

## A Systems Engineering Exploration on the topic of Obsolescence using Soft Systems Methodology

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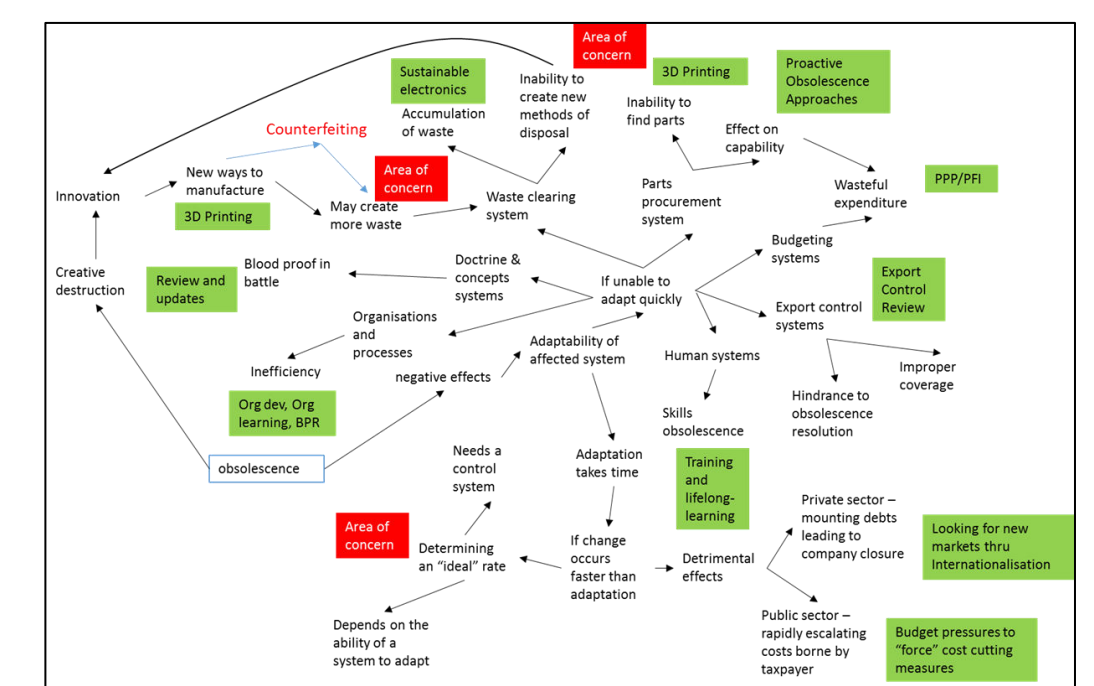
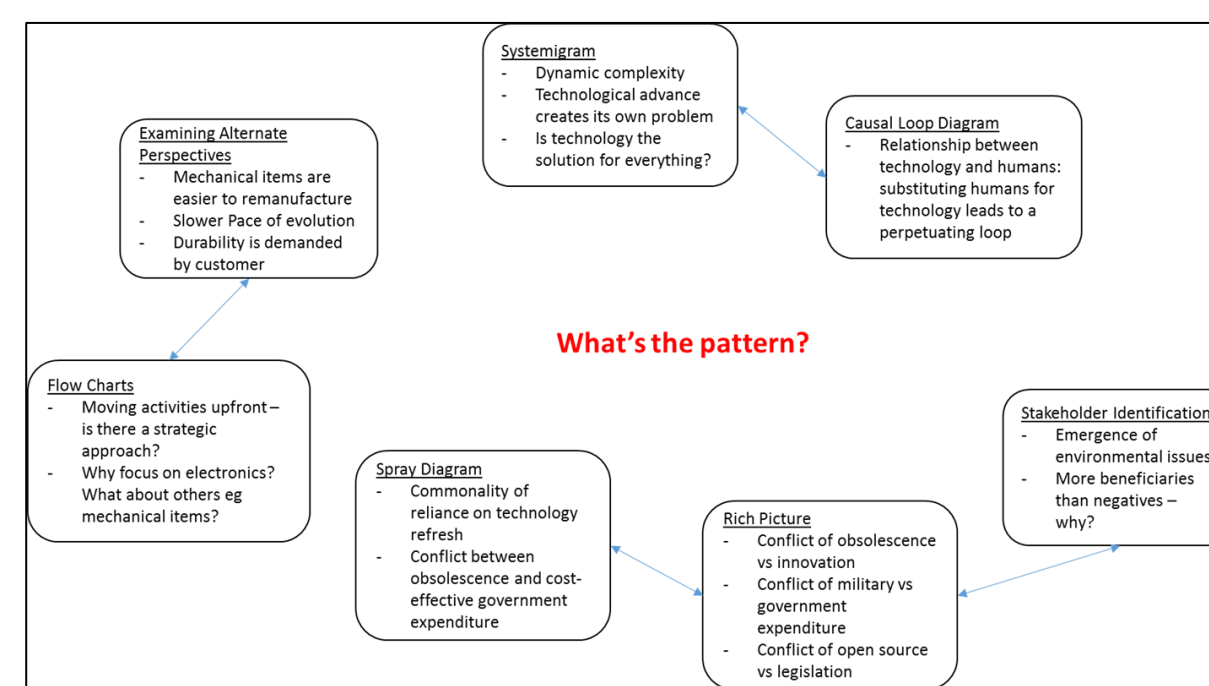
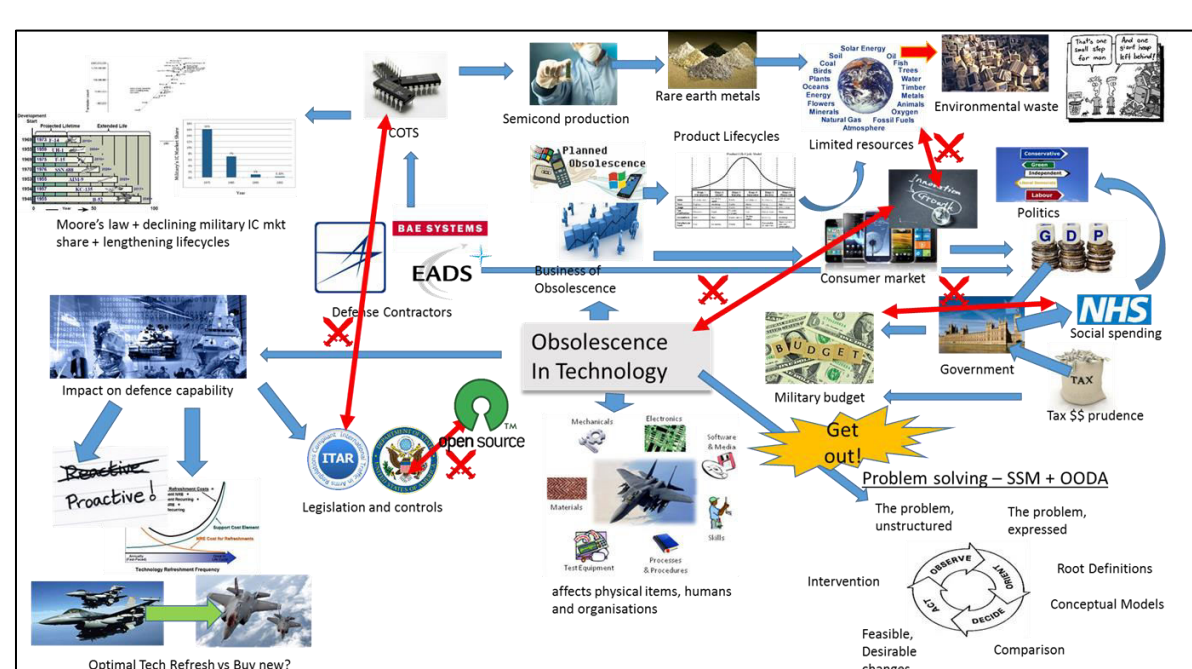
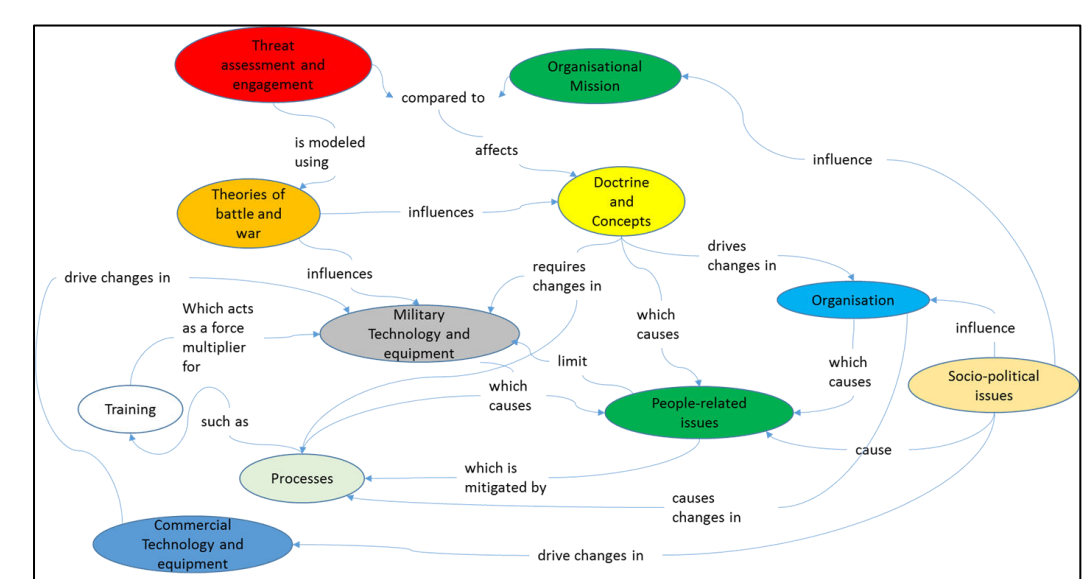
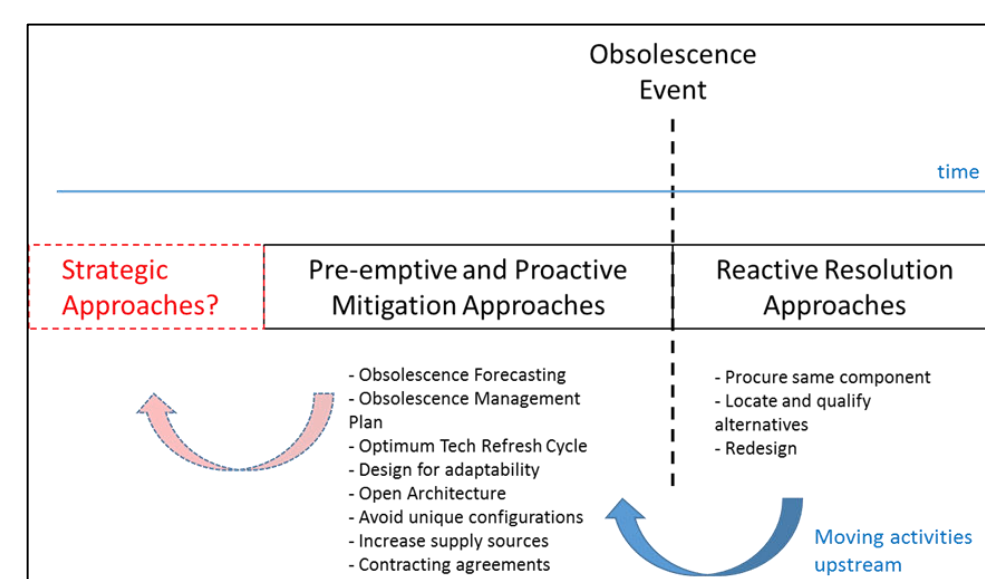
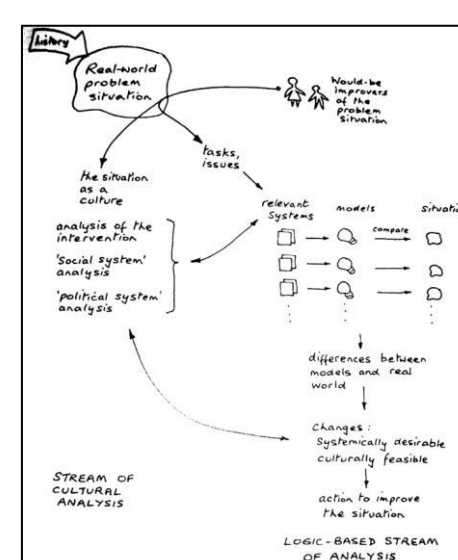
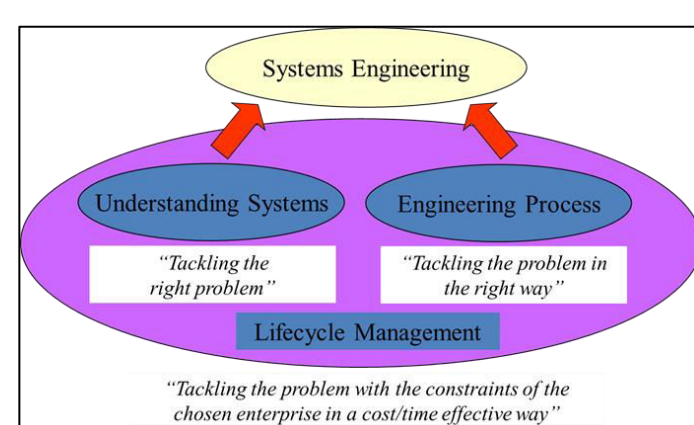
### Objective

This thesis examines the issues and perspectives that contribute towards existing solutions for obsolescence, and aims to suggest new perspectives and solutions. It (1) explores and categorises the types of obsolescence that affect defence capability, (2) reviews literature and identifies patterns and gaps, (3) applies the ‘two streams’ of Soft Systems Methodology iteratively with holistic and reductionist perspectives, convergent and divergent thinking, and top-down and bottom-up approaches, leading to new interventions at varying levels of abstraction, which are then compared to current reality for feasibility.

### Main Research Ideas

In this research, questions asked are: (1) What types of defence capability are there? (2) how is obsolescence in each of these capabilities tackled, and are these methods cross-applicable? Where are the gaps? (3) How can systems engineering be applied to distil the problem and expand the problem space? (4) Which methodology is suitable for such a “foggy” or “messy” problem? (5) from a system perspective, where are the conflicts? Who are the stakeholders? What are their *weltanschauungs*? What are possible CATWOE interventions that can synergistically tackle the problem? (6) Are these interventions feasible and implementable in reality? And finally (7) what should the military focus on, to reduce the problem of obsolescence?

US DOD DOTMLP (ARCC, 2015)	UK MOD DDOs (Taylor and Tatham, 2008)	Australia DOD PIC (Australian DOD, 2012)	Canada MOD PRICE (Rempel, 2010)	Innovations in Defense Capability (Garmik, 2009)
Doctrine	Doctrine and Concepts	Command & Management	Concepts & Doctrine	Concepts
Organisation	Organisation	Organisation & Environment	Organisation & Environment	Organisation
Training	Training	Collective Training	Collective Training	Processes
Material	Equipment	Major Systems	Technology	Technology
Leader Development	Personnel	Leadership	Leadership	People
Facilities	Infrastructure	Facilities & Training Areas	Infrastructure	People
	Information	Information Management	Information Management	
	Logistics	Supply Support	Equipment Support	
		Research and Development & Operational Research	Research and Development & Operational Research	Theory



### Findings

Gaps exist in tackling technological obsolescence. Recent research has begun to aggregate previous solutions, which were focused on mathematical optimisations (eg. MOCA) into a holistic masterplan covering immediate-term, medium and long-term resolution and mitigation. The thesis found six possible synergistic interventions, which were not previously mentioned in literature, of 1) monitoring and avoiding restrictive systems such as US ITAR, 2) optimisation of defence budgets through PPP, 3) research and support of Additive Manufacturing in the military, 4) Concerted policy and management efforts for the management of e-waste 5) support sustainable electronics, and 6) influence consumer opinions, via advertising the effects of obsolescence, to result in sustainable innovation instead of Schumpeterian creative destruction. However, Additive Manufacturing is likely to create more e-waste and thus better methods of e-waste recycling and management are necessary.