Report for Faculty Initiative Fund FY 23

Report for Faculty Initiative Fund FY 24

Prepared by

Zhi Tao, PI

Zhi (Vicky) Tao, PhD
Associate Professor of Logistics
College of Business & Public Policy
University of Alaska Anchorage

Dear Office of Academic, Students & Research,

I would like to use the opportunity to extend my gratitude to the committee and the office for selecting and awarding my proposals. I was honored to receive these awards, and I was very encouraged to continue building a stronger research portfolio. These are my highest research achievements at UAA, I published 8 papers and reviewed a book, in addition to developing and implementing more research ideas. I also would like to use the report opportunity to reflect on what I have gained and learned through the projects and the progress of each project. I will start the report of project "A New Control Chart Applied to Evaluate Students' Performance", followed by the sustainable project "A Grocery Chain Location Selection in Alaska".

Sincerely,

Zhi Vicky Tao

1. Faculty initiative Fund 24 for "A New Control Chart Applied to Evaluate Students' Performance"

The progress went better than planned. I think back and find the following factors which contributed to the progress of the project. 1. Data collection. The data was collected in 2019 when I was at a research university teaching a business analytics class with big size around 100 students, which was open for all college students. The data and model were prepared early when I started the project. The model of the new control chart was developed when I was in my PhD program, I published the following paper using the loess model. "Zhi Tao, Fengkun Liu, Fanglin Shen, Michael Suh and David Booth, "A New Control Chart Based on the Loess Smooth Applied to Information System Quality Performance", *International Journal of Operational Research, 15(1), 2012."*

During the big size class teaching and the complicated grade structure which was not 100 points and was not so obvious using regular control chart, I started to think of a good way to monitor students' progress on any time point in addition to midterm and final, the idea of the new control chart to evaluate students' performance was generated therefore I collected data very early back then. The early data collection helped to make the project progress. 2. Conference presentation and feedback. I attended 23 Annual Decision Sciences Institution Conference in Atalanta to present the paper and received very constructive feedback. For example, one colleague suggested applying this control chart to business operations in addition to education management, which is meaningful and increases the chance to publish in a good business journal when I talked about the future publication about the project during presentation. After the conference, I have been thinking about how to use the new control chart to establish the early warning system for the business operations where the underperformers of businesses need to be aware of their positions and take steps to improve while they see outperformers in comparison. The idea and new application are another research project. 3. The right collaborators and allocation of the work. I am the principal investigator, the research idea and model are mine and I find the project collaborators who are also the coauthors of the paper for publication in the future. In this project, professor Robert Puvar and Professor Rebecca Abreham are my

collaborators. Robert Puvar is a professor in decision sciences from University of North Texas. He is the one who run the model. The new control chart is new to him but we communicate quite often I am not surprised he learns quickly and implements it quicky using the software available in his university. Rebecca Abraham is a professor in finance at Nova Southeast University. She is very experienced collecting the related articles from journals for preliminary review. Our work together made the presentation possible at the conference. More than that, at the conference, one colleague asked a question "regarding such a big size class, the outliers are few, will you explain?". This question first set me to defend our control chart, which was our baby and we worked together for it, we never thought this would be a question. After I brought back this feedback to our group, we brainstormed and checked every possible reasons. We did find some reasonable reasons for the few outliers in addition to identifying more outliers as attachment.

After that we had a deep relearning the model and the process, reran the model from scratch for crosscheck, we did correct the previous errors and identified additional outliers from to. The process is more time consuming than the first round running but it is very rewarding. The right collaborators, their dedication, patience and hard working contribute to the progress of the project. 4 Travelling and feedback from a colleague passionate in teaching. I traveled to University of Alaska Fairbanks and met with professor Haiwei Chen, who is a finance professor. Not only he is passionate in teaching, he has wealth of teaching experience. When I presented him the idea of the control chart, he asked me a question " with a grade structure (not 100 points), I use percentage to roughly evaluate students' performance, how do I use your new chart for" That is really great question because our study does present the two control charts: the regular one (the idea is 6 sigma or percentage rules) which is mean based; the new control chart which is median based and identify additional outliers. His question also changed my thinking: originally the study addresses more on the new control chart, the regular one is used to make comparison. Now I think the new control chart is used in conjunction with the regular one, they work better together. Visiting the university of Alaska Fairbanks and meeting colleagues at UAF are amazing. After the trip, I am still thinking about more questions trigged by the regular control chart and we identify more outliers (extreme points), however, some underfarmers they are not extreme points but they fall outside of normal performer zone, how to specify them?

All these factors contribute to the progress of this project which exceeds expectations. If there is something I learn from this one: when I make a budget, I did not think too much. Since every time I travel to attend conference, the budget is around $ 2500. For traveling to UAF, it did not need this much. I may travel to UAF more times or I may go to another conference using the reminder of the money.

I also realize how important all the feedback is and how hard it takes to improve the work and prepare for publication in a good journal.

2.The Sustainable Project “A Grocery Chain Location Selection in Alaska”

I am always interested in research on sustainability. I started with presenting my first paper on green supply chain management at 1 st International Symposium on Green Supply Chains when I was in my doctorate program. I graduated in 2013 with dissertation about carbon emission modeling in green supply chain management. Including my dissertation, I have the following papers associated with sustainability.

Zhi Tao & Rebecca Abraham, “Mathematical Models for Carbon Responsible Retailer”, submitted to Journal of Academy of Business and Economics, 2024.

• Zhi Tao, Rebecca Abraham & Ravi Chinta, “Multiple Objective Linear Programming Model Applied to Sustainability” Journal of Academy of Business and Economics, 21 (1), 2021.

• Zhi Tao, Alfred Guiffrida and O. Felix Offodile, “Two Stage Supply Chain with Carbon Emission”, American Journal of Management, 17(1), 2017.

• Zhi Tao, “Carbon Emission Modeling in Green Supply Chain Management”, 2013, [Doctoral dissertation, Kent State University]. Kent State University Campus Repository.

• Zhi Tao, Alfred L. Guiffrida & Marvin D. Troutt, “A Green Cost Based Economic Production/Order Quantity Model” 1st International Symposium on Green Supply Chains, Akron, July 30, 2010.

I was very excited about the project; however, this project took more time than I thought. I think back now, these reasons make the project take longer. The model is solid. I have presented the new model I learned at the conference, no negative feedback no further constructive feedback. It is my first time using and applying it to the research. It is empirical research. The data is not available from the public. I designed the questionnaire based on the main criteria and sub-sub-criteria and the data needs to be collected from an experienced and well logical person. The weight is generated from the comparison. For example, if the person prefers apple to orange to pear, he gives high to low score in that order and his score needs to reflect this logic. There are some errors allowed but generally it requires the interviewee who is very logical about comparison for each criteria in each candidate city. Because of that requirement, I contacted a person I thought he was qualified to provide the data by answering the questionnaire, he did not respond, which was a bummer. I was still thinking of finding the right person among our business partners. For the model collaborators, I was thinking of professor Robert Puvar and Professor Rebecca Abraham again since we did the project of control chart well. Professor Robert is good at implementing the model and professor Rebecca Abraham is good at theory and literature review. Therefore, we expect to enforce relearning the model together including the rechecking the questionnaire I designed and have more discussions ahead.

Think back about this project, I also learn to consider the budget for the new software. Since it is a new model for me, I did not think it further when I made the budget. The best

way to implement this is new software recently developed in the market, better than SAS selected earlier, which just needs to input data, point and click, it will give you all the results immediately. Since I did not budget for the new software, I will pay for this out of my pocket.