WATER RESOURCE MANAGEMENT AND TECHNOLOGY JOIN FORCES

WATER

UJ´s Process, Energy and Environmental Technology Station (UJ PEETS) supported Golder Associates Africa who are mandated by the Water Research Commission of South Africa (WRC) to update the South African Water Quality Guidelines Volume 3: Industrial Use, 2nd edition (1996). The guidelines provide an important contribution to water resource management in South Africa. Subsequently, the decision support function of water quality guidance has grown and become more complex.

Increased scientific understanding of the complexity of water resource systems and adaptive management processes have led to new ways of managing water quality. In 2008, a national review by the then Department of Water Affairs and Forestry recognised the need for the development of South African Risk-based Water Quality Guidelines. The necessity to extend the application of the water quality guidelines to a risk-based approach and the significance of producing a software-based decision tool to support the decision processes was identified. The WRC funded the project, and Golder Associates was appointed to develop the prototype risk-based guidelines.

The two main project components included the development of the risk approach and quantification methodology for the risk assessment; and the development of the informatics for design of a technology demonstrator decision support system (DSS) that would support the risk -based decision making for industrial water use.

The objective of the DSS is to provide managers and users in the industrial sector with guidance on the risks associated with using water of variable quality. It also allows for quantitative fitness-for-use analyses and determining the water quality requirements for industrial water usage for a site specific context.

On the experience of the initial DSS application tool development, Kenny Chirombo says: "My desire to hone my user experience design skills was piqued by the fact that the tool's acceptance criteria were based on achieving a positive and intuitive user experience. As a developer, working on the project gave me a fantastic opportunity to diversify my skill set and introduced me to important business processes that aided in my professional development. The assignment was an enjoyable yet practical approach to enhance my knowledge of software development and associated business processes."

Kenny Chirombo
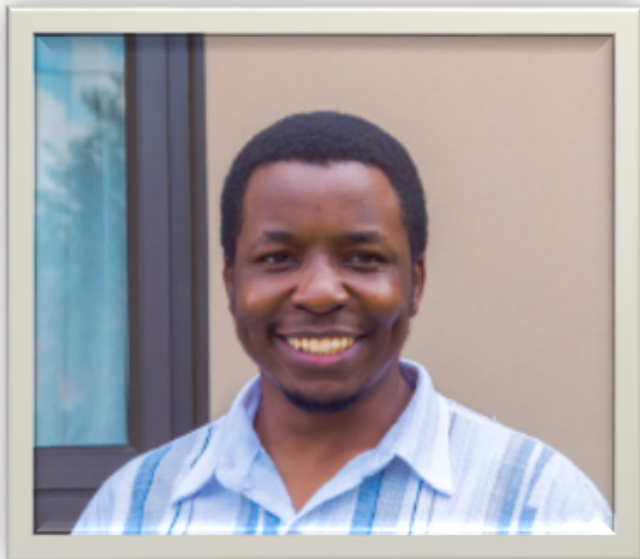
Kenny Chirombo (Student Developer at UJ) was provided with the opportunity to gain work based experience on this project. Chirombo's first task was to compare different software applications and select the ones most appropriate to develop the decision support system.

The Python GUI library (PyQt5) was selected as the most suitable software for its more sophisticated widgets, sleek-intuitive look and ease of use. The next objective was to translate the business objectives into functional specifications. These specifications while defining the modelling aspects and required outputs, it also outlined architectural constraints, requiring the DSS tool to be compatible with open-source standards and cross-compatible across most user operating systems. The functional specifications also required the software tool to generate user- defined water quality fitness for use reports and options to download the information.

Priya Moodley (Project Leader, Golder Associates Africa) on the future use and advantages of the Software Application Tool states: "The tool features have met the design specifications of the risk-based decision support system for industrial water use guidance, which is a paradigm shift in how water quality guidelines are presented, for South Africa and internationally as well. As a prototype demonstrator tool, the DSS is to be developed and tested further for full-scale implementation, as part of an integrated platform incorporating all the user groups of the water quality guideline series. On the ongoing development of the decision support tool maintenance will be needed as more scientific empirical data becomes available to support the tool functionality. The tool easily lends itself to expansion in future."

Olawale Kukoyi (UJ PEETS Engineer) comments: "As an engineer engaged with managing the final outcome of the project as linked by the UJ PEETS mandate to support innovation development, I was enthusiastic to be part of the completion of the software tool and its application in real time. It showcased and proved the theory of the Fourth Industrial Revolution, using this project and UJ PEETS commitments to such impactful projects for greater efficiency. We strive to further participate in such innovative projects in the near future."