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# Biases and debiasing of decisions in ageing military systems

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## Abstract

Many of the administrative decisions that must be made in a military environment are complex and rely on a rational analysis of situations. Decisions within the domain of ageing systems are particularly difficult and often riddled with different biases. This paper investigates why rational thinking is not always the norm, and suggests possible ways to assist decision making. A few biases are identified, and available debiasing techniques are discussed. It was found that research in this field is limited and must be expanded in order to ensure optimal decision.

**Key words:** Cognitive bias, motivational bias, debiasing.

## 1 Introduction

Military leaders are confronted with decisions from strategic to tactical levels. They encounter uncertainty, lack of information and forced abstraction on the different levels. Defence forces face an operating environment characterized by volatility, uncertainty, complexity, and ambiguity. Military decision makers must make sense of this paradoxical and chaotic setting. Succeeding in this environment requires decision makers that are willing to embrace improvisation and reflection. Decisions within the domain of ageing systems are particularly difficult and often riddled with different biases.

Carl von Clausewitz’s metaphoric description of the condition of war is as accurate today as it was when he wrote it in the early 19<sup>th</sup> century [2]: “Their judgement was based more on wishful thinking than on sound calculation of probabilities; for the usual thing among men is that when they want something they will, without any reflection; leave that to hope, while they will employ the full force of reason in rejecting what they find unpalatable. – Thucydides, History of the Peloponnesian War”.

This paper starts with a review of literature on the areas of risk management, cognitive biases, and motivational bias. The paper then applies the insight to the life cycle management of ageing military systems to identify typical risks and biases and suggest ways to mitigate such biases.

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## 2 Literature study

Kahneman & Tversky [4] confirmed the presence of common cognitive biases in the professional judgements of laypersons and experts. They were dissatisfied with the discrepancies of classical economics in explaining human decision making, and developed the initial tenets of a discipline now widely known as behavioural economics.

“Cognitive biases are departures from purely rational thought. They are systematic errors in thinking that prevent us from being entirely rational. There are a number of causes. One common cause is complexity. The human mind is not equipped to deal with the sheer number of factors and their relationships in many situations found in a modern, technologically-complex society. In order to counter this, we commonly use heuristics (rules of thumb) to help assess complex situations.” Examples of heuristics may be rules of thumb, educated guesses, gut reaction or common sense [9].

Since Kahneman & Tversky’s ground-breaking work, behavioural decision researchers have identified a large number of biases in human judgement and decision making, each bias showing a deviation from a normative rule of probability or utility theory. Montibeller & von Winterfeldt [5] focused on biases that are relevant for decision and risk analysis because they can significantly distort the results of an analysis and are difficult to detect and correct.

Montibeller & von Winterfeldt [5] define a cognitive bias as a systematic discrepancy between the “correct” answer in a judgemental task, given by a formal normative rule, and the decision maker’s or expert’s actual answer to such a task. Montibeller & von Winterfeldt regard motivational biases, which include conscious and unconscious distortions of judgements and decisions, made within an organizational context and because of self-interest, fear and social pressure, as equally important. Montibeller & von Winterfeldt point out that the methods for reducing motivational biases is fundamentally an unexplored research field.

Motivational bias is the adjustment of response motivated by perception of reward or penalty. Motivational bias is different from cognitive bias, in which a discrepancy, usually subconscious, is introduced by the manner in which the individual processes information [5]. All motivational biases are hard to correct [5]. An example of a motivational bias given by Montibeller & von Winterfeldt [5] is the underestimation of the cost of a project to provide more competitive bids. This is definitely the case in decisions regarding life cycle management of ageing military systems.

According to the *United States* (US) Army [7], research suggests that consequences of intuitive decision making, and therefore of relying on heuristics and succumbing to cognitive biases, become more prevalent in situations of greater complexity or uncertainty. Insight into the nature of human decision making has important implications for the US Army, its mission and the decisions military professionals make. The US Army [7] provides awareness of existing research on decision making in general and, more specifically, cognitive biases, that may inform US Army efforts to prepare its soldiers and leaders for the environment of the future.

### 3 Reduction or mitigating of biases (debiasing)

Debiasing is the reduction of bias, particularly with respect to judgement and decision making. According to Montibeller & von Winterfeldt [5], debiasing refers to attempts to eliminate, or at least reduce, cognitive or motivational biases. Early attempts showed the limited efficacy of debiasing tools, *i.e.*, to which degree they reduced the bias and brought judgments close to the required normative standard, but recently researchers have become somewhat more optimistic about overcoming biases, particularly with the use of adequate tools and methods [5].

Bias training can result in debiasing at a general level in the long term. Morewedge *et al.* [6] found that training provides mitigating strategies that can reduce some biases. For example, a person may learn or adopt better strategies by which to make judgements and decisions.

Debiasing can occur as a result of changes in external factors, such as changing the incentives relevant to a decision or the manner in which the decision is made. Debiasing can play an important role to improve decisions regarding life cycle management of ageing military systems.

### 4 Application: Decision biases in the life cycle management of ageing military systems

The following common scenario provides a practical example to discuss biases that influence decisions regarding ageing military systems.

Multiple factors conspire against optimal decision-making in the life cycle management of ageing military systems. It is often the case that system deterioration develops due to sustained under-resourcing and under-investment, especially in financially constrained defence environments. This leads to perceptions of performance obsolescence when compared to the latest state-of-the-art competitors. These deficiencies are often not as relevant when it comes to the “simple” work-horses of defence, such as transport fleets. The typical tendencies are numbered for ease of reference when discussing the possible biases.

1. Multiple operational and support challenges arising from a lack of proper investment (**underinvestment**).
2. **Pessimism and “challenge fatigue”** among operational, maintenance and management staff.
3. Resulting **perceptions of technological obsolescence**, of being unable to logistically support the system into the future, and of imminent end-of-system-life.
4. **Inadequate expertise to analyse the cost and effectiveness** of all system life-cycle alternatives. These options include the following:
  - (a) Continue as-is;
  - (b) Logistic re-capitalisation;
  - (c) Life extension;
  - (d) Upgrade;

- (e) Phase-out with replacement;
  - (f) Phase-out without replacement (*i.e.*, doing without a capability); and
  - (g) Phase-out and replacement with a non-materiel solution (*i.e.*, delivering the capability in some other way such as doctrine change, or via another existing system).
5. The so-called “**conspiracy of optimism**” — that a new acquisition project will be successful, within schedule and budget, and that a new system will be more effective, efficient and economical despite frequent evidence to the contrary.
  6. **Ingrained preferences** for specific systems, suppliers or countries of origin.
  7. **Vested personal interests**, such as the opportunity to manage large programs, often with attractive foreign deployments.
  8. **Political preferences**, such as changing alliances.

#### 4.1 Bias 1: Myopic problem representation

Myopia is also known as near-sightedness.

**Description:** This bias occurs when an oversimplified problem representation is adopted, based on an incomplete mental model of the decision problem [5].

**Evidence:** This bias focuses on one option — to acquire a new system — regardless of implications, that defies all logic. It focuses on a small number of objectives — a single future state of the world — such as unfounded expectations of lower operations, acquisition and support cost [5].

**Relevant tendencies are the following:**

- 1 — Under-investment; and
- 4 — Inadequate expertise to analyse cost and effectiveness.

**Debiasing techniques are the following:**

- Explicitly encourage thinking about more objectives [5];
- Encourage evaluating viable new alternatives [5]; and
- Encourage thinking of other possible states of the future [5].

#### 4.2 Bias 2: Availability or ease of recall

**Description:** The bias occurs when the probability of an event that is easily recalled, is overstated [8].

**Evidence:** In this case, the eagerness of having a new system is overstated. The expectation of a new system without problems overshadows the train of thought. All elements of life cycle costs of systems are often not taken into account.

**Relevant tendencies are the following:**

- 5 — Optimism conspiracy.

New equipment tends to have a “honeymoon period” in which few problems are experienced; institutional memory of this tendency provides an easily available metaphor.

**Debiasing techniques are the following:**

- Encourage thinking about other possible states of the future;
- Apply devils advocacy; and
- Provide facts and statistics [5].

### 4.3 Bias 3: Affect influenced

**Description:** This bias occurs when there is an emotional predisposition for — or against — a specific outcome or option that taints judgements [5]. This is probably triggered when facing a difficult decision and a “gut feeling” is used.

**Evidence:** Several studies [5] that assess the role of affect causing an inverse perceived relationship between positive and negative consequences related to pandemics and human-caused hazards. Affect influences the estimation of probabilities of events [5].

**Relevant tendencies are the following:**

- 3 — Perceptions of technological obsolescence;
- 7 — Vested personal interests; and
- 8 — Political preferences.

**Debiasing techniques are the following:**

- Avoid loaded descriptions of consequences in the attributes [5];
- Cross-check judgements with alternative elicitation protocols when eliciting value functions, weights, and probabilities [5];
- Use multiple experts with alternative points of view [5]; and
- Enforce formal decision making methods.

### 4.4 Bias 4: Confirmation

**Description:** Confirmation bias is the tendency to find, interpret, favour and remember information so that it confirms pre-existing beliefs [1]. This may lead to the unconscious selective use of facts.

**Evidence:** Confirmation bias is evident in several experimental settings, such as in information gathering, selection tasks, evidence updating, and own-judgement evaluation [5].

**Relevant tendencies are the following:**

- 3 — Perceptions of technological obsolescence;
- 7 — Vested personal interests; and
- 8 — Political preferences.

**Debiasing techniques are the following:**

- Use multiple experts with different points of view [5];

- Generate and test alternative hypotheses;
- Challenge assessments with counter-facts [5]; and
- Probe for evidence for alternative propositions [5].

#### 4.5 Bias 5: “Conspiracy of optimism” or optimism bias

**Description:** The bias occurs when the desirability of an outcome leads to an increase in the extent to which it is expected to occur. It is also called “wishful thinking” or “desirability of a positive event or consequenc” [5].

People tend to overestimate the probability of positive events and underestimate the probability of negative events happening to them in the future. A number of factors can explain unrealistic optimism, such as perceived control [8].

**Evidence:** This bias is observed when people’s subjective confidence in their own ability is greater than their objective (actual) performance. It is frequently measured by having experimental participants answer general knowledge test questions; they are then asked to rate on a scale how confident they are in their answers [1]. The UK Treasury now requires that all ministries develop and implement procedures for megaprojects that will curb so-called “optimism bias” [3].

**Relevant tendencies are the following:**

- 5 — Optimism conspiracy.

**Debiasing techniques are the following:**

- Use formal methods of decision making;
- Provide facts and statistics [5];
- Use multiple experts with alternative points of view [5]; and
- Use decomposition and realistic assessment of the facts [5].

#### 4.6 Bias 6: Desirability of options or choice

**Description:** This bias leads to over- or underestimating probabilities, consequences, values, or weights in a direction that favours a desired alternative [5].

**Evidence:** Only anecdotal evidence, such as the biased estimates of probabilities and impacts in risk assessment [5].

**Relevant tendencies are the following:**

- 6 — Ingrained preferences.

**Debiasing techniques are the following:**

- Use analysis by multiple stakeholders with different backgrounds providing different value perspectives; and
- Use multiple experts with different opinions for evaluation [5].

	Tendencies	Biases							
		1 Myopic	2 Availability	3 Affect	4 Confirmation	5 Optimism	6 Choice	7 Omission	8 Pessimism
1	Under-investment	X							X
2	Pessimism								X
3	Obsolescence perceptions			X	X				X
4	Inadequate analysis	X						X	
5	Optimism conspiracy		X			X		X	
6	Ingrained preferences						X	X	
7	Personal interests			X	X			X	
8	Political preferences			X	X			X	

**Table 1:** Summary of tendencies and possible biases.

## 5 Conclusion

This paper summarised literature on the topic of cognitive biases. Some typical biases applicable to this scenario of decision-making in the life cycle management of ageing military systems were identified and defined. Evidence to substantiate each bias was discussed, followed by the specific relevant tendencies within the scenario of decision-making in the life cycle management of ageing systems. Lastly, debiasing techniques that could be of value in combating these biases and tendencies were suggested.

The article highlights the existence of typical erroneous tendencies and biases in decision-making on life cycle management of military systems, and provides a conceptual basis for a systematic approach to bias detection and mitigation. The conceptual basis can serve as foundation for further analysis. It will ensure that all tendencies and biases are covered and broadened to other decisions in a specific military environment, for example research in support of developmental training.

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## 4.7 Bias 7: Omission of important variables

**Description:** This is the tendency to overlook important aspects when making decisions.

**Evidence:** Important facts and decision variables are omitted to enhance a particular choice.

**Relevant tendencies are the following:**

- 4 — Inadequate expertise to analyse cost and effectiveness;
- 5 — Optimism conspiracy;
- 6 — Ingrained preferences;
- 7 — Vested personal interests; and
- 8 — Political preferences.

**Debiasing techniques are the following:**

- Explicitly encourage thinking about more objectives [5];
- Use formal methods of decision making;
- Defining balanced expert groups;
- Encourage evaluating viable new alternatives; and
- Encourage thinking of other possible states of the future.

## 4.8 Bias 8: Pessimism

**Description:** The pessimism bias is a cognitive bias that causes people to overestimate the likelihood that bad things will happen. This bias distorts people’s thought process, and can be detrimental to your emotional wellbeing, which is why it is strongly associated with various mental health issues, and most notably with depression.

**Evidence:** Undesirability of a negative event or outcome (precautionary thinking, pessimism) [5]. Pessimism will unquestionably influence the thought processes of decision makers.

**Relevant tendencies are the following:**

- 1 — Under-investment;
- 2 — Pessimism and “challenge fatigue”; and
- 3 — Perceptions of technological obsolescence.

**Debiasing techniques are the following:**

- Use formal methods for the analysis;
- Use uninvolved, independent teams to provide cross checks; and
- Provide facts and statistics to inform decision makers.

Table 1 summarises typical tendencies, and possible biases underlying these tendencies.