Sense Making - Underpinning Concepts and Relation to Military Decision-making

Mark Burnett, Pete Wooding and Paul Prekop

Australian Government

Department of Defence

Defence Science and

Technology Organisation

Outline

Three main concepts in this paper:

• *Knowledge* as a cognitive process that is key to sense making;

•*Philosophy* and *epistemology* as a framework in which knowledge is applied, refuted, tested and grown;

•The recognition that sense making deals with *complex systems* underpins new ways of perceiving the world and generating conjectures that can be tested within an epistemological framework.

Introduction

Decision makers at all echelons go through a process of goal-directed *sense making* when dealing with complex and dynamic problems involving, for instance, ambiguous or poor information, changing circumstances and multiple players.

The focus of sense making is to provide the decision-maker with a plausible understanding of a complex environment of serendipitous and not fully understood interactions and relationships.

Sense Making

Sense making is a process involving active agents structuring the unknown to be able to act

Sense making is a process decision-makers undergo when dealing with problems that are:

- Complex, ill-defined, dynamic and uncertain

- Not normally needed for routine (skilled and unskilled) work

"The terrain is not already mapped so that the job of the sense maker is to discover the pre-existing map….. It is the job of the sense maker to convert a world of experience into an intelligible world." - Weick

Sense Making and SA

Sense making and situation awareness (SA) are closely linked.

"The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future". (Endsley's definition of SA)

"Sense making" abstracts away from the temporal and physical associations of the word "situation".

Sense Making, Knowledge and Epistemology - I

Sense making depends on:

- The <u>knowledge</u> brought to the process by the participants
  - Expertise, insight, experiences, and judgements
  - Hard to codify and share as information

- The <u>way</u> that knowledge is used for creative thinking, generation of insights and goal-directed action.
  - Realm of philosophy and epistemology
  - A framework or methodology in which knowledge creation and use occurs.

Knowledge

From a sense making perspective we adopt this definition of knowledge:

Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (Davenport and Prusak 1997).
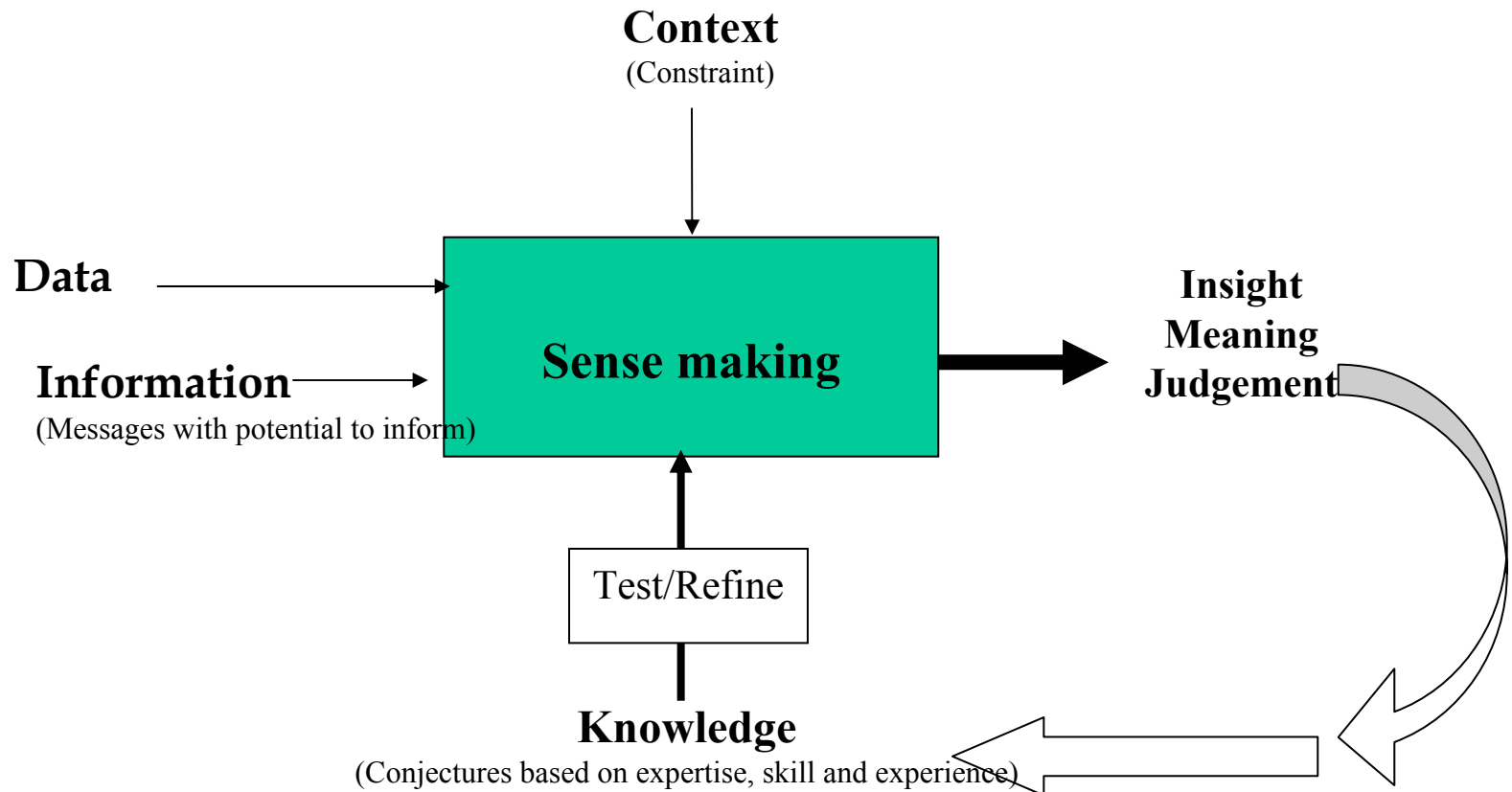
Epistemology

Core question (Giffin and Reid):
"What is the process by which human knowledge grows?"

- The relevant domain is philosophy.
- A robust and constructive approach for military processes, built on Popper, is Critical Rationalism(CR).

CR rejects the inductive notion that universal theories can be derived from gathered facts.

- "All knowledge remains conjectural".
- Theories or conjectures logically precede observational data.
- Breadth of information does not equate to depth of knowledge.

Sense Making, Knowledge and Epistemology – II

Context
(Constraint)

Data

Information
(Messages with potential to inform)

Sense making

Insight
Meaning
Judgement

Test/Refine

Knowledge
(Conjectures based on expertise, skill and experience)

Complexity – I

Military commanders are trying to make sense of *complex* systems

A Complex System is any system that involves a large number of dynamically interacting elements

A Complex System is fundamentally different to a complicated system!

Characteristics:
- Non-linearity
- Unpredictability
- Interdependence
- Dynamical behaviour
- Adaptation

Complexity – II

Natural phenomena examples
- Weather systems
- Ecosystems such as a coral reef

Human systems, characterised by very large numbers of interacting agents (people) embedded in multiple, multi-directional and overlapping causal structures, are inherently complex.

- For instance public opinion, the motives of allies and adversaries, military operations and governmental decision-making are innately complex systems.

Cynefin Domains of Order and Un-order

Unordered Domains	Ordered Domains
Complex Pattern Management The domain of many possibilities: Cause and effect coherent in retrospect. Matriarchal/Patriarchal Leadership **Probe, Sense, Respond**	**Empirically knowable** Analytical/reductionist The domain of the probable. The domain of experts. Oligarchic Leadership; **Sense and Respond**
Chaos Turbulent and unconnected. Charismatic or tyrannical leadership. **Act, Sense, Respond**	**Empirically known** The domain of the actual. The only place where best practice makes sense. Bureaucracy. Feudal Leadership; **Categorise and Respond**

Old Sense Making	New Sense Making
Based on 19th century physics (equilibrium, stability, deterministic dynamics)	Based on biological metaphors (structure, patterns, self-organisation, life cycle)
Philosophical underpinnings due to inductivism	Philosophical underpinnings due to critical rationality
Sees the world as orderly, predictable and well-understood	Sees the world as complex, unpredictable and poorly understood.
Knowledge can be coded, centralised and managed	Knowledge resides largely in the minds of people
Information is key to better sense making	Knowledge is key to better sense making
Sense making occurs within a well-defined organisational hierarchy	Sense making occurs across and beyond defined organisational hierarchies
Teams actively seek confirmation of their views	Teams actively seek refutation of their views
Key enabler is networking of IT systems	Key enabler is networking of people

Sense making and decision making

ADF doctrine for the planning and conduct of operations is based on the OODA loop

The Orient and Decide phases are the most problematical for decision-makers in complex and uncertain environments
- Much of the knowledge needed in these phases is tacit
- The OODA approach itself probably doesn't offer the best process for Commander's and their staff

CECA – Critique, Explore, Compare, Adapt - (Bryant)
- Alternate model for military decision-making in complex environments
- Coheres with our view of sense making and decision making

Implications – I

The approach to S M outlined here has a number of implications for decision-makers (this slide and the remainder)

A CR philosophy suggests:
- We actively look for evidence that does not fit with our conjectures
- We attempt to make our reasoning and thinking processes rational and open to critical conjecture
- Intelligence is presented with a plausible understanding of a complex environment represented through a range of partially supported conjectures
- The decision maker can avoid early closure based on initial evidence
- We have a more organic method for dealing with fleeting opportunities and unforseen threats

Implications – II

Support for knowledge creation and creative thinking

Use organisational structures and technology that allow staff to examine and test out each other theories and ideas.

Two important types of collaborative networks:
- Community of Practice
- Exploration Network

CoP and Exploration Network characteristics

Community of Practice	Exploration Network
Specialised terminology	Everyday language
High levels of abstraction	Low levels of abstraction
Shared practice and domain of interest	Shared experiences, values and beliefs.
Well-defined practice within the domain	The development of a practice is a possible, long-term outcome of exploration, not a given.
Well-defined areas of common interest (the domain of the CoP)	Often poorly defined areas of common interest
Long-lived, relatively static membership	Short-lived, dynamic associations
Community members defined by professional groupings	Networks form and re-form depending on task and need
Goal is incremental improvement in applying knowledge in a well-defined area	Goal is to develop new interpretations, conjectures and ideas
Examples include guilds, scientists, technical repair staff, software engineers.	Examples: Tiger Teams, and social networks such as Community Action Groups

Implications – III
Support for operational planning

Much of the core knowledge for sense making is tacit

Finding means for communicating and growing this knowledge is vital.

Approaches that assist in this tacit to explicit knowledge conversion are techniques and technologies for socialisation of ideas such as:

- Creative dialogue, brainstorming.

- War gaming and what-if scenario examination.

- Synchronous technologies that link distributed teams

Sense making for planning life cycle
(highly abstracted and abridged)

	Outputs	Principal Actors	Constraints	Time scale	Exploration network	Sense making context
Immediate Planning	Plans; Orders; CONOPs	Mil op; Mil str; Government Coalition partners	Commanders intent; Time for planning; ROE; Capability; Preparedness;	Short (weeks, days)	Strategic intelligence; Operational intelligence; HUMINT; Principal actors;	Military appreciation; Understanding of broader effects of operation;
Conduct of Operation	FRAGOs Briefs; SITREPs	Mil op; Components Coalition partners;	Orders; Time for deployment; ROE; Equipment;	Short (weeks, days, hours)	Strategic intelligence; Operational intelligence; HUMINT; Principal actors;	Understanding commander's intent; Local situation; Understanding conceptual model of networked decision-makers;