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Introduction

The knowledge of factors that affect the Fitness-For-Purpose of a Systems-of-Systems (SoS) varies from “known, known-unknown to unknown-unknown”: Design for Re-configurability, Resilience, etc. addresses the former categories, but “it is the latter category that tend to be the difficult ones ...”[1]



[3]



[2]

So what can be done about the “Unknown-Unknowns?”

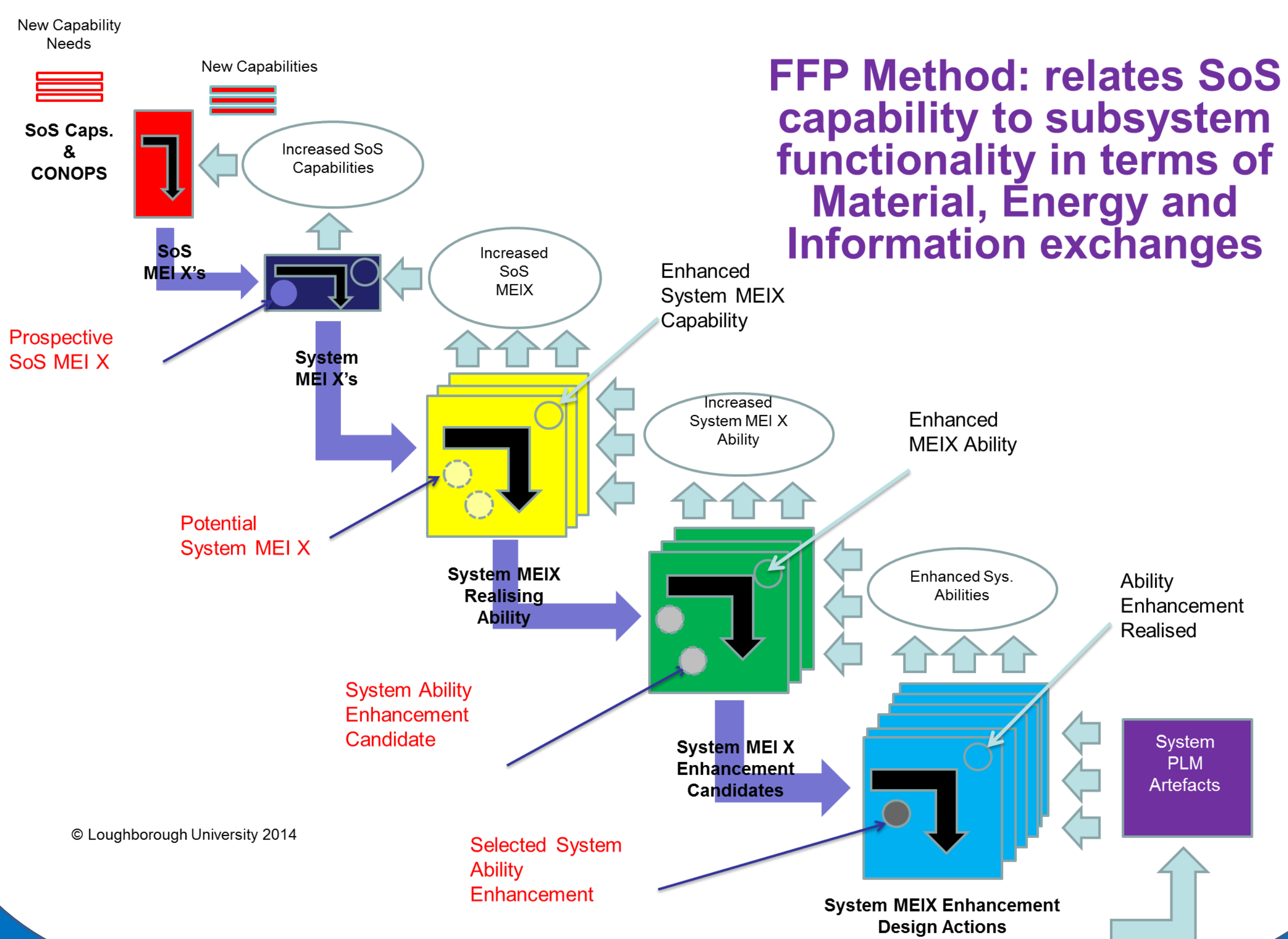
Objectives

The objective of this research is to create a method and process for the engineering of system characteristics so that composing Systems-of-Systems (SoS) that have experienced unpredictable changes in operation, composition or external factors can be maintained Fit-For-Purpose (FFP).

This research asserts that a Systems-of-Systems **does not** maintain Fitness-For-Purpose because:

It cannot implement the correct, timely and complete interchange of Material, Energy and Information (MEI) between its constituents and/or its external environment that is necessary to achieve a particular purpose.

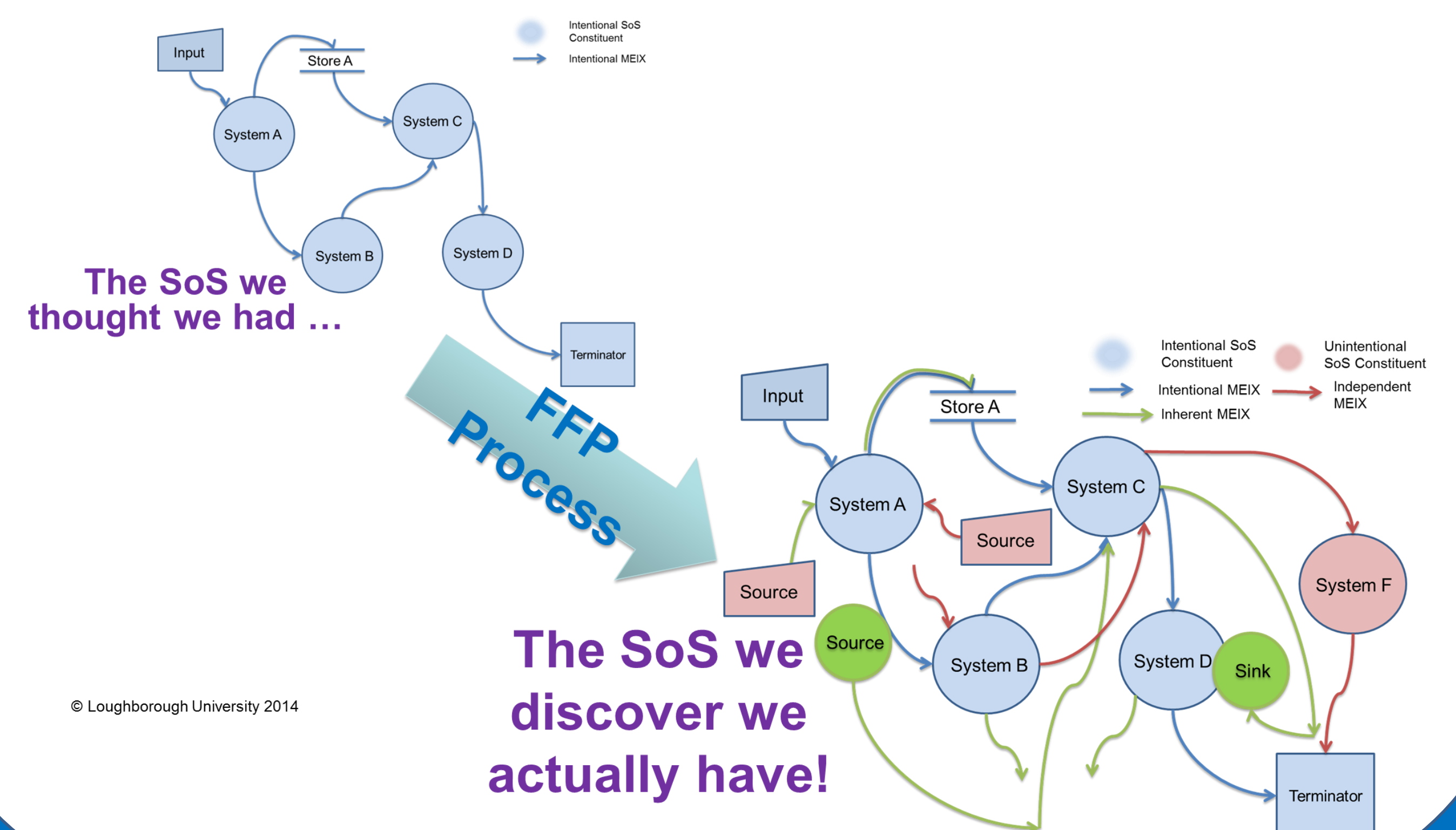
Systems exchange material and/or energy and/or information; the FFP method and process analyse and engineer enhancements of these exchanges between constituent systems



Description

These enhancements facilitate the re-composition of System-of-Systems that have experienced unforeseeable changes in operation, internal and/or external factors to be maintainable as Fit-For-Purpose.

MEI is moved from a source to a sink by a connecting bearer. These Sources, Sinks and Bearers (SSBs) can be intended (Designed-for), Inherent (with the designed solution) or Independent (associated with the intended solution). The FFP process identifies the inherent and independent SSBs and assesses their potential for MEI exchange enhancement by analysing the transfer headroom associated with each.



Conclusions

This poster summarizes a scoping exercise conducted as part of an on-going PhD. At the time of writing, several areas are yet to be worked out. The detailed choice of research tools and methods is to be determined in conjunction with Thales, the collaborating major industrial systems integrator company.

It is suggested that projects still get “caught out” despite design and development activities such as extensive modelling, virtual prototyping and Failure Mode Effects Criticality Analysis common to high criticality projects, all of which aim to prevent difficulties occurring later in the lifecycle.

FFP is not offered as a “magic bullet”, a panacea for all ills, or as being beneficial to all cases: the exploiter has to assess the value of FFP at the chosen scale of MEIX enhancement for themselves alongside their other scheduled activities.

The utilisation of the FFP process may prevent problems by identifying additional interactions to be modelled. MEIX enhancements would increase the ability of a SoS to be maintained FFP and reduce the time to recover it if lost.

Acknowledgements & Contact Details

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