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WESTERN CAPE



28 September 2024

The Director  
University of Missouri South African  
Education Program (UMSAEP) 213  
Hulston Hall  
Columbia MO 65211

Dear Prof. Uphoff,

This serves as my report of the activities associated with the award made to me at the University of the Western Cape (UWC) under the University of Missouri South African Education Program for a research visit undertaken from 17 January to 3 February 2024.

#### **UMSAEP University of Missouri Visit Report 17 January – 3 February 2024**

Dr Malcolm Garbutt, Department of Information Systems, EMS, University of the Western Cape

#### **Host Colleagues from the University of Missouri**

Prof. Doug Smith (UMSL) and Prof. Haitao Li (UMSL)

What started as a narrow focus on energy efficiency optimization expanded to incorporate several areas of interest to me personally and on behalf of my students at UWC.

Against the backdrop of the energy crisis in South Africa, the primary aim of this exchange was to collaborate with UMSL to provide an optimization context for a project based on the concept that methods of reducing electrical energy consumption and improving energy efficiency have several benefits at multiple levels. While the main target population are supply chains, the impact is far broader. Reducing energy demand reduces load demand on the national grid and lowers the capacity requirements where renewable sources are appropriate. Both outcomes result in lowered costs. In the case of renewables, this can provide income from excess energy production. Hence, the project has moved from an information systems project to a cross-disciplinary one utilizing operations research, economics, and accounting concepts.

One of the first realizations is that the energy crisis is not restricted to South Africa. Understandably, renewables are a worldwide requirement. However, climate and climate change can cause significant disruptions to energy supply and demand. In addition, recent disruptions to peace have impacted energy supplies.

The initial outcome produced a provisional electrical energy demand pattern from a single dwelling that has been validated by external data from a national source and confirmed by initial views from hospitality energy data. Currently, negotiations are underway to access and anonymize the hospitality data to further the study.

In addition to the optimization work, I presented a seminar about South Africa and the energy efficiency and optimization work to date. This led to a collaboration between myself, Prof Smith and Prof Li to produce a case study for Prof Li's Master's students.



Although these collaborations could have taken place online, several additional benefits from the faculty exchange related directly to the in-person interactions. These benefits ranged from academic to cultural to personal.

#### *Academic*

- Practical - A “water-cooler” meeting in the printing room with Prof James Campbell led to an impromptu drone research meeting, which is assisting one of my Master’s students’ projects. Two projects were of particular interest: the transport of medical items to and from remote areas and the use of drones for communication.
- Methodological - A referral to Prof Joe Rottman led to a tea meeting where we could discuss the use of case studies, which is a constant concern of mine due to my perception of a general misuse of the method.

#### *Cultural*

- Even with the impressive work ethic and long hours of the UMSL staff, I managed to enjoy several cultural experiences.
- I spent time in the St Louis History and Art Museums, which provided fascinating insights into the history of the area.
- The Zoo provided a natural history background and a chance to meet with the head of ornithology, who is also part of Midwest energy awareness.
- Attending the world premiere of a Martin Luther King play provided background and wonderful insight into issues like what we have faced in South Africa.

#### *Personal*

- I got to visit Busch Stadium, Home of the St Louis Cardinals. Even though it was off-season, the game excitement was palpable.
- The Gateway Arch was a bucket list item.
- Finally, brisket burnt ends have replaced my biscuits and gravy cravings.

#### **Ongoing work**

- The project has a provisional plan of three years, which means that the outputs are still in progress.
- The development of an energy efficiency optimization model is ongoing.
- The use of digital twin technologies for energy efficiency is continuing.
- Positioning and research papers are in the planning phase.
- A spin-off of the exchange is the initiation of a drone-based communication project for search and rescue.

#### **Acknowledgements**

I want to express my sincere gratitude for the financial and logistics support extended to our project from UMSAEP (University of Missouri System Academic Excellence Program) and the University of Missouri St Louis. The financial support provided by UMSAEP and UMSL has enabled me to pursue our goals and make significant strides in my work. I am truly grateful for the dedication to advancing research and academic excellence demonstrated by UMSAEP and the University of Missouri campuses. Your support has not only impacted the project directly but has also enhanced the overall academic and research environment, fostering innovation and knowledge dissemination. Once again, thank you for your invaluable support, which has been instrumental in the realization of our goals and aspirations.



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I look forward to continued collaboration and the positive outcomes that will result from the joint efforts.

Yours, sincerely

A handwritten signature in black ink that reads 'Garbutt'.

Dr Malcolm Garbutt

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