

Case Study

ETERNAL

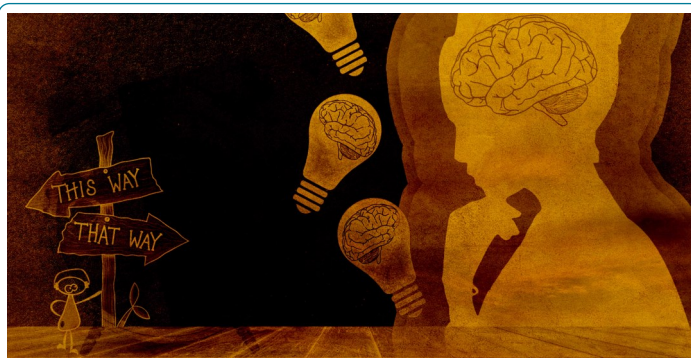
EARLY-STAGE DECISION MAKING FOR SUSTAINABILITY

ACCESSIBLE TO ALL

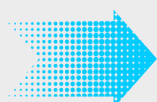
Sustainability is an increasingly important driver of innovation in pharmaceutical manufacturing and the broader process industries. Innovation of any sort however requires key staging-point decisions to be made. In individual projects, scientists and technical managers must decide which technology, materials, and equipment to use. Equally, those responsible for directing project portfolios must choose which projects to prioritise. In either case, *early* decision making is desirable to avoid sinking time and money into dead-end projects, and to identify what further work is needed for projects with a future.

The earlier one decides however, the harder it can be to obtain firm evidence (e.g. conclusive experimental data, fully validated costings, or life cycle impacts) upon which to base the decision. The growing societal expectation that sustainability criteria are factored into such decisions merely adds to the challenges faced by the decision maker.

Motivated by the desire to increase the accessibility of decision-making methodologies to non-specialist users, Britest Limited, an SME partner in ETERNAL, has developed



Multiple-criteria decision analysis (MCDA) or, equivalently, Multiple-criteria decision making (MCDM) is a means of combining many criteria (objectives) which need to be considered together in order to adequately choose between a set of alternatives. Often these criteria may be partially or entirely in conflict with one another, and uncertainty just makes the decision maker's life harder!



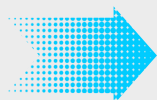
Context

Innovation for sustainability in pharmaceutical manufacturing and the process industries in general requires decisions to be made about which projects and technology options to prioritise.



Challenge

When managing innovation projects and portfolios, early decision making is desirable to avoid sinking time and money into dead-end projects. The earlier a decision is made however, the harder it can be to obtain conclusive data, validated costings, and life cycle impacts upon which the decision will be based.



Innovation

Britest has developed a framework that teams can use to think systematically about the many criteria which go into deciding whether a proposed innovation enhances sustainability or not, coupling it with an improved method for multiple-criteria decision analysis in the presence of uncertainty. The combination can be used to guide a facilitated decision-making process towards clear, documented outcomes.



Next Steps

Working in collaboration with project partners and the EU standardization community, Britest is looking to maximise the impact of this innovation as part of a proposed new CEN standard methodology for early-stage sustainability assessment and Efficient Energy by Design.

a framework that teams can use to think systematically about the many criteria which go into deciding whether a proposed innovation enhances sustainability or not, coupling it with an improved method for multiple-criteria decision analysis in the presence of uncertainty. The combination has been applied successfully to several industry-relevant decision scenarios to guide a facilitated decision-making process towards clear, documented outcomes.

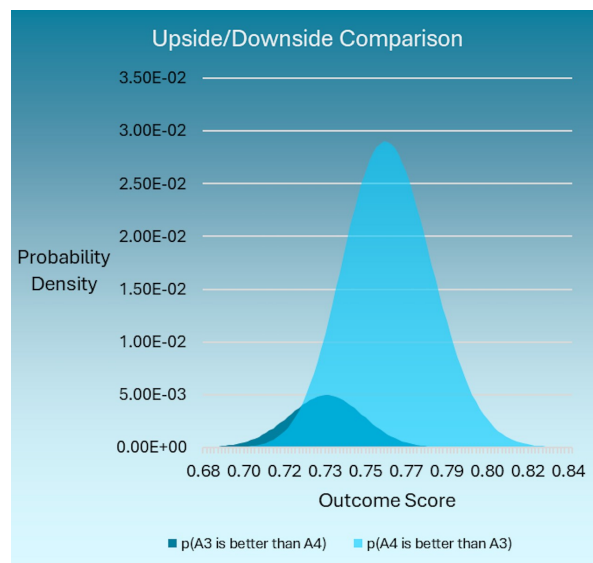
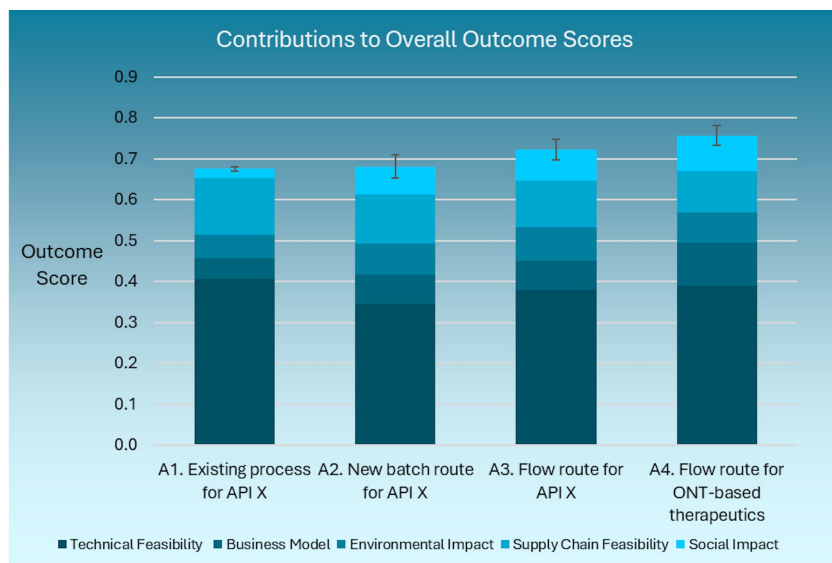
Features and Advantages

The new two-level Framework for Early-Stage Sustainability Assessment (FESSA) helps decision makers think holistically about their product and process innovations. It prompts conversation and knowledge sharing across five primary criteria: Technical Feasibility, clarity of Business Model, lowest possible Environmental Impact, feasibility of the Supply Chain around the manufacturing process, and Social Impact (people factors). By drilling down into how well the innovation addresses a range of sub-criteria within each top-level domain a rich overall picture of the strengths and weaknesses of the available options can be built up.

The framework is supported by a lightweight computational algorithm CURE (Computed Uncertainty Range Evaluation) which handles both criterion weighting for importance, and the uncertainty in the evaluation scores provided to the alternatives. Thus, decision makers can indicate not just how they rate outcomes relative to one another, but how sure or unsure they are in their evaluation. The final output, a outcome score distribution for each alternative, clearly indicates the prospects of success across all the sustainability dimensions.



The final output clearly indicates the prospects of success across all the sustainability dimensions.



Results and Benefits

The FESSA-CURE methodology developed in ETERNAL and its application to a real-life technology platform selection challenge is fully described in an open-access, peer-reviewed paper published in *Open Research Europe*.¹

- The approach has been further applied successfully to a batch versus continuous process selection scenario encountered by Reig Jofre within one of ETERNAL's green chemistry industrial case studies.
- This innovation brings MCDA for sustainability within the grasp of non-specialist users within the context of facilitated group activities. In particular, it strengthens Bristle's capability to support early-stage thinking about the sustainability dimension of innovation projects.
- Further collaboration to maximise the impact has been stimulated between ETERNAL and the European standardization community, through a proposed new CEN standard methodology for early-stage sustainability assessment and efficient energy by design.

ETERNAL is contributing to the sustainable development of pharmaceutical manufacture, use and disposal, by using and promoting full life cycle approaches covering design, manufacture, use, and disposal through

- application-industry oriented R&D and scale-up;
- clear pathways to compliance;
- new scientific knowledge on the environmental fate and eco-toxicological effects of pharmaceuticals; and
- behavioural change for safe use and disposal.



Co-funded by
the European Union

This project has received funding from the European Union's Horizon Europe Framework Programme (HORIZON) under grant agreement No 101057668. The work of UK-based Associated Partners has been funded by UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee.

1. See doi.org/10.12688/openreseurope.18195.1

Find out more at: www.etalproject.eu