

# Research project offer

**Location** : ISAE SUPAERO, Toulouse, France

**Department** : DISC

**Research group** : Decisional Systems

**Supervisor** : Sophia Salas Cordero (PhD Student), Rob Vingerhoeds

**Email** : rob.vingerhoeds@isae-sup aero.fr

## OFFER DESCRIPTION

**Title** : Approach to anticipate obsolescence

**Proposed duration and period** : 6 months, e.g. March-August 2021

**Context**  
(max 10 lines)

Obsolescence is the fact that the component no longer offers the expected features, or offers them but with a level of performance that can be judged as outdated or not enough. Systems obsolescence is a problem that all businesses face or will face. Obsolescence may be due, for example, to technological change (version of a contributor to the system that is no longer maintained) or changes in regulations (pollutants for the environment). The subject of obsolescence is currently not or hardly studied. Awareness in the industry, as well as the development of a structured approach to addressing obsolescence is needed. This project aims at contributing to solutions for these challenges.

**Objectives and work**  
(max 20 lines)

The question that is central to this project is:

Is it possible to design systems that are resilient to obsolescence?

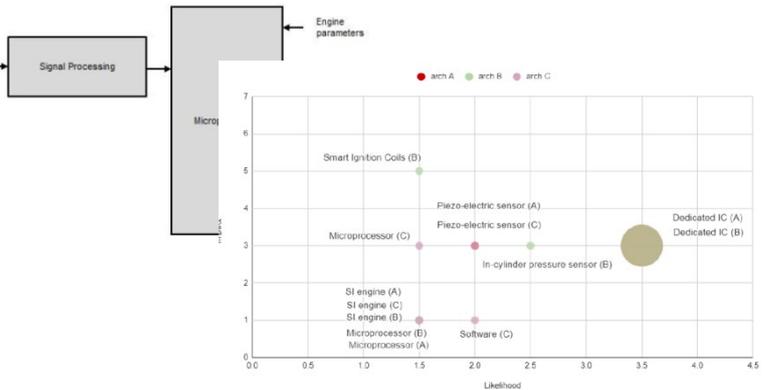
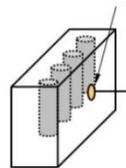
Today, no system is immune to obsolescence. If the system design has not anticipated obsolescence, as soon as it appears for a module / function / technology, remediation solutions can be envisaged: preventive storage, etc. However, in a proactive approach, system architects and business designers must integrate the risks associated with obsolescence. This internship is proposed within the framework of an existing PhD Thesis project. The project does NOT seek to avoid obsolescence, but rather to "absorb" it in the most robust way, minimizing any propagation of malfunctions and potential failures. It is interested in proposing techniques to be able to integrate the potentiality of obsolescence from the very first phases of system design; in the architecture definition phase.

During the early stages of design, alternative systems architecture options are reviewed. The approach uses obsolescence considerations as constraints during the early design phases, to allow the identification of components potentially at risk of obsolescence. Presenting designers with this information allows them to improve the design, by making it robust and resilient, or to accept the risk and develop an obsolescence mitigation plan.

The PhD Thesis project aims at proposing impact analysis tools for the system concept stage as well mechanisms to provide solutions in synthesis of design alternatives. Widely used in Systems Engineering (SE) and project management, Design Structure Matrices (DSM) were chosen to model the interfaces. The DSM is an NxN matrix that maps the interactions among the set of N elements, is a network modeling tool used to represent the elements comprising a system and their interactions, thereby highlighting the system's architecture or designed structure. DSMs are particularly well suited for applications in complex systems development and used more often in the area of engineering management. Within the framework of this internship, this novel approach with so far interesting results needs to be extended and applied to a larger case-study for validation.

	Smart Ignition Coils	Microprocessor	SI engine	Dedicated IC	In-cylinder pressure sensor
Smart Ignition Coils				1	1
Microprocessor				1	
SI engine	1				1
Dedicated IC	1	1			
In-cylinder pressure sensor	1		1		

sensor (0-25 KHz) piezoelectric block on the piston has to be able to be used in laboratory as best possible for riders



**Possibility to continue with a PhD (Yes/No) :** Yes (funding to be discussed)

### REQUIRED APPLICANT PROFILE AND SKILLS

**Study level**  
(tick possible choices)

- Undergraduate students (3<sup>rd</sup> or 4<sup>th</sup> year)
- Master students (1<sup>st</sup> or 2<sup>nd</sup> year)
- PhD students

**Required profile and skills**

Design  
Systems Engineering and Computer Science  
Some knowledge on systems modelling is a plus (but not mandatory)

**Other useful information**

None