How the Internet of Things Is Impacting Animal Health Part 1: Large Animal

This article talks about how the Internet of Things connects with the animal health industry in a sector known as the "Internet of Animal Health Things" or IoAHT for short. The Web application that we are creating directly links with the animal health industry because the purpose of our app is to track the health of cattle. We have a list of medications that the user creates to apply to their livestock. The cost and quantities of these administrations are kept track of to view different analytics later. Right now we only look at the number of operations and costs of the medication, but it could be taken further. For example, if you wanted to do analytics on cattle that had a certain start weight on the farm, that could be implemented. The article addresses how the demand for meat keeps rising. If the demand keeps going up, obviously farmers have to keep up as well. By farmers using software tools to maximize their efficiency, their methods will become more effective, making more meat available per farm. Not to mention the profits the farmer is also bound to gain. If we have tools to track animal's health, then conclusions might be drawn to make an aspect of the operation more efficient. It is pretty cool to see an article so directly linked to what we are creating for Performance Livestock Analytics. We will definitely see the IoAHT evolve and expand as time goes on with the increasing demand.

The Internet of Animal Healthy Things: IoAHT

This article also talks about the animals and IoT. It suggests that the category of animals can be broken down into different sections such as wildlife, pets, and farm animals. Each section using the IoT to accomplish different tasks and concerns. For example, with wildlife there is a concern with ensuring safety the animals amongst the developing world. Therefore, it is important to track a wild animal's behavior and movements. This is done by a GPS collar sending real time locations to a smartphone or computer.

The category that our group is interested in is farm animals. As the population increases across the world so does the demand for food and this demand for food increases the need for efficient livestock farms. An interesting thing talked about in this article is wearable tech devices. The devices would transmit data to an analysis system and would determine if the cow is "healthy" or getting sick. This feature or wearable device would be the next step to our website. If Performance Livestock were to use this technology the data would tell us if the cow is getting sick before it is actually sick which would allow us to start treatment earlier ie. producing more efficiently. Our website tracks the health of the cows on a manual basis in the terms that someone has to check the cow and determine if it's sick. With the data from the device we could set up alerts to tell the user to check on the cow instead. One thing that we could add to our project is the alert feature. We track when a medication is given to a particular group, but we could add a follow up alert asking if the cow has recovered. We could also alert if a cow has been sick for a certain amount of time.

Over time I believe that the device would be a good addition to our application because the data would improve the usefulness of our application. It would provide more efficient livestock farming. However, for a lot of the farmers is all about minimizing the cost spent on the cattle, so if the collar cost $50 per cattle they wouldn't be able to profit off the cattle. If the collar was long lasting, reusable, reliable, and the batteries lasted a long time I think this would be a viable option since farmers could use the same collar on multiple cattle. Therefore the cost would be spread across multiple cattle.

Recent Advances in Wearable Sensors for Animal Health

In yet another research paper "Recent Advances in Wearable Sensors for Animal Health" published by Suresh Neethirajan the author discusses the potential role of wearable health sensors in the cattle health market. In this work, Dr. Neethirajan discusses the growing importance of cattle farm efficiency as global demand for derivative food stocks continues to increase. A case is then made that this industry is not only ready but waiting for an advancement in health monitoring technologies to help increase operational efficiency on these farms through the effective real-time monitoring of animal health. The author proposes that recent advancements in IoT device technology and the widespread adoption of similar health monitoring devices for humans has driven the cost of the technologies down enough that they are beginning to become cost effective for larger cattle raising operations. He proposes that with a limited up front cost a company could conceivably create devices specifically for cattle application derived from these similar devices currently being used to monitor human health. Dr. Neethirajan then turned his attention to the problem of developing a monitoring platform capable of taking in and monitoring data from this wide array of devices. He says that "there is a need to integrate all the available sensors and create an efficient online monitoring system". Ideally, he says, such a system could monitor sensor data in real-time and provide that data to operations without delay. However, because Dr. Neethirajan's background is in Biological Engineering he offers little insight into how such a system might be developed. However, he does provide clues towards the future of device technology that could be entering markets soon. He points to the development of nano biosensors and advanced molecular biology diagnostic techniques as one possible method of preventively detecting various kinds of infectious diseases for cattle. Dr. Neethirajan concludes his article by saying that the large-scale adoption of these types of emerging techniques and technologies is likely. It would be smart, therefore, to consider the future of our own cattle health system within the context of this information.

Non-Invasive Sensor Technology for the Development of a Dairy Cattle Health Monitoring System

The research paper "Non-Invasive Sensor Technology for the Development of a Dairy Cattle Health Monitoring System" written by Anshul Awasthi, Daniel Riordan and Joseph Walsh, discusses the possibility and feasibility of using non-invasive sensors in order to monitor the health of dairy cattle. The paper opens with how monitoring the health of an a cow would benefit the farmer and economy and goes into how they conducted their study to show how it can be done.

First covered in their research was a study of the economy and what portion was made up of livestock and its importance to the world. The emphasis here is that the cattle market has grown rapidly in recent years and with it expected to continue to grow, there is a need to monitor the health of animals without having a farmer inspect each animal as that is impractical with larger herds.

In the study the authors conducted they identified nine common health events that a cow can experience. These health events have a capability to affect the human population directly whether that be by causing a shortage in product or the overall quality. For each of the health events the researchers describe the measurable indicators that occur when a cow has the given health event along with the impact farmers have experienced from that event. The conclusion of this was that the illnesses identified have a significant role in the amount a farmer can make.

Finally the researchers describe a case of a cow getting a certain illness and what symptoms are expressed. They then describe an apparatus with the necessary sensors to be able to identify the nine health events and what work went into deciding upon the system they opted for.

In conclusion the authors performed a very practical study and have worked on creating a system that will provide useful information to the farmer that will go far in providing a positive impact not only for the farm it's implemented on but on society as a whole.

Internet of Animal Health Things (Opportunities and Challenges)

This research paper, written by authors from Zoetis Inc. (an animal health company) and authors from the University of Cambridge seeks to discuss what an internet of animal health things (IoAHT) could potentially mean for the animal production industry, along with some of the potential problems that may be encountered when looking to make this concept a reality. Initially, the paper discusses the difficulty of the animal production industry from both a labor and a data-recording point of view. This leads to issues with being able to track data properly, and can prevent the suppliers of animal products from being able to give detailed breakdowns of what is in the animal products that they produce. The concept being pitched in this paper is essentially that through the utilization of sensor for animals throughout the process, it is possible to create something that is similar to an IoT, but with animal health, hence the IoAHT. This allows the farmer to track vitals for all the animals that they are raising in a more seamless way that provides the detailed background information that consumers demand today. The challenge that is being faced with this concept today is that there is no defined industry standard for how

to approach storage of this type of data. In addition to this concept being fairly new to the industry, there is also the fact that collection of the data for the creation of this IoAHT is fairly invasive, and while possible to use seamlessly, one of the major problems is that this seamlessness causes the invasiveness to be obscured for someone who is not familiar with the way that the data is being utilized. As a whole, the concept of having an Internet of Animal Health Things seems to be extremely beneficial, both for the farmers who utilize the product and for those that consume the products that are produced by those farmers. This is a really neat conceptual idea, and it is something that could potentially be beneficial in the context of our work with Performance Livestock Analytics. The issue with data privacy and understanding of the invasiveness of utilizing other users' data to perform larger data analytics may be a difficult obstacle to overcome however, so realistically this seems to be something that would need to be more widely standardized before it's something that we or our client could utilize. This need for a standardized process for storage of the data and acceptance from the farmers involved in the product is cited as a prerequisite for the IoAHT, and it is clear from reading through the article that this is something that would need to be in place for us to utilize it as well.

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