

An Innovative New Approach to Animal Care

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Abstract - Agricultural communities in rural areas often difficulty to attain expedient information and resources for their animal health issues. Most veterinarians are usually more than an hour away from the farmers, and in most cases animal health issues are only addressable through phone conversation. Advances in technology have enabled many human health problems to be investigated through telemedicine approaches, and it is believed that a similar approach could improve access and quality of veterinary care, especially in remote locations. The appropriate application of telemedicine can enhance animal care in rural communities by facilitating expedient communication, diagnostics, and possible treatment recommendations, client education improvement, vet visit scheduling, and other tasks. In addition, a telemedicine system could be linked to a strong distance education program that could provide multi-media resources for consumers so that they cannot just solve a crisis, but they can be better informed and thereby prevent medical crises. This project seeks to expand a web-based system and smart device app that will serve as a distance learning and a telemedicine tool to assist farmers in getting immediate support and reaching veterinary care professionals and extension agents. We believe that this service will be a powerful tool to assist animal producers in managing their animals, and to provide them the ability to obtain possible solution for problem they may encounter. We accomplish this by providing access to a database with any smart media device. This database contains simple to understand information with accompanying videos and pictures.

Keywords—*smart media, information extension, management issues*

I. INTRODUCTION

For many Americans the Internet, social media and mobile technology are now a part of their way of life.

Approximately 81% of American adults, and 95% of teens use the Internet [7]. Smart media devices have revolutionized the communication sector of our society. Still, despite the advances in technology, people understand that we have just embarked on a revolution that is in its early phases [1]. Although it is all quite difficult to predict, the high rate of change and progress of Internet functions and applications indicates we can still expect a lot in the coming years [2]. The state of Texas can be regarded as one of the leading goat producing states [5]. In the past 20 years, Texas has seen tremendous increase in the goat industry, however, there has been little increase in the availability of information for the goat producers [11]. The International Goat Research Center (IGRC) at Prairie View A&M University has been instrumental in trying to disseminate information regarding goat management. The Annual Goat Field Day hosted by the International Goat Research Center, has provided valuable information to farmers regarding goat management, from artificial insemination to goat judging. These field-day activities have been widely acknowledged to have major social and economic benefits for the clientele and have accelerated the process development of the goat industry in the region. There is a shift in the way the public requires information. The research has shown that people are more interested in receiving information online in comparison to face-to-face [8]. The changing demographic and the social media revolution have caused the IGRC to seek new and innovative ways to meet the needs of its clientele.

Understanding the change in information delivery methodology and the desire to serve its clientele, the IGRC developed a comprehensive database of livestock management issues specifically dealing with goats. IGRC has provided an

information portal that is both user friendly and responsive. The database is hosted at <https://vetlink.pvamu.edu>. Its content provides information on common diseases affecting the caprine species, symptoms of these diseases, videos of management tips on disease symptoms, and prevention methods. All these are accessible on any smart media devices. This powerful tool has been instrumental in assisting goat producers in the management of their herd.

As the population gravitates towards smart media devices, more people are turning to the Internet to address “common problems” [7]. This has greatly enhanced the capacity of the extension system in reaching more producers at their convenience. This will provide the farming community with the type of information dissemination system they so desire [1].

II. TRADITIONAL VERSUS NEW METHOD

The traditional method of providing information to producers has some limitations. These traditional methods are expensive as it is costly to produce and print the extension bulletins and flyers. It is also costly to train the whole extension personnel to understand the technology and answer possible queries of farmers. It is believed that the traditional system entails one communication, whereby, the information is given to the producer and often times lack a mechanism for appropriate feedback [9]. The capacity of the extension system is very limited. The challenge in terms of reaching all villages and all farmers is becoming more and more difficult. The farming community needs a proper information dissemination system on a continuous basis. The Internet, through the various social media apps, if properly managed can provide a novel alternative to information dissemination for the extension program. Mobile Internet is now commonplace. The data shows that 87% of Americans have cell phones and more than 45 % of adults have smart phone [3].

Mobile connectivity through smartphones and tablet computers, make any time anywhere access to information a reality for the vast majority of Americans. Mobile devices have changed the way people think, how and when they can communicate and gather information by making just-in-time and real-time encounters possible. They have also affected the way people allocate their time and attention [5].

III. METHODS AND APPROACH

The main purpose of this study was to examine how the use of technology by extension professionals can enhance their day-to-day outreach efforts. The authors conducted a survey to gauge how familiar the subjects were with smart media devices and how willing they were to use this technology in their day-to-day activities. The research team sought and obtained funding from USDS/NIFA 1890 Capacity Building Grant Program to achieve the objectives of the project. The objectives were to:

- 1) *Establish a novel livestock diagnostic information delivery system.*
- 2) *Create searchable web database about livestock diseases.*

- 3) *Develop high quality videos discussing individual livestock diseases.*

We obtained additional funding to develop an app, which is now the integral focus of the project. Collaboration between the Computer Science Department and the College of Agriculture and Human Sciences was needed to achieve newly formulated objectives. These new objectives were to:

- 1) *Develop apps that will allow producers to share livestock information*
- 2) *Create a searchable web database about livestock diseases*
- 3) *Create a portal for livestock producers to share management concerns with other producers and livestock healthcare professionals*

SYSTEM STRUCTURE AND IMPLEMENTATION

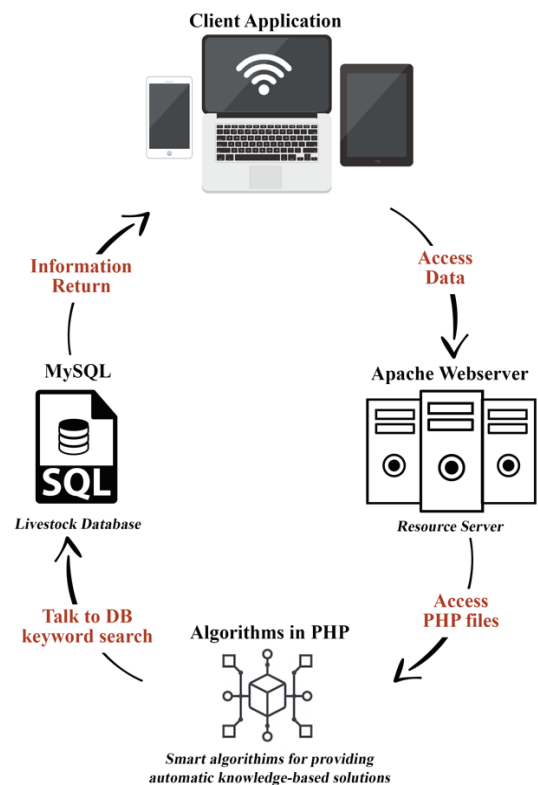


Fig. 1. Server side and client-side work flow for information delivery.

The workflow concept is outlined in figure 1 above. The developmental process was two-fold (1) Web-based development and (2) Native app development. The Web-based component is a simple approach tailored to have the look and feel of an App (<https://vetlink.pvamu.edu/mobile>). In this way we can add features as needed and tailor them to different OS platforms. Web-based apps can look and feel very close to native apps. The users will gain access through their onboard Web browser which will require a network connection. Hence, the users will feel network delays. The native app development for a single mobile OS is the traditional approach, but it's also the most time-consuming. Each mobile platform vendor offers completely different

programming environments, and each has a unique UI style. Apple's Xcode IDE employs the proprietary Objective-C language for iOS devices, while Google's Android coders generally use the open source Eclipse IDE combined with Android's native Android Development Tools (ADT) Java programming plug-in. Microsoft offers Visual Studio Express for Windows Mobile and its Windows Phone SDK. The Web-based development requires specific software to be installed on the server in order to create a seamless connection and operation. The applications used to create web-based app were HTML5, CSS, PHP, JS with XAMPP or phpMyAdmin and MySQL database (Fig 1). This structure is also used to store the database for the native app development process. For the native App development, Swift was used this is a new programming language for iOS, macOS, watchOS, and tvOS app development. Simultaneously, work is being done using Android Studio to create an Android version of the App.

We decided to design and implement a web-based app first, because it was the easiest way to work out all possibilities, and it required less time to deliver and test our program using real users. After obtaining the main techniques about web development we moved forward to use the Swift language which is specific language for the iOS system. While simultaneously developing an Android version of the App

Swift is a revolutionary programming language that is safe, fast, and modern. It is industrial-quality programming language. Swift code is compiled and optimized to get the most out of modern hardware. The syntax and standard library have been designed based on the guiding principle. Its combination of safety and speed make Swift an excellent choice for everything from simple operations to entire operating system.

IV. DATA COLLECTION

The NSF I-CORP training created a framework to interview Animal Producers (N=104) to identify possible customers for the VETLINK app. Individual interviewed were; FFA members, 4H members, Goat Producers, Veterinarians, Vet School Librarians, Extension Agents, American Sheep Industry (ASI) members and American Goat Federation (AGF) members. From these interviews, we were able to identify customer archetypes, whereby we could be aware of their major problems and how our technology could help them. It was apparent that the number one problem was the ability to obtain credible information easily. This was in alignment with our before mentioned objective. This information allowed us to develop a workflow to achieve our objectives (Figure 2).

A collaborative approach was required to make this workflow a practical one to leverage the technology of this era. A new approach was needed to provide the solutions for the farmers who are located in remote areas and are classified as small farmers. They generally owned 20 or less animals and are sometimes more than 50 miles away from the closest veterinarian. Issues like these led to the mobile goat application (app) known as VetLink, developed through

collaboration between the College of Agriculture Sciences and the Department of Computer Sciences. The College of Agriculture and Human Sciences provided the data regarding livestock management, while students within the Department of Computer Sciences were recruited to develop the programming scripts needed to make the app a reality. All programming was done with the supervision of staff within the college

INFORMATION PATHWAY IN ACCESSING THE DATABASE

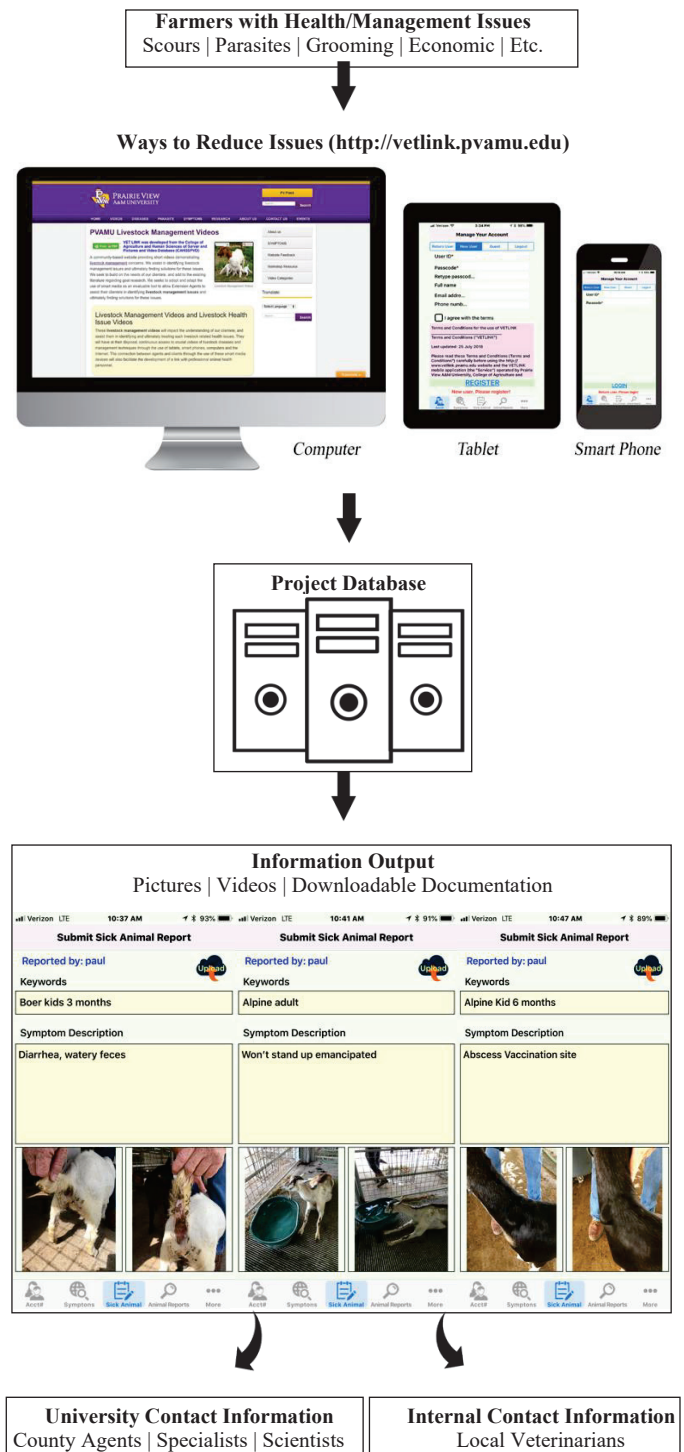


Fig. 2. Work flow for App Development

V. RESULTS

In the 4 years of the database, we have had encouraging results that show there is a need for an online method of information delivery. The videos on the website have been viewed over fifteen thousand times and we average 300 organic views per month for the first two years. All activities on the website is monitored through Google Analytics. The data shows that most of the visitors are within the United State of America (Figure 3a & 3b).

FIGURE 3 (A AND B). WEBSITE TRAFFIC AND GEOGRAPHICAL LOCATIONS

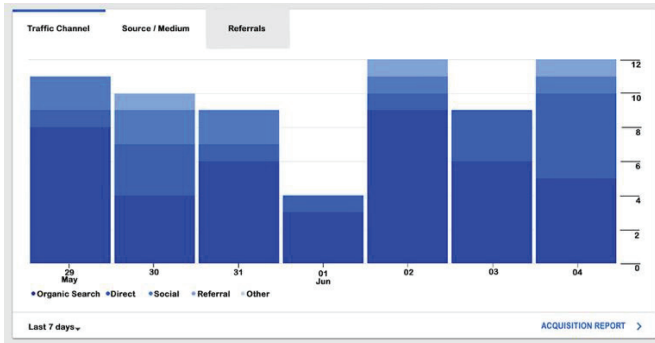


Figure 3a: Data showing Website visits by day from may 29 to june 04, 2018

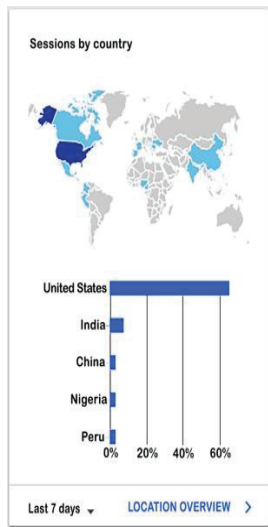


Fig. 3b.

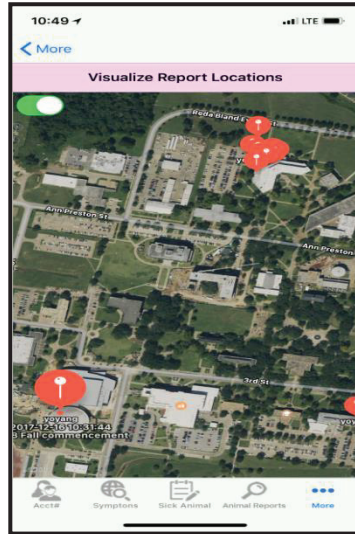


Fig. 4.

Most of the traffic to the website database are classified as organic traffic.

The term “organic traffic” refers to the visitors that land on your website as a result of unpaid (“organic”) search results. Organic traffic is the opposite of paid traffic, which defines the visits generated by paid ads.

By definition, this increase in organic traffic has a strong correlation with the quality and relevant content on the website. The second level of search criteria direct search refers to individuals who visit the page directly. The third group of search criteria is social group. Since social groups originate from content that was streamed this implies the results are more relevant to the user. There is a YouTube

page associated with the website database, which would be the main source of visitors within this group.

The app development is another component of this information delivery project. The app is being developed based on information already on the database. The benefit derived from this approach is noticeable, as the app complements the website and provides an easy way of keeping the app updated with relevant information. The data has shown that the number of mobile users is greater than the number of desktop users. Consequently, it is more effective to use a mobile information delivery system to maximize information reach and to personalize each user’s experience. By providing a personalized service, animal producers are more likely to talk to each other.

VI. CONCLUSION

We are aware that there are similar products on the market. Our product is unique because it was designed to aid producers and not to healthcare vets. Our sole intention is not to provide a diagnosis tool, but to provide information to assist producers to make the best decision.

They may be seeking information about sick animals including possible causes, symptoms, or good practice measures they can implement on their farms. The app will also provide a list of veterinarians in close proximity to the producer’s location.

Visualizing the sick-animal report distribution in both time and geographic location aspect is very important and very useful for researchers and authorized government agency to monitor potential animal disease outbreak, thus issue timely warning message to community.

The “*Visualize geographic distribution of sick animal reports*” (Figure 4) function of the app allows super users, such as authorizes and livestock government agency, to visualize the geographic distribution of all the sick animal reports on Google map. Various constraints can be applied to filter results, such as the date period, the submitter, keywords, and geographic region. Figure 4 is a snapshot of a visualization screen. The map can be either in street mode or hybrid mode, and can be zoomed in/out. Each pin on the map represents one report, and clicking on a pin brings up details of that report. However, regular users can only visualize the reports submitted by himself or herself. Users with special privilege use this function to monitor the places where the diseases are happening, which help answer some critical questions, such as “Where is the center of the animal disease happening?” “How big is the area that is affected by the disease break out?” “How serious is the disease situation (density of the pins)?” “How many animals are getting the disease?” “What kind of disease is it?” “What type of livestock is affected?” This important information can help the scientists and researchers and government officials better monitor the spread of the disease, and issue warning promptly.

The App will be available in the Apple Store in the summer of 2018 while the Android version will be available for

download in the summer of 2019. Using this mobile app individuals will have the advantage of utilizing features of a mobile device like camera, contact list, GPS, phone calls to local vets, compass, Google Maps, etc. Users of this App will be able to utilize features to enhance their experience and ability to locate vets in close proximity.

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