Journal of
Information
Systems
Education

Volume 36
Issue 4
Fall 2025

Teaching Case

Smart Poultry Farming Using the Internet of Things, Artificial Intelligence, and Analytics: A Project Management Case

Denise McWilliams, Ash Mady, and Cindi Smatt

Recommended Citation: McWilliams, D., Mady, A., & Smatt, C. (2025). Teaching Case: Smart Poultry Farming Using the Internet of Things, Artificial Intelligence, and Analytics: A Project Management Case. *Journal of Information Systems Education*, 36(4), 379-383. https://doi.org/10.62273/DMUU5863

Article Link: https://jise.org/Volume36/n4/JISE2025v36n4pp379-383.html

Received:	December 31, 2024
First Decision:	April 8, 2025
Accepted:	June 14, 2025
Published:	December 15, 2025

Find archived papers, submission instructions, terms of use, and much more at the JISE website:
https://jise.org

ISSN: 2574-3872 (Online) 1055-3096 (Print)

Journal of Information Systems Education, 36(4), 379-383, Fall 2025
https://doi.org/10.62273/DMUU5863

Teaching Case
Smart Poultry Farming Using the Internet of Things, Artificial Intelligence, and Analytics: A Project Management Case

Denise McWilliams
Ash Mady
Cindi Smatt
Mike Cottrell College of Business
University of North Georgia
Dahlonega, GA 30597, USA
denise.mcwilliams@ung.edu, ash.mady@ung.edu, cindi.smatt@ung.edu

ABSTRACT

Efficient and profitable business operations today rely on the use of advanced technologies. This is particularly evident in managing family farms in the competitive broiler chicken industry. Farmers raising broiler chickens from chick to optimum weight in five weeks require investments in and use of smart farming technologies employing the Internet of Things (IoT), automated monitoring and alerts, artificial intelligence, and machine learning. This case explores these technologies at one family farm in North Georgia to understand how smart technologies and the Internet of Things (IoT) provide an automated workforce and consistent production results. The farm, located in Dawsonville, Georgia, is a large operation raising 200,000 chickens per cycle with a workforce of two. Understanding the application of smart technologies in family business operations aids in meeting world food demand, increasing food quality, and farmer profitability. This case study is used in undergraduate and graduate-level management information systems, analytics, and project management courses to critically evaluate the application of these technologies in creating a more efficient business operation. Teaching notes with suggested guidelines, assignments, and discussions are provided upon request.

Keywords: Project management, Teaching case, Internet of Things (IoT), Artificial intelligence, Analytics, Case-based learning

1. INTRODUCTION

Many people do not realize the technological complexity involved in poultry farming today. We go to the grocery or a restaurant to purchase chicken for our meals, but we fail to understand or appreciate how it is produced. John and Brady own a large, multigenerational poultry farm in North Georgia. They raise 200,000 chickens in five-week cycles, making this a massive operation that could be managed by two people only with the use of advanced technologies.

Georgia is the top-producing broiler state in the U.S., according to the 2024 USDA Poultry Production and Value report (USDA, 2025) and is the largest agricultural segment in Georgia (UGA Extension, n.d.). The broiler chicken industry is vertically integrated and organized as integrators and producers. The farm operation is the producer working with one of several companies as integrators providing hatcheries, feed mills, and processing plants. Integrator companies include Tyson, Purdue, and Mar-Jac. Producers contract with a single integrator to make a "moderate" return, especially considering the high investment costs to build and maintain housing, equipment, and smart technologies (Derksen, 2019; The Poultry Site, 2006). Production cycles range from 5 to 7 weeks based on the contract and desired broiler weight.

The case of a North Georgia family farm raising 200,000 broiler chickens per cycle with only two employees showcases how smart technologies—such as IoT, AI, and automated systems—can revolutionize operations in traditional agricultural settings. However, as these farms become increasingly tech-dependent, they face new strategic challenges. Students are asked to critically evaluate not just the benefits of these innovations, but also the strategic challenges in organizational and operational implications involved in implementing and scaling smart farming technologies.

2. BACKGROUND

The project in this case is based on an actual poultry farm in North Georgia. As structured, undergraduate and graduate-level courses may benefit from using this case as a semester-long series of assignments. Alternatively, one or more specific assignments may be selected for course modules. In this case, students assume the consultant role responsible for developing and implementing smart technologies to create more efficient farm operations including the internet of things (IoT), artificial intelligence, machine learning, and analytics. This case is intended for use in an information systems project management course. However, the case may also be applied in analytics, systems analysis and design, and information systems capstone courses.

3. CASE TEXT

3.1 Overview

Several years ago, before partnering with Brady, John realized that the traditional model of managing farm operations involving manual labor, monitoring, and management was not sustainable. Therefore, John began to investigate and understand these technologies for use in the family farm's business operations. John explored how these technologies were applied at several farms across North Georgia and talked with technology and equipment vendors.

Furthermore, efficient and profitable operations depend upon smart technologies and IoT integration to operate equipment, monitor environmental conditions, and send alerts when attention is needed. Consistent production weights bring bonus payments to producers. John's preliminary research indicated numerous advanced technologies available for poultry management, including feeding, watering, behavioral monitoring, and environmental monitoring and control (Ojo et al., 2022). The technologies employed include IoT sensors (Ojo et al., 2022), AI-enabled computer vision for welfare management (Guo et al., 2022; Okinda et al., 2019), sound analysis in health and welfare for early disease detection (Mbelwa et al., 2021), and big data and machine learning analyses to optimize overall farm performance (Patel et al., 2022).

John realized the significance of employing technologies to create efficient operations and ensure that the family farm provides a sufficient income base. However, he is beginning to feel overwhelmed as he attempts to understand what advanced technologies are available and which should be implemented. Thus, John seeks advice from his sister, Mary, who works as a consultant at a technology company.

As Mary, you (the student) are challenged to help John. Mary begins by interviewing John to understand the business vision, operations, and requirements. She then researches available vendors and technologies to develop deployment options for consideration.

3.2 The Interview

The goals of the interview are threefold: 1) document a business vision; 2) develop business operations process diagrams; and 3) develop a list of requirements. Mary develops a preliminary list of interview questions, including:

- What is your vision for the business operation?
- Describe your current farming operations, including:
  - Operational structure
  - Buildings and purpose
  - Equipment
  - Employee roles and responsibilities
  - Affiliations (vendors and integrator)
  - Reporting
  - Process flow(s)
- What are your challenges or pain points in operating the farm?
- How do you measure productivity?
- What performance measures are used to evaluate farming operations?
- Which integrator is currently contracted?
  - Is automation a requirement of this integrator now or in the future?
  - If so, what are the terms?

"Let's get started," Mary says to John, who begins to talk about farm operations. Operating a poultry farm without automation is time-consuming and labor-intensive. The feed is stored in large bins next to each chicken house (referred to as the *House*). Five-gallon buckets are filled with feed and manually distributed to feeding pans within the House. The process is repeated for water, which is distributed to watering troughs. John manually operates winches to raise and lower the feed pans to control consumption.

The environment for raising chickens is strictly controlled to prevent disease and pest infiltration and to optimize growth. Therefore, the chickens do not go outside. They are free to roam within the House. Each House contains ventilation, fans, lights, heaters, and cooling equipment. John must manually enter each House multiple times throughout the day to maintain proper temperature, humidity, airflow, and ammonia levels (feces). Adjustments vary as the young chicks grow into chickens and achieve the optimum weight, approximately 4.5 pounds over five weeks. Between each five-week cycle is a cool-down period of 2-3 weeks, allowing time to clean out the Houses and prep for a new cycle. Seven-week cycles are also an option, with vendors like Tyson producing larger chickens. However, John prefers managing the shorter five-week cycle.

Additionally, John takes visual and auditory cues when entering a House. He can enter a House, and based on the sounds of the chickens, he can tell whether they are happy, sick, or distressed. Observing chicken behavior also provides visual welfare cues such as posture, missing feathers, and pecking. For example, chicken legs' size, shape, and color indicate adequate water consumption. The current operational capacity without automation is 10,000 chickens, barely enough to maintain an income for John.

Currently, there are no employees. John is the sole, independent operator of the farm. The integrator is Mar-Jac Poultry, a Gainesville, Georgia-based company supplying chickens for store-brand rotisserie chickens. Through the Mar-Jac contract, John purchases chicks and feed. Mar-Jac then buys back the chickens based on the weight gained. Bonuses are awarded based on consistent weight with less feed. Furthermore, Mar-Jac conducts periodic inspections to ensure the welfare of the chickens. John has also learned that Mar-Jac will soon limit independent operator contracts to those with poultry farm automation.

At present, the process of measuring productivity is conducted manually, relying primarily on the use of spreadsheets. This approach requires farm personnel to input and manage performance data without the aid of automated systems or integrated software tools. Key indicators used to evaluate productivity include the total number of chickens raised, the average weight of birds at market age, the feed conversion ratio, and the mortality rate over a given production cycle. These metrics provide critical insight into operational efficiency and animal health. Furthermore, performance data are compared with that of other farms in the region to establish benchmarks and identify areas for improvement. This regional benchmarking serves as a valuable tool for assessing competitive standing and informing data-driven decision-making.

John will be the second independent operator in Dawsonville to apply advanced and smart technologies. Farmers in the area have been hesitant, or even afraid, to automate. However, John sees automation and technology as the future for sustainable and profitable operations. Operating at the scale needed to sustain two families, John and Brady, can only be achieved this way.

As a result of the interview, Mary confirms John's business vision as:

1) Taking the family farm operation from manual to automated with advanced technologies.
2) Expanding the operation to significantly increase production and profitability, thus accommodating a partner, Brady, his son-in-law.

3.3 Poultry Management Technologies

Mary expanded on John's preliminary research to understand available smart technologies for poultry management. Consistent with John's findings, advanced technologies are available to manage feeding, watering, behavioral monitoring, and environmental monitoring and control. In addition, Mary confirmed that advanced analytical techniques are available for monitoring and reporting utilizing big data, IoT, AI, computer vision, and machine learning. Mary can appreciate how overwhelmed John must feel. Having been the younger sibling in the family, Mary had not previously understood the depth of complexity involved in poultry management. When considering poultry's contributions to meeting food demand worldwide, Mary appreciates the rigor involved in producing a safe, consumable food product.

As Mary organizes her findings and develops options for John to consider, she reflects on today's advanced and smart technologies available today. Mary develops a table to help John organize and understand the findings. Refer to Table 1 for Mary's summary of available technologies. Table 1 represents a summarized list of technologies and available vendors. This is not intended to be a comprehensive list, as technological innovations continue at a rapid pace.

3.4 Assessing and Managing Performance

In addition to the equipment and operating technology, John hopes to take advantage of advanced capabilities for assessing and managing farm performance and welfare management. Based on the research, he understands that data collected through sensors, cameras, and microphones produces a performance dashboard, generates notifications and alerts, and performs analyses that enable performance optimization. Ad-hoc and repetitive reports can also be produced based on business needs, data captured, and analysis results. In addition to the previously mentioned performance measures, John can use computer vision, AI, and machine learning techniques for the following purposes:

- Detecting diseases and abnormal behaviors (disease predictive analytics)
- Estimating density and crowding
- Optimizing feed systems and feed consumption
- Detecting pest and predator infiltration (i.e., coyote, fox, mouse, rat, snake)
- Estimating and predicting body weight
- Estimating cloacal temperature
- Recognizing lameness
- Diagnosing respiratory problems
- Analyzing broiler vocalizations

Mary advises John to prioritize these analyses, dashboard(s), and reports so that functionality can be phased in as he becomes familiar with their application and utilization.

3.5 Implementing a Solution

Mary meets with John to discuss options for implementing technology throughout the family farm. They develop a plan to phase in the equipment, hardware, and software needed over two years. John feels more comfortable with the implementation process and is confident that production will increase to provide sufficient income for John and Brady. John estimates a targeted production volume of 200,000 chickens per five-week cycle.

Six fully enclosed Houses measuring 500 feet by 48 feet are needed to achieve John's target. Furthermore, each House is equipped with two feed bins (like a silo), each holding 28,000 pounds of feed. Automating the movement of feed from the bins to pans inside a House involves the installation of an auger, feed clocks, and computer software to manage flow and volume and monitor consumption. Similarly, water is piped into a pneumatic drinking system. Vitamins and medication can be administered through the watering system.

John will also need to install components for IoT that will enable communication between equipment, sensors, and operating software. Zones are created within a House to manage the environment precisely. Each House will contain:

- Tunnel doors with evaporative cooling
- In-house stir fans
- Lights and light clock functions with dimming
- Operation of air inlets with static pressure
- Inside and outside temperature gauges
- Heating and cooling equipment
- Humidity, air speed, static pressure, carbon dioxide, and ammonia sensors
- Sprinklers
- Surge protectors
- Cameras
- Microphones
- Software to monitor sensors, manage tolerance thresholds, and control equipment
- Software to manage alerts and notifications to mobile devices when manual attention is needed

There are several options to phase in the automation and advanced technologies. Mary and John carefully evaluate options and work with several vendors to develop a detailed implementation plan spanning two years. Budgetary concerns and costs are also evaluated, which may impact financing and implementation options. John is excited about the prospects for a sustainable farm operation.

4. ASSIGNMENTS

The *Smart Poultry Farming* case offers opportunities for numerous possible assignments and flexibility in adapting assignments for various information systems courses. Students may work as individuals or teams to perform assignments related to this case. The assignments can be completed as stand-

Category	Description	Technologies	Vendors
General	Applicable to all technologies.	Fiber optic, ethernet, and wireless communications. Internet access. Cloud storage and applications usage. IoT sensors, cameras, microphones, Zigbee, GPRS, Ardunio, RFID, Bluetooth, Biosensors, and mobile phones. Storage of data types for audio, images, videos, and text.	Numerous.
Feeding	The control of feed flow, volume, and consumption.	Automated feeding equipment such as augers, bins, feed clocks, and storage. Analytical techniques include linear regression, neuro fuzzy, and decision trees.	Chore-Tronics; Ohaus Corp.; Waterer.
Watering	The monitoring and control of water flow, volume, and consumption.	Automated watering equipment such as water tanks, tubes, and pneumatic drinking systems. Analytical techniques include linear regression, and decision trees.	Chore-Tronics; Ziggity Systems, Inc.; Waterer.
Behavioral monitoring	The remote monitoring of poultry behavioral characteristics including feeding, resting, running, respiratory rate, activity monitoring, cloacal temperature, posture, pecking, rale sound, and weight.	IoT sensors, cameras, microphones, and mobile phones. Internet and/or cloud access to data storage and applications. Estimating crowded chickens and density employs deep learning, k and fuzzy-C. Monitoring activity utilizes decision trees, artificial neural network (ANN), deep learning, linear regression, Bayesian regression. Mobile phone alerts and notifications.	Marantz; SoundTalks; Allied Vision Technologies; Monacor; Texas Instruments; SGX; Ohaus Corp.
Behavioral control	Control or intervention techniques for managing livestock.	Analyzing feed consumption and body weight. Assessing health status for lameness, weight, growth, and heat stress.	Same as behavioral monitoring.
Environmental monitoring and control	The remote sensing, monitoring, and control of the poultry environment include temperature, lighting, moisture, feces content, humidity, ammonia, carbon dioxide, and pest monitoring. Reporting of malfunctioning devices.	IoT sensors (humidity, temperature, CO_2, ammonia, air speed, static pressure) and data transmission. Internet and/or cloud access to data storage and applications. Automated equipment operation for fans, ventilation, evaporative cooling, air inlets, lights, tunnel doors, sprinklers, and heaters. Analytical techniques for monitoring include linear regression, fuzzy logic, neuro-fuzzy, ANN, and deep learning. Mobile phone alerts and notifications.	Agri Alert; Chore-Time Chore-Tronics; Fancom BV; Panningen; MTech Systems; Maximus; Big Dutchman.
Disease analytics	Early detection and diagnosis of diseases to avoid disease spread and manage large poultry numbers. Decrease the need for manual observation and human decision making.	Analyzing eating patterns, poultry movement patterns and postures, weight checking, and poultry sound analysis. Dashboard displaying analytical assessments for decision-making and alerts. Mobile phone alerts and notifications.	Idexx; Maximus; RoboScientific.
Analytical analyses	Feed conversion ratio optimization. Varied analyses for optimizing farm operations.	Analyses include images, vocalization, classification, regression, and clustering. AI and machine learning techniques such as deep neural networks, recurrent neural networks, deep belief networks, convolutional neural networks (digital image processing), autoencoders, generative adversarial networks, deep reinforcement learning. Dashboards displaying analytical assessments for decision-making and alerts. Mobile phone alerts and notifications.	Chore-Tronics; MTech Systems; Maximus.
Computer vision	A non-invasive, low-cost, image-based automated process control for poultry health and welfare management.	Hardware (2D and 3D digital cameras, computers, and lighting units) and software (image processing and analysis algorithms). Data storage.	Baader Poultry; FLOX.

Table 1. Advanced and Smart Poultry Technologies

alone exercises for specific modules, a semester-long series of related assignments, or capstone project, based on the syllabus.

5. CONCLUSION

This case presents opportunities to engage students in a real-world application of advanced and smart technologies in the farming industry, specifically poultry farming. However, IoT, artificial intelligence, computer vision, and analytics have similar applications across numerous industries. For example, these technologies are utilized in many farming operations, such as livestock and water management. IoT and analytics are heavily used in managing sports and recreational fields, golf courses, and manufacturing. Understanding the application and implementation of advanced and smart technologies provides a competitive advantage to students entering the information systems workforce.

Students working as individuals or teams can complete numerous assignments related to this case, which is based on a real-world situation at a family farm in North Georgia. The names and dialogs have been fictitiously created based on actual scenarios. The assignments can be completed as stand-alone exercises for specific modules or a semester-long series of related assignments. Students experience a real-world case and its associated challenges.

6. REFERENCES

Derksen, B. (2019, April 9). *Thinking of Starting a Poultry Business? Here's What You Need to Know.* The Poultry Site. https://www.thepoultrysite.com/articles/thinking-of-starting-a-poultry-business-heres-what-you-need-to-know

Guo, Y., Aggrev, S. E., Wang, P., Oladeinde, A., & Chai, I. (2022). Monitoring Behaviors of Broiler Chickens at Different Ages With Deep Learning. *Animals*, 12(23), 3390. https://doi.org/10.3390/ani12233390

Mbelwa, H., Machuve, D., & Mbelwa, J. (2021). Deep Convolutional Neural Network for Chicken Diseases Detection. *International Journal of Advanced Computer Science and Applications,* 12(2), 759-765. https://doi.org/10.14569/IJACSA.2021.0120295

Ojo, R. O., Ajayi, A. O., Owolabi, H. A., Oyedele, L. O., & Akanbi, L. A. (2022). Internet of Things and Machine Learning Techniques in Poultry Health and Welfare Management: A Systematic Literature Review. *Computers and Electronics in Agriculture*, 200, 107266. https://doi.org/10.1016/j.compag.2022.107266

Okinda, C., Lu, M., Liu, L., Nyalala, I., Muneri, C., Wang, J., Zhang, H., & Shen, M. (2019). A Machine Vision System for Early Detection and Prediction of Sick Birds: A Broiler Chicken Model. *BioSystems Engineering*, 188, 229-242. https://doi.org/10.1016/j.biosystemseng.2019.09.015

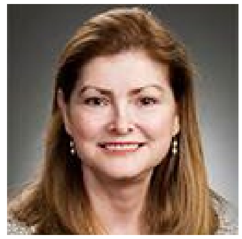
Patel, H., Samad, A., Hamza, M., Muazzam, A., & Harahap, M. K. (2022). Role of Artificial Intelligence in Livestock and Poultry Farming. *Sinkron: Journal & Penelitian Teknik Informatika*, 7(4), 2425-2429. https://doi.org/10.33395/sinkron.v7i4.11837

The Poultry Site. (2006, May 3). *Guide for Prospective Contract Broiler Producers.* The Poultry Site. https://thepoultrysite.com/articles/guide-for-prospective-contract-broiler-producers

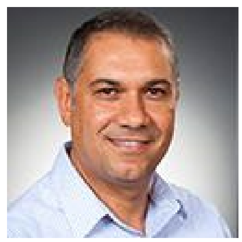
UGA Extension. (n.d.). *Poultry and Eggs.* University of Georgia. https://extension.uga.edu/topic-areas/animal-production/poultry-eggs.html

USDA. (2025, April 29). *Poultry Production and Value 2024 Summary*. U.S. Department of Agriculture, National Agricultural Statistics Service. https://release.nass.usda.gov/reports/plva0425.pdf

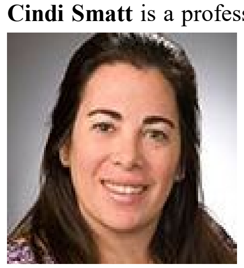
AUTHOR BIOGRAPHIES



Denise McWilliams is an assistant professor of information systems in the Mike Cottrell College of Business at the University of North Georgia. Her research involves the behavioral aspects of information systems and intelligent assistants, as well as analytical techniques. She has thirty years' consulting and information systems experience. Her work has been presented at numerous conferences and has been published in Information Systems academic journals.



Ash Mady is an associate professor of information systems and serves as department head of the Computer Science and Information Systems department in the Mike Cottrell College of Business at the University of North Georgia. He has over twenty years of experience in management and software engineering. He teaches a variety of computer science and information systems courses. His research interests include information systems and security topics with publications in numerous Computer Science and Information Systems academic journals.



Cindi Smatt is a professor of information systems and serves as associate department head of the Computer Science and Information Systems department in the Mike Cottrell College of Business at the University of North Georgia. She teaches a variety of information systems and database management courses. Her research interests include information systems and database topics with publications in numerous Information Systems academic and higher education journals.

INFORMATION SYSTEMS & COMPUTING ACADEMIC PROFESSIONALS

STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the ***Journal of Information Systems Education*** have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN: 2574-3872 (Online) 1055-3096 (Print)