

## **Workshop/Course abstract - Best Fit for Common Life Cycle Value (LCV)**

*An Open Design Systems Methodology for Optimizing Service Life Design integrating systems life-cycle preference- (stakeholders – objectives/weights ) and performance functions (engineering assets – LCA behavior)*

Why is sustainability always the closing item of a construction project? And, why is it that sustainability does not gain its entry into the design and decision process from intrinsic motivation, but mostly from contrived regulations? This is because current design and construction management methodologies are not open and one-sided and thus do not include the motive of and the life-cycle value (LCV) for stakeholders in the sustainability decision support modelling. The tools available for this purpose mostly lack a design-thinking and system-oriented approach and are often based only on life-cycle assessment (LCA) information and performance models. This results in sustainability decisions that can be 'straightened out' a posteriori to an acceptable compromised result, but which certainly do not establish that this is the maximum achievable synthesis value balancing the different stakeholder interests.

Therefore, a value-driven multi-objective optimisation approach is needed to arrive at a priori best fit for common purpose configurations that both reflects stakeholders' sustainability interests and engineering assets' life-cycle performances. However, contemporary multi-objective design optimisation methods have a number of shortcomings<sup>1</sup>: e.g., 1) no integration of socio-technical functions 2) Pareto front based with its ambiguous use; 3) incorrect mathematical way of aggregating different objectives (mostly monetised meaning not purely value-oriented).

In this workshop/course we will provide an appropriate response for the aforementioned issues by the introduction of a state-of-the art open design systems methodology (named Odesys). Odesys integrates preference function modeling and design performance optimization and enables stakeholders to find the group-optimal life-cycle value for a best fit service life design. The methodology is based on a new multi-objective design optimisation method called IMAP (Integrative Maximisation of Aggregated Preferences), and its added value will be demonstrated by comparing the results with both single objective design outcomes and with the design results obtained by the classical min-max method. Odesys and IMAP have been operationalised in an open source and Python based software package called Preferendus. In the workshop/course, a Preferendus demo will be given and participants will be given the opportunity to familiarise themselves with this tool. Finally, participants will perform an open design learning (ODL) based LCV exercise themselves using the Preferendus.

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<sup>1</sup> For more information, see Wolfert, A. R. M. (2023). Open Design Systems. IOS Press.