Transdisciplinary Approach in Studying Military Transformations – A case study in Evolution of Military Enterprises

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The complex socio-technical, adaptive system called military enterprise composes from a variety of layers and components according to the practice of enterprise architecture (EA). The EA has been supporting the military in their organisational transformations since the 1990s. Nevertheless, there is evidence of several partially or fully failures in the recent history of Armed Forces digital transformations. Why the digital transformation seems to be so difficult for the military and how to improve the practice of EA to improve success?

The research focuses on improving the modelling of the evolution of a military enterprise in its core knowledge creation processes of organisational learning, sense-making, and decision-making. The transdisciplinary research aims to understand the whole enterprise, in all of its complexities, instead of focusing only on parts of it. Indeed, transdisciplinary research involves across the disciplines, between the disciplines and beyond the disciplines. Therefore, this research evolves spiralling between scientific methods and non-scientific practices. The study follows a process that provides constant feedback from application in practice to model development in theory. The process offers an iterative approach to verify the outcome, reduces the complexity, and meets the practitioner's reality, similar to the engineering method called spiral development.

The transdisciplinary research was divided into eight sub-studies, each using the feasible research method of that particular field of science as illustrated in the following table.

Publication vs. Research Approach	*Science*	*Data*	*Research Methodology*	*Time dimension*	*Approach to Evolution*
1. Evolution of the socio-technical system	Systems	Extreme case sampling of historical data	Experiment	Longitudinal	Knowledge-driven
2. Military Affairs	Military history	Heterogeneous sampling of historical data	Case study, experiment	Longitudinal	Historical reasoning
3. Military knowledge management	Knowledge	Typical case sampling of historical data	Experiment	Longitudinal	Path-creation
4. Military information management	Engineering	Typical case sampling of historical data	Design, Demonstration, Evaluation	Longitudinal	Knowledge-driven

5.Military information security	Engineering	Typical case sampling of historical data	Survey	Longitudinal	Knowledge-driven
6.Military ICT architecture	Engineering	Heterogeneous sampling of observations and historical data	Case study	Longitudinal	Knowledge-driven
7.Enterprise architecture in Military change management	Design	Heterogeneous sampling of case study data	Demonstration = Experimentation with Case study data	Cross-sectional	Combination
8.EA tool helping to apply Artificial Intelligence in Military Enterprise	Design	Heterogeneous sampling	Demonstration = Experimentation of case study data	Cross-sectional	Combination

The research addresses the three observed gaps in modelling the architecture of a military enterprise, namely:

> 1. Challenge in modelling the dynamics related to the evolution of military enterprise is solved by developing and utilising a knowledge-creation driven model for the evolution of the socio-technical system.

> 2. Challenge of partial models for military affairs is solved composing a military affairs model from applicable business models and improving the understanding of the military as a value stream.

> 3. Constraints of the existing enterprise architecture models in explaining the evolution of multilayer value streams are solved by designing an EA tool that supports the EA practitioners to analyse the military enterprise and define the transformation journey with opportunities and obstacles better than before.

The Enterprise Architecture Tool for military enterprises arises from studying the knowledge-driven evolution of an enterprise (evolutionary steps within each layer), military affairs from a value stream view (strategic posture and process performance), and improving the TOGAF ability to model complex adaptive systems (forces effecting within and from outside of a military enterprise).

The research designed an EA tool for military EA practitioners. When demonstrating and evaluating the EA tool, it appeared to fulfil the standard requirements for an EA model satisfactorily, addressed the particular challenges in modelling the dynamics of enterprise evolution, and did well in advising how to implement the features of artificial intelligence in a military system.

With both theoretical and practical impacts, the research provides potential advantages to ways of:

1. Analyse the strategic transformation ability of both adversary and own military forces.
2. Plan and implement a successful, holistic transformation in the military.
3. Require and build more integrated operational capabilities based on a layered system of systems architectures.
4. Manage small changes in the continuous development of military capabilities.
5. Improve the integration of existing systems and components of military force.