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| **Client:** | Akhere Olenloa | **File:** 24-004 |
| **Dept:** | Agricultural and Biological Engineering | **Faculty:**  **Student:** |
| **Date:** | 1/30/24 | **Initial Meeting:**  **Follow-up:** |
| **Consultant and Attendees:** Sumeeth Guda, Akhere Olenloa, Dr. Bruce Craig, Dr. Klein Ileleji | | |
| **Statement of Problem:** To investigate the challenges that grain farmers and grain elevators face regarding adopting grain monitoring technology. Additionally, to develop a predictive model for the adoption of the technology. | | |
| **Goal of this Project:** Ph. D Dissertation, Journal Article | | |
| **Background:** The purpose of the study is to understand the state of adoption of grain storage monitoring technologies. Evidence suggests that there is a very low adoption rate despite advancements in technology. The problem the client wants to address is why only 10% of on-farm storage owned by farmers use a form of monitoring technology, and 30% of off-farm storage owned by grain elevators use a form of monitoring technology. | | |
| **Progress of project at this time:** Design Phase (No data collected). | | |
| **Relevant information presented at the meeting:**  The project is still in the design phase. The survey will be sent virtually to a representative nationwide sample of both farmers and grain elevator operators regarding their decision to adopt or not adopt grain management technologies. A pilot study was conducted with 5-6 participants using a draft copy of their survey. All respondents were connected with Purdue University. The number of samples needed to do this survey will be determined at a later time and date. Because the survey wasn’t attached to the client’s initial application, the bulk majority of the meeting was the client walking Sumeeth and Dr. Craig through the draft survey he created. The draft survey has 5 major thematic sections.   1. The first section is collecting demographic information about the participants. Collecting the education level, gender, and region the participants are located in. 2. The second section is about the characteristics of the grain storage facilities that the farmers or grain elevators have. It asks about their storage capacity, the type of grain collected, storage period, business period, and if there are already grain monitoring technologies in place. 3. The third section is about the technological features and drivers for adoption of the grain monitoring technology, assuming the participant already utilizes grain monitoring technology. Specifically what company their technology is from, what factors are being monitored (Humidity, CO2, Spoilage, Insects, Temperature, etc.), the frequency of the monitoring, and the use of the factor within the grain management. 4. The fourth section collects data regarding the participants’ perceptions and benefits of adopting grain storage management technologies. 5. The fifth section is asking about the challenges and constraints with respect to the adoption or use of grain storage technology.   Within the survey, there were some issues identified in the thematic sections. A concern Dr. Craig had about the survey was that the way the survey was worded as it carried the implication that the participants had already adopted the monitoring technology. There was a lack of sections for participants who did not adopt the technology or chose not to adopt the technology. The two main problem areas are thematic areas 3 and 4 with respect to area 2. The participants who did not adopt the technology could not answer any of the questions in area 3. Additionally, within area 4, it was more geared towards participants who adopted the technology, as question 23 which was part of this grouping did not have a complementary section for participants who did not have the technology.  Another concern Dr. Craig had about the survey was that it wasn’t inclusive in several broad areas. In the first thematic area it had to include a binary response section to determine if the participant had a post-secondary degree or not. The third thematic area has an issue with not being specific enough to answer all the questions inside question 19 to check all 3 answers in the box, additionally there is a missing mapping between question 20 and 21. The fourth thematic area requires 2 different sub areas to answer, as the current draft is biased in favor of participants who already adopted the technology. Sumeeth also had a concern regarding how crop loss factored into the project and how that influenced the adoption rate.  Overall, because the client wants to answer 3 major questions:   1. Is there an association of the demographic information (ex. age and gender), grain storage duration, grain storage capacity and location of grain storage on the adoption of stored grain monitoring technologies among grain elevators and farmers? 2. Do grain elevators and farmers’ experiences with managing stored grain influence their adoption of stored grain monitoring technologies? 3. How do grain elevators and farmers’ perceptions of stored grain monitoring technologies influence their adoption of stored grain monitoring technologies?   Based on the research questions, it was determined that all could be answered via linear or logistic regression and contingency table analysis. However, the main problem is that there is no data collected for this project, and the survey the client drafted is not yet approachable for all sides to the research question. | | |
| **Recommendations for Design and/or Analysis**: Based on the concerns raised in the previous section, the broad issue is that the draft survey is not approachable to all participants within the survey. Dr.Craig recommended the following remedial design measures within the thematic sections.   1. For the first section, since there was an issue regarding not indicating if the participant had a degree of not, the remedial measure would be to include a section asking whether the participant had a degree or not, and if they did, they had to answer the remaining questions. Otherwise, they could skip those questions. 2. For the second section, include a binary component within question 17. That being if they check yes to this question, they answer the questions within section 3, if they check no, they skip section 3 and answer all the questions within section 4. 3. For the third section, have the participants check all 3 of the boxes within question 19. As well as have the mapping from question 20 to 21. That being if they check no to question 20, they should not answer question 21. 4. The fourth section has the biggest change to its design. It needs to be split into 2 different parts, one which addresses the participants who adopted the monitoring technology and another part for participants who didn’t adopt the technology. Within each of these two sections have two different emphases for their perceptions of monitoring technology. For participants who adopted the technology the emphasis will be placed on how they feel they have benefited from the adoption and focus on the drawbacks of the technology since adoption. For participants who did not adopt, the emphasis will be understanding their perception of understanding why they would adopt the technology, and understanding why they wouldn’t adopt the technology.   Additionally, to see if the survey is effective, regression techniques need to be developed to understand the data collected from the participants. Before the client can submit the data for IRB approval, Dr. Craig recommended to the client to state the maximum number of survey participants they can realistically sample. The survey should be reworded and restructured to be more approachable to the participants. Additionally, they should re-run the test survey to gather test data, or generate dummy data for the experiment. However, before these steps can be taken, the survey has to be put into its final form.  Since the client has minimal experience with generalized linear models and specifically with logistic regression, Dr. Craig recommended that the consultant assist the client with the regression part of the experiment. The consultant should also provide techniques to the client to generate the best linear model for prediction with respect to the test data. This is necessary because when the full survey is conducted, the client can use modelling techniques to answer their hypotheses and answer their main research question. | | |
| **Who will carry out these actions?**  **Client:**   * Provide the consultant with the results of the trial survey. * Restructure and finalize the survey to be more inclusive with respect to the participants’ current adoption status of the monitoring technology using the suggestions from this IM. * Get IRB approval for the main survey.   **Consultant:**   * Work with the client to finalize the survey and make sure the wording is appropriate. * Take the pilot data from the initial survey potentially introduce dummy data to create a testing data set. * Develop regression techniques for general linear model selection and binary modelling, using the testing data set and utilizing SPSS software. | | |
| **Status:** Follow-up is necessary, potentially have a weekly meeting time to touch basis about the project. | | |

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