162	1.000	-.8570	.7755
	Stocker/Backgrounder	Cow Calf	-.25084	.35715	.981	-1.2860	.7843
		Feedlot	-.12169	.37342	1.000	-1.2040	.9606
		Show Cattle	-.28889	.44184	.986	-1.5695	.9917
		Seedstock	-.20000	.37459	.995	-1.2857	.8857
		Other	-.24074	.42781	.993	-1.4807	.9992
	Other	Cow Calf	-.01010	.25798	1.000	-.7578	.7376
		Feedlot	.11905	.28007	.998	-.6927	.9308
		Show Cattle	-.04815	.36635	1.000	-1.1100	1.0137
		Seedstock	.04074	.28162	1.000	-.7755	.8570
		Stocker/Backgrounder	.24074	.42781	.993	-.9992	1.4807
Traditional Media to obtain Beef Industry information	Cow Calf	Feedlot	.02629	.16283	1.000	-.4458	.4984
		Show Cattle	.05486	.30066	1.000	-.8168	.9265
		Seedstock	.01042	.16587	1.000	-.4705	.4913
		Stocker/Backgrounder	-.17477	.38248	.997	-1.2837	.9341
		Other	.08449	.27645	1.000	-.7170	.8860
	Feedlot	Cow Calf	-.02629	.16283	1.000	-.4984	.4458
		Show Cattle	.02857	.32219	1.000	-.9055	.9627
		Seedstock	-.01587	.20230	1.000	-.6024	.5706
		Stocker/Backgrounder	-.20106	.39963	.996	-1.3597	.9576
		Other	.05820	.29972	1.000	-.8108	.9272
	Show Cattle	Cow Calf	-.05486	.30066	1.000	-.9265	.8168
		Feedlot	-.02857	.32219	1.000	-.9627	.9055
		Seedstock	-.04444	.32374	1.000	-.9830	.8941
		Stocker/Backgrounder	-.22963	.47285	.997	-1.6005	1.1413
		Other	.02963	.39207	1.000	-1.1071	1.1663
	Seedstock	Cow Calf	-.01042	.16587	1.000	-.4913	.4705
		Feedlot	.01587	.20230	1.000	-.5706	.6024
		Show Cattle	.04444	.32374	1.000	-.8941	.9830
		Stocker/Backgrounder	-.18519	.40088	.997	-1.3474	.9771
		Other	.07407	.30139	1.000	-.7997	.9479
	Stocker/Backgrounder	Cow Calf	.17477	.38248	.997	-.9341	1.2837
		Feedlot	.20106	.39963	.996	-.9576	1.3597
		Show Cattle	.22963	.47285	.997	-1.1413	1.6005
		Seedstock	.18519	.40088	.997	-.9771	1.3474
		Other	.25926	.45784	.993	-1.0681	1.5866
	Other	Cow Calf	-.08449	.27645	1.000	-.8860	.7170
		Feedlot	-.05820	.29972	1.000	-.9272	.8108

		Show Cattle	-.02963	.39207	1.000	-1.1663	1.1071
		Seedstock	-.07407	.30139	1.000	-.9479	.7997
		Stocker/Backgrounder	-.25926	.45784	.993	-1.5866	1.0681
Electronic Media To obtain general information	Cow Calf	Feedlot	.22601	.16723	.756	-.2586	.7106
		Show Cattle	.95783*	.31508	.034	.0447	1.8709
		Seedstock	.10624	.17019	.989	-.3870	.5994
		Stocker/Backgrounder	-.46717	.48755	.930	-1.8801	.9457
		Other	-.13384	.28965	.997	-.9732	.7055
	Feedlot	Cow Calf	-.22601	.16723	.756	-.7106	.2586
		Show Cattle	.73182	.33654	.258	-.2434	1.7071
		Seedstock	-.11977	.20724	.992	-.7203	.4808
		Stocker/Backgrounder	-.69318	.50168	.738	-2.1470	.7607
		Other	-.35985	.31286	.859	-1.2665	.5468
	Show Cattle	Cow Calf	-.95783*	.31508	.034	-1.8709	-.0447
		Feedlot	-.73182	.33654	.258	-1.7071	.2434
		Seedstock	-.85159	.33802	.127	-1.8311	.1280
		Stocker/Backgrounder	-1.42500	.56833	.130	-3.0720	.2220
		Other	-1.09167	.41133	.093	-2.2837	.1003
	Seedstock	Cow Calf	-.10624	.17019	.989	-.5994	.3870
		Feedlot	.11977	.20724	.992	-.4808	.7203
		Show Cattle	.85159	.33802	.127	-.1280	1.8311
		Stocker/Backgrounder	-.57341	.50268	.863	-2.0301	.8833
		Other	-.24008	.31445	.973	-1.1513	.6712
	Stocker/ Backgrounder	Cow Calf	.46717	.48755	.930	-.9457	1.8801
		Feedlot	.69318	.50168	.738	-.7607	2.1470
		Show Cattle	1.42500	.56833	.130	-.2220	3.0720
		Seedstock	.57341	.50268	.863	-.8833	2.0301
		Other	.33333	.55463	.991	-1.2740	1.9406
	Other	Cow Calf	.13384	.28965	.997	-.7055	.9732
		Feedlot	.35985	.31286	.859	-.5468	1.2665
		Show Cattle	1.09167	.41133	.093	-.1003	2.2837
		Seedstock	.24008	.31445	.973	-.6712	1.1513
		Stocker/Backgrounder	-.33333	.55463	.991	-1.9406	1.2740
Electronic Media to obtain beef industry information	Cow Calf	Feedlot	.21776	.19693	.878	-.3531	.7886
		Show Cattle	.86458	.33434	.109	-.1046	1.8337
		Seedstock	-.06399	.19693	1.000	-.6348	.5069
		Stocker/Backgrounder	-.30208	.56230	.995	-1.9321	1.3279
		Other	-.23264	.33434	.982	-1.2018	.7365
	Feedlot	Cow Calf	-.21776	.19693	.878	-.7886	.3531
		Show Cattle	.64683	.36249	.480	-.4040	1.6976
		Seedstock	-.28175	.24166	.852	-.9823	.4188
		Stocker/Backgrounder	-.51984	.57948	.946	-2.1996	1.1599
		Other	-.45040	.36249	.815	-1.5012	.6004
	Show Cattle	Cow Calf	-.86458	.33434	.109	-1.8337	.1046
		Feedlot	-.64683	.36249	.480	-1.6976	.4040

		Seedstock	-.92857	.36249	.115	-1.9793	.1222
		Stocker/Backgrounder	-1.16667	.63937	.454	-3.0201	.6867
		Other	-1.09722	.45210	.156	-2.4078	.2133
	Seedstock	Cow Calf	.06399	.19693	1.000	-.5069	.6348
		Feedlot	.28175	.24166	.852	-.4188	.9823
		Show Cattle	.92857	.36249	.115	-.1222	1.9793
		Stocker/Backgrounder	-.23810	.57948	.998	-1.9179	1.4417
		Other	-.16865	.36249	.997	-1.2194	.8821
	Stocker/ Backgrounder	Cow Calf	.30208	.56230	.995	-1.3279	1.9321
		Feedlot	.51984	.57948	.946	-1.1599	2.1996
		Show Cattle	1.16667	.63937	.454	-.6867	3.0201
		Seedstock	.23810	.57948	.998	-1.4417	1.9179
		Other	.06944	.63937	1.000	-1.7840	1.9228
	Other	Cow Calf	.23264	.33434	.982	-.7365	1.2018
		Feedlot	.45040	.36249	.815	-.6004	1.5012
		Show Cattle	1.09722	.45210	.156	-.2133	2.4078
		Seedstock	.16865	.36249	.997	-.8821	1.2194
		Stocker/Backgrounder	-.06944	.63937	1.000	-1.9228	1.7840
Social Media to obtain general information	Cow Calf	Feedlot	.13881	.21121	.986	-.4736	.7512
		Show Cattle	.10706	.35858	1.000	-.9327	1.1468
		Seedstock	-.32257	.21515	.665	-.9464	.3013
		Stocker/Backgrounder	.14410	.60307	1.000	-1.6046	1.8928
		Other	.36632	.38999	.935	-.7645	1.4971
	Feedlot	Cow Calf	-.13881	.21121	.986	-.7512	.4736
		Show Cattle	-.03175	.38877	1.000	-1.1591	1.0956
		Seedstock	-.46138	.26240	.497	-1.2223	.2995
		Stocker/Backgrounder	.00529	.62150	1.000	-1.7968	1.8074
		Other	.22751	.41792	.994	-.9843	1.4393
	Show Cattle	Cow Calf	-.10706	.35858	1.000	-1.1468	.9327
		Feedlot	.03175	.38877	1.000	-1.0956	1.1591
		Seedstock	-.42963	.39093	.881	-1.5632	.7039
		Stocker/Backgrounder	.03704	.68573	1.000	-1.9514	2.0254
		Other	.25926	.50855	.996	-1.2154	1.7339
	Seedstock	Cow Calf	.32257	.21515	.665	-.3013	.9464
		Feedlot	.46138	.26240	.497	-.2995	1.2223
		Show Cattle	.42963	.39093	.881	-.7039	1.5632
		Stocker/Backgrounder	.46667	.62285	.975	-1.3394	2.2727
		Other	.68889	.41992	.574	-.5287	1.9065
	Stocker/Backgrou nder	Cow Calf	-.14410	.60307	1.000	-1.8928	1.6046
		Feedlot	-.00529	.62150	1.000	-1.8074	1.7968
		Show Cattle	-.03704	.68573	1.000	-2.0254	1.9514
		Seedstock	-.46667	.62285	.975	-2.2727	1.3394
		Other	.22222	.70266	1.000	-1.8153	2.2597
	Other	Cow Calf	-.36632	.38999	.935	-1.4971	.7645
		Feedlot	-.22751	.41792	.994	-1.4393	.9843

		Show Cattle	-.25926	.50855	.996	-1.7339	1.2154
		Seedstock	-.68889	.41992	.574	-1.9065	.5287
		Stocker/Backgrounder	-.22222	.70266	1.000	-2.2597	1.8153
Social Media to obtain general information	Cow Calf	Feedlot	.19048	.21300	.947	-.4270	.8079
		Show Cattle	.05556	.36116	1.000	-.9914	1.1025
		Seedstock	-.19048	.21300	.947	-.8079	.4270
		Stocker/Backgrounder	.51852	.49953	.904	-.9295	1.9665
		Other	-.05556	.36116	1.000	-1.1025	.9914
	Feedlot	Cow Calf	-.19048	.21300	.947	-.8079	.4270
		Show Cattle	-.13492	.39131	.999	-1.2692	.9994
		Seedstock	-.38095	.26087	.690	-1.1372	.3753
		Stocker/Backgrounder	.32804	.52174	.989	-1.1844	1.8405
		Other	-.24603	.39131	.989	-1.3803	.8883
	Show Cattle	Cow Calf	-.05556	.36116	1.000	-1.1025	.9914
		Feedlot	.13492	.39131	.999	-.9994	1.2692
		Seedstock	-.24603	.39131	.989	-1.3803	.8883
		Stocker/Backgrounder	.46296	.59773	.971	-1.2697	2.1956
		Other	-.11111	.48804	1.000	-1.5258	1.3036
	Seedstock	Cow Calf	.19048	.21300	.947	-.4270	.8079
		Feedlot	.38095	.26087	.690	-.3753	1.1372
		Show Cattle	.24603	.39131	.989	-.8883	1.3803
		Stocker/Backgrounder	.70899	.52174	.751	-.8034	2.2214
		Other	.13492	.39131	.999	-.9994	1.2692
	Stocker/ Backgrounder	Cow Calf	-.51852	.49953	.904	-1.9665	.9295
		Feedlot	-.32804	.52174	.989	-1.8405	1.1844
		Show Cattle	-.46296	.59773	.971	-2.1956	1.2697
		Seedstock	-.70899	.52174	.751	-2.2214	.8034
		Other	-.57407	.59773	.929	-2.3068	1.1586
	Other	Cow Calf	.05556	.36116	1.000	-.9914	1.1025
		Feedlot	.24603	.39131	.989	-.8883	1.3803
		Show Cattle	.11111	.48804	1.000	-1.3036	1.5258
		Seedstock	-.13492	.39131	.999	-1.2692	.9994
		Stocker/Backgrounder	.57407	.59773	.929	-1.1586	2.3068

Note. * The mean difference is significant at the 0.05 level.

Mean and Standard Deviations for Type of Cattle Producer

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Cow/ Calf Producer-Members

Construct	Items	*M*	*SD*

General Usage			
Importance of EM to Obtain General Information	12	3.26	.624
Importance of TM to Obtain General Information	9	2.92	.698
Importance of SM to Obtain General Information	9	1.95	.998
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.09	.766
Importance of TM to Obtain Beef Industry Information	9	3.03	.633
Importance of SM to Obtain Beef Industry Information	9	1.91	.982
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.07	.670
Frequency of Use of TM to Obtain General Information	9	3.02	.596
Frequency of Use of SM to Obtain General Information	9	1.70	.868
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	2.86	.775
Frequency of Use of TM to Obtain Beef Industry Information	9	3.01	.621
Frequency of Use of SM to Obtain Beef Industry Information	9	1.67	.884

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Feedlot Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.02	.641
Importance of TM to Obtain General Information	9	3.07	.481
Importance of SM to Obtain General Information	9	1.77	.892
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	2.82	.708
Importance of TM to Obtain Beef Industry Information	9	3.02	.694
Importance of SM to Obtain Beef Industry Information	9	1.84	.859
General Usage			
Frequency of Use of TM to Obtain General Information	12	2.90	603
Frequency of Use of EM to Obtain General Information	9	2.84	.683
Frequency of Use of SM to Obtain General Information	9	1.56	.757
Beef Industry			
Frequency of Use of TM to Obtain Beef Industry Information	12	2.98	.614
Frequency of Use of EM to Obtain Beef Industry Information	9	2.64	.812
Frequency of Use of SM to Obtain Beef Industry Information	9	1.47	.724

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Show Cattle Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	2.65	.905

Importance of TM to Obtain General Information	9	2.79	.581
Importance of SM to Obtain General Information	9	1.64	1.10
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	2.39	.814
Importance of TM to Obtain Beef Industry Information	9	3.31	.424
Importance of SM to Obtain Beef Industry Information	9	1.72	1.23
General Usage			
Frequency of Use of TM to Obtain General Information	12	3.06	..494
Frequency of Use of EM to Obtain General Information	9	2.11	.619
Frequency of Use of SM to Obtain General Information	9	1.59	1.07
Beef Industry			
Frequency of Use of TM to Obtain Beef Industry Information	12	2.95	.938
Frequency of Use of EM to Obtain Beef Industry Information	9	2.00	.826
Frequency of Use of SM to Obtain Beef Industry Information	9	1.61	1.20

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Seedstock Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.10	.737
Importance of TM to Obtain General Information	9	2.99	.645
Importance of SM to Obtain General Information	9	2.29	1.03
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.00	.819
Importance of TM to Obtain Beef Industry Information	9	3.09	.584
Importance of SM to Obtain Beef Industry Information	9	2.22	1.16
General Usage			
Frequency of Use of TM to Obtain General Information	12	2.97	.574
Frequency of Use of EM to Obtain General Information	9	2.96	.596
Frequency of Use of SM to Obtain General Information	9	2.02	.804
Beef Industry			
Frequency of Use of TM to Obtain Beef Industry Information	12	3.00	.626
Frequency of Use of EM to Obtain Beef Industry Information	9	2.92	.756
Frequency of Use of SM to Obtain Beef Industry Information	9	1.85	.777

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Stocker/Backgrounder Producer-Members

Construct	Items	*M*	*SD*

General Usage			
Importance of EM to Obtain General Information	12	3.44	.822
Importance of TM to Obtain General Information	9	2.00	1.00
Importance of SM to Obtain General Information	9	2.38	.864
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.50	.707
Importance of TM to Obtain Beef Industry Information	9	3.22	.509
Importance of SM to Obtain Beef Industry Information	9	1.77	.192
General Usage			
Frequency of Use of TM to Obtain General Information	12	3.54	.294
Frequency of Use of EM to Obtain General Information	9	2.77	1.17
Frequency of Use of SM to Obtain General Information	9	1.55	.785
Beef Industry			
Frequency of Use of TM to Obtain Beef Industry Information	12	3.18	1.13
Frequency of Use of EM to Obtain Beef Industry Information	9	3.16	.235
Frequency of Use of SM to Obtain Beef Industry Information	9	1.14	.256

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Other Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.27	.556
Importance of TM to Obtain General Information	9	2.74	.341
Importance of SM to Obtain General Information	9	2.06	.954
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.38	.665
Importance of TM to Obtain Beef Industry Information	9	2.68	.523
Importance of SM to Obtain Beef Industry Information	9	2.22	1.24
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.20	.623
Frequency of Use of TM to Obtain General Information	9	3.01	.585
Frequency of Use of SM to Obtain General Information	9	1.33	.577
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	3.09	.884
Frequency of Use of TM to Obtain Beef Industry Information	9	2.92	.615
Frequency of Use of SM to Obtain Beef Industry Information	9	1.72	.772

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviations for Role in Cattle Operation

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Owner/ Operator Producer-Members

Construct	Items	*M*	*SD*

General Usage			
Importance of EM to Obtain General Information	12	3.11	.688
Importance of TM to Obtain General Information	9	2.94	.659
Importance of SM to Obtain General Information	9	1.99	.998
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	2.99	.749
Importance of TM to Obtain Beef Industry Information	9	3.03	.620
Importance of SM to Obtain Beef Industry Information	9	1.97	1.00
General Usage			
Frequency of Use of EM to Obtain General Information	12	2.97	.712
Frequency of Use of TM to Obtain General Information	9	2.99	.602
Frequency of Use of SM to Obtain General Information	9	1.74	.882
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	2.81	.774
Frequency of Use of TM to Obtain Beef Industry Information	9	3.00	.607
Frequency of Use of SM to Obtain Beef Industry Information	9	1.66	.875

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Owner/ Non- Operator Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.29	.567
Importance of TM to Obtain General Information	9	2.87	1.00
Importance of SM to Obtain General Information	9	1.62	.862
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	2.64	1.15
Importance of TM to Obtain Beef Industry Information	9	3.51	.538
Importance of SM to Obtain Beef Industry Information	9	1.81	1.01
General Usage			
Frequency of Use of EM to Obtain General Information	12	2.77	.875
Frequency of Use of TM to Obtain General Information	9	3.31	.541
Frequency of Use of SM to Obtain General Information	9	1.62	.915
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	2.77	.875
Frequency of Use of TM to Obtain Beef Industry Information	9	3.22	.612
Frequency of Use of SM to Obtain Beef Industry Information	9	1.62	.967

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently

Mean and Standard Deviation Scores for the Importance and Frequency of Use of Communication Tools by Construct as perceived by Herd Manager Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.61	.473
Importance of TM to Obtain General Information	9	1.91	.630
Importance of SM to Obtain General Information	9	2.22	1.09
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.66	.333
Importance of TM to Obtain Beef Industry Information	9	2.66	.111
Importance of SM to Obtain Beef Industry Information	9	1.62	.819
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.37	.059
Frequency of Use of TM to Obtain General Information	9	2.86	.995
Frequency of Use of SM to Obtain General Information	9	1.62	.739
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	3.19	.792
Frequency of Use of TM to Obtain Beef Industry Information	9	2.55	.693
Frequency of Use of SM to Obtain Beef Industry Information	9	1.77	.785

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance of Communication Tools by Construct as perceived by a Farmhand Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.75	.3535
Importance of TM to Obtain General Information	9	3.11	.628
Importance of SM to Obtain General Information	9	1.50	.236
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.70	.412
Importance of TM to Obtain Beef Industry Information	9	2.33	.222
Importance of SM to Obtain Beef Industry Information	9	1.33	.111
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.58	.117
Frequency of Use of TM to Obtain General Information	9	3.00	.785
Frequency of Use of SM to Obtain General Information	9	1.66	.111
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	3.25	.3535
Frequency of Use of TM to Obtain Beef Industry Information	9	2.94	.864
Frequency of Use of SM to Obtain Beef Industry Information	9	1.55	.314

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviation Scores for the Importance of Communication Tools by Construct as perceived by Role of Other Producer-Members

Construct	Items	*M*	*SD*
General Usage			
Importance of EM to Obtain General Information	12	3.56	.491
Importance of TM to Obtain General Information	9	2.84	.513
Importance of SM to Obtain General Information	9	2.12	.871
Beef Industry			
Importance of EM to Obtain Beef Industry Information	12	3.64	.393
Importance of TM to Obtain Beef Industry Information	9	3.04	.652
Importance of SM to Obtain Beef Industry Information	9	2.70	1.24
General Usage			
Frequency of Use of EM to Obtain General Information	12	3.34	.650
Frequency of Use of TM to Obtain General Information	9	3.21	.542
Frequency of Use of SM to Obtain General Information	9	2.00	1.14
Beef Industry			
Frequency of Use of EM to Obtain Beef Industry Information	12	3.28	.788
Frequency of Use of TM to Obtain Beef Industry Information	9	2.85	.844
Frequency of Use of SM to Obtain Beef Industry Information	9	2.03	1.05

Note: TM = traditional media, EM = electronic media, SM = social media. A four-point Likert scale was used for the perceived importance of communication tools: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. A four-point Likert scale was used for the frequency of use of communication tools: 1) never, 2) rarely, 3) occasionally, and 4) frequently.

Mean and Standard Deviations for Producer-Member Age

Mean, Standard Deviations, and Significance of the Importance and Frequency of Communication Tools by Age of Iowa Cattle Producers

		Age							
		18-35		36-49		50-64		65+	
Construct	Items[a]	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
General Usage									
Importance of EM	12	3.48*	0.37	3.22	0.77	3.04*	0.67	3.38	0.50
Importance of TM	9	2.89	0.47	2.78	0.67	2.99	0.68	2.88	0.99
Importance of SM	9	2.13	1.06	2.17	0.98	1.69	0.82	2.01	1.08
Beef Industry									
Importance of EM	12	3.37	0.53	2.88	0.83	3.06	0.68	3.18	0.75
Importance of TM	9	3.01	0.74	2.99	0.66	2.98	0.62	3.28	0.52
Importance of SM	9	2.08	1.10	2.01	1.18	1.89	0.94	2.12	0.99
General Usage									
Frequency of EM	12	3.27	0.53	2.98	0.71	2.88	0.78	3.26	0.53
Frequency of TM	9	2.71*	0.48	2.91	0.62	3.13*	0.55	3.23*	0.61
Frequency of SM	9	1.95	0.91	1.74	0.93	1.56	0.79	1.91	0.99
Beef Industry									
Frequency of EM	12	3.08	0.64	2.80	0.82	2.87	0.77	3.12	0.78
Frequency of TM	9	2.87	0.63	3.01	0.65	2.98	0.60	3.25	0.56
Frequency of SM	9	1.85	0.87	1.67	0.97	1.53	0.82	1.88	0.86

Note: *Significance between the age groups, $p<.05$, [a]=The number of items in the construct. The importance scale: 1) very unimportant, 2) moderately unimportant, 3) moderately important, and 4) very important. The frequency scale: 1) never, 2) rarely, 3) occasionally, 4) frequently. EM=Electronic Media. SM=Social Media