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Submission: There have been repeated cases of complex Defence systems integration projects encountering major problems even to the point of cancellation or premature replacement. The DWP consultation process should take careful note of the incidence of these experiences and compare that with the experience in major commercial and industrial systems of like complexity.

The comparison is not stark at all – every week the Tuesday IT supplement of the The Australian reports yet another failed major IT project somewhere in the world.

The reason for this phenomenon is not the competence of the companies and individuals involved, nor of the uncertainties of the technology employed. Rather it is an inherent limitation of our current imperfect understanding of the dynamics of the information and communications technology being used. This is especially so in the field of complex system integration, and even more so when some of the systems to be integrated are already in use – so-called legacy systems.

The DWP consultation team should note that this is not the same subject as complex project management although they often occur together. Complex systems integration can occur even in uncomplicated projects. Just with a single black box to be supplied by a single, experienced supplier there can be complex systems to be integrated. This may not be a complex project to manage – at least as far as the customer is concerned. There may still be overwhelming problems in the complexity of the technological task itself.

The solution to the failures of complex systems integration projects is in two parts:
1. Firstly there is a continuing need to understand the issues involved in the integration processes themselves. This is the subject on continuing research and development and is a major strength of some academic and scientific groups in Australia, and internationally
2. Secondly there must be a much greater awareness that increased integration will inevitably increase complexity and there is a threshold beyond which the performance is no longer predictable – emergent behavior will occur and that will preclude acceptance to specifications that cannot be met within such a condition

This latter effect may be compared with the behavior of water as it transitions between solid, liquid and gaseous phases. In normal conditions of pressure and purity these transitions are highly predictable. When these conditions are varied then less predictable states can occur such as super-cooled liquid below freezing point.

The same occurs in systems for which the complexity level has exceeded the threshold postulated above

The bottom line is that the Defence material acquisition process needs to assess the complexity of projects and mandate a risk reduction process such as progressive prototyping of high-complexity systems.

The state of the art is not yet advanced sufficiently to prevent such failures in the future and we should plan and manage accordingly.

I agree to my submission being published on the Defence website

I agree to my submission being quoted in the Community Consultation Report