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"Adapting C2 to the 21st Century"

The role of sensemaking in the Command-ISTAR relationship (I-091)

Track 4: Cognitive and Social Issues

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Abstract

The purpose of ISTAR is to provide the Commander, and other 'consumers', with decision support – specifically problem structuring in support of problem solving. The relationship between Command and ISTAR is characterised, in UK military doctrine, by the provision of Intelligence Requirements (IRs) to the ISTAR function and the dissemination of information and intelligence (i2) to consumers, including the Commander himself. This information-centric view does not, however, capture the organisational relationships between Command and ISTAR; nor does it explain how Command and ISTAR collaborate in cases where IRs cannot be fully expressed. This paper introduces an activity model of the Command-ISTAR relationship which draws on both Weick's sensemaking concept and military experience. In particular, Daft & Weick's (1984) 'model of organisations as interpretation systems' asserts that perceived environmental complexity shapes the mode of interpretation that an organisation might employ for sensemaking. When complexity is perceived as low, organisations tends to employ a 'discovery' mode of interpretation, involving structured scanning, collection and analysis methods, typically against well-understood 'items' in the environment. When complexity is perceived as high, however, organisations may not possess an adequate frame of reference for interpretation or know what 'items' are meaningful; in these cases they employ an 'enactment' mode of interpretation that focuses on 'learning by doing' (alternatively, 'prospecting'). The Command-ISTAR activity model incorporates both interpretation modes to distinguish between procedural and adaptive ISTAR, the former being concerned with the efficient processing of IRs and the latter both coping with complexity (by supporting Command-led problem framing) and adjusting procedural ISTAR to maintain the effectiveness of the overall ISTAR function. A key argument from the paper is that although military organisations tend to be designed for discovery-mode interpretation, they should support both discovery and enactment given the types of environment that they operate in.

Introduction

The relationship between Command and the Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) function remains critically important as the UK adopts a Comprehensive Approach (CA) [2] and complementary military Effects Based Approach (EBA) [3]; both of these approaches recognise the impact of complexity upon military operations and call for a better understanding of the environment, across all seven dimensions[1].

UK military doctrine [1] describes the purpose of the Intelligence function[2] as "decision support to the command process" [1, para. 110]. The broader ISTAR function[3] ultimately serves the same purpose. The doctrine asserts that "the Commander must tell his Intelligence staffs what he wants to know and when he wants it; he must therefore direct their efforts. As the Commander will be concerned with broader issues, his Intelligence staffs must break down his direction into a series of discrete information needs…" [1, para. 201] This direction includes Intelligence Requirements (IRs); the discrete information needs are associated Requests for Information (RFIs) that are developed within the Intelligence Cycle[4] at the Direction stage. Through the Intelligence Cycle, "the [Intelligence] staff directly supports the Commander by providing him with the intelligence he needs to plan and conduct operations. As part of this, the [Intelligence] staff also supports other staff divisions [denoted here as 'consumers']" [1, para 111].

The essence of the doctrinal Command-ISTAR relationship, therefore, is that the Commander and other consumers express their intelligence and information (i2) needs in the form of IRs, to be processed through the Intelligence Cycle. The nature of ISTAR decision support is *problem structuring* – providing the Commander with "the fullest possible understanding of the adversary and the operational environment within a specific context, in order that they can plan and conduct operations successfully" [1, para. 402]. In practice, this is achieved through engagement *with* the Commander since he is "his own Chief Intelligence Officer" [12].

Further, the concept of sensemaking (from organisational psychology) suggests that that problem structuring in highly complex environments (within which military organisations must operate) is better served by learning through action than by directed collection and processing of i2. In other words, iterative problem solving is required to help structure the problem itself. One reason for this is that it is difficult to build an understanding of such environments through the more passive approach of learning through collection; indeed, it may not always be possible to identify the pertinent questions (IRs) for penetrating this complexity.

This paper asserts that, given both of the above arguments, the Command-ISTAR relationship should not be based simply upon the expression of IRs to the ISTAR function and the associated provision of i2 to the Commander.

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[1] The (Strategic) Environment is based on the complex inter-relationship of the seven dimensions: Physical; Social; Scientific and Technical; Economic; Legal; Political; Military.

[2] [1] also assigns this purpose to Intelligence (the product).

[3] [1] ISTAR includes both an Intelligence function (provided, at the Operational level, by J2) and a STAR function that includes staff operating outside the J2 staff division, e.g. collectors and separate analysis cells.

[4] The "structured approach to Intelligence" [1] is encapsulated by the four stage Intelligence Cycle, which comprises Direction, Collection, Processing and Dissemination (DCPD).

Aim

The aims of this paper, which reports research funded by the UK MOD, are:

- To promote discussion concerning the nature of the Command-ISTAR relationship across the full spectrum of operations that UK military organisations are likely to be engaged in, both now and in the future. By extension, this discussion encompasses all military problem-structuring activities in complex environments, not simply those supported by ISTAR, and not simply those conducted by the UK.
- To recommend the type of capability developments that will provide increased support for the Command-ISTAR relationship within the same context. These typically focus upon organisational structures, processes and equipment capability.

Approach

The approach taken to the research included an examination of relevant UK military doctrine, the development of a 'landscape' for characterising military operations, an analysis of relevant descriptive models of sensemaking within the context of this landscape and the characterisation of the Command-ISTAR relationship in an organisational activity model. The activity model provides a framework within which recommendations are made.

The approach is grounded in organisational science and is only one of many that may be adopted for the same problem. As such, this paper focuses upon organisational activities and their interactions rather than the characterisation of information that is exchanged within the Command-ISTAR relationship.

The Command-ISTAR relationship

The Command-ISTAR relationship is based upon the interactions between two Communities of Interest (CoI):

- Command and Consumer Community. This community includes those with needs for i2 – the Commander himself and other military functions (such as Plans and Operations);
- ISTAR Community. This community includes those who are responsible for fulfilling i2 needs and comprises Intelligence staffs and Surveillance, Target Acquisition and Reconnaissance (STAR) staffs.

A third CoI – the Action Community – is defined as those who directly undertake activity within the operational environment, excluding traditional STAR. This CoI *supports* the Command-ISTAR relationship rather than being directly involved within it, and, together with the other two CoIs defined above, appears in the organisational activity model introduced later in this paper.

Although doctrine provides a comprehensive list of the purposes of ISTAR, a simplified set of ISTAR consumers is Plans and Operations. Within Operations, two specific Joint Enablers (Targeting and Force Protection) are identified as key military activities that give rise to different types of i2 needs. Staff engaged in these activities are therefore defined as two further Consumer types [13].

Whilst the purpose of ISTAR is to support decision-making, the key type of activity undertaken between the Command & Consumer and ISTAR CoIs is problem-solving, which includes problem framing and the formulation and testing of hypotheses. It requires i2 as input and may precipitate the seeking of further i2 before decisions can be made.

Operational landscape

Military operations are conducted within environments[5] that can be characterised on a number of dimensions that, together, define a 'landscape'. For the purpose of this paper, the operational landscape is characterised by two independent dimensions: 'familiarity-strangeness' and 'rate of significant change'. 'Familiarity-strangeness' is equivalent to (perceived) environmental complexity. Complexity is present when "it is impossible to reduce the overall behaviour of the system to a set of properties characterising the individual components" [9] 'Rate of significant change' is a factor of (perceived) environmental variability and perceived importance of events – hence 'significant'.

Environmental characteristics necessarily influence the nature of military operations. One such way in which this happens is through the impact they have upon problem-solving and, in particular, the sense that can be made of that environment. Complex and variable environments are likely to render equivocal[6] and uncertain information, which makes sensemaking difficult – including the ability to focus collection activity to generate i2 to support ongoing sensemaking.

Sensemaking within military organisations

This section introduces the concept of sensemaking and highlights two descriptive and comparable frameworks for sensemaking in operational environments with differing degrees of perceived complexity.

The sensemaking concept

The concept of sensemaking [7] seeks to explain how organisations learn about their environment through the ongoing interplay between action and interpretation. Sensemaking may be thought of as a range of integrated approaches to three broad activities: scanning (data collection), interpretation (data given meaning) and learning (action taken). This range of approaches is illustrated in Figure 1, which contains both feed-forward links (scanning → interpretation → learning) and feedback links (learning → interpretation and learning → scanning). The feed-forward links describe an approach by which purposeful collection provides sufficient data that, when interpreted, provides the basis for learning and action. A different sensemaking approach, however, begins with action, which precipitates scanning and interpretation[7]. This latter approach is called 'enactment' and is described under both the Cynefin framework [6] and Daft & Weick's model [8] later in this section.

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[5] It is stressed that 'environment' is used, within this paper, in the sense of the definition in footnote 1. It is *not* limited to geographic characteristics.

[6] Here we cite two comparable definitions of equivocality: "Equivocality exists when a Commander can map multiple mental models onto the volume of information available" [4]; "Equivocality is the extent to which data are unclear and suggest multiple interpretations about the environment" [8]

[7] Daft and Weick's scanning-interpretation-learning model of sensemaking is similar to Boyd's Observe-Orient-Decide-Act (OODA) loop [15] in both purpose and content. Scanning maps onto Observe, Interpretation onto Orient and Learning onto Decide and Act. Further, both models emphasise the ongoing nature of activities and interactions – and the importance of multiple *feedback* loops. Boyd explanation of the OODA loop is effectively an alternative explanation of the Daft & Weick sensemaking model in Figure 1: "the entire loop (not just orientation) is an ongoing many-sided implicit cross-referencing process of projection, empathy, correlation, and rejection".

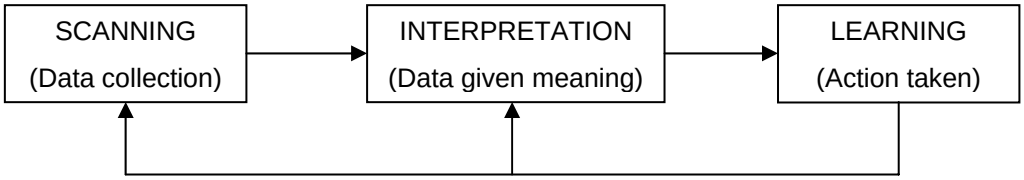

Figure 1; Relationships between organisational scanning, interpretation and learning (from Daft & Weick) [8]

Interpretation itself can be thought of as the interaction between two further activities:

- The construction and maintenance of 'frames of reference' for understanding the environment.
- The comprehension of environmental stimuli within those frames.

A frame of reference is a (shared) cognitive construct that represents a 'way of perceiving' the environment; without a frame, data is meaningless. The 'environmental stimuli' come from collected data. These stimuli also, however, support the modification of frames themselves. For example, the terrorist attacks on London in July 2005 were quickly recognised as such due to the 'Al Qaeda hallmarks' (e.g. multiple concurrent attacks, civilian targets, launched from within the transport system). These characteristics were recognised from the previous attacks on New York, Washington and Madrid. Our collective frame of reference shifted, however, as it became apparent that the suicide bombers were British nationals. This altered the sense we made of the attacks and has shaped our response to them.

Situational Awareness vs. sensemaking

Whilst situational awareness [10] focuses on the placement of stimuli into frames, sensemaking encompasses an integrated approach to problem-solving that also includes learning through action, rather than simply observation, to support framing/reframing.

The importance of framing, and the shortcomings of (attaining) situational awareness as a coherent explanation of organisational problem structuring activity, is greatest in complex and dynamic environments, where an effective 'way of perceiving' environmental behaviour may be difficult to develop (due to complexity) and, even then, may only be fleeting in its utility (due to variability) . In such cases, the Commander[8] may not always possess a frame of reference sufficient for recognising critical elements within that environment.

The importance of ISTAR (in particular, the Intelligence function) is in supporting the Commander's interpretation of the environment – not just by collecting i2 but also by contributing directly to framing so that the requirements for i2 can themselves be understood.

The Cynefin framework

Kurtz and Snowden's Cynefin framework [6] describes four types of environment (classified according to 'perceived environmental complexity') and organisational concepts, tools, methods and sensemaking approaches for dealing with that complexity. Kurtz and Snowden argue that the range of complexities presented in

[8] Although sensemaking is an organisational concept, it is recognised that the Commander plays a dominant role in sensemaking within his organisation (e.g. HQ), just as he does in decision-making. Thus we may use 'the Commander' in place of 'the organisation' in describing sensemaking phenomena.

the framework only become visible if some key assumptions about operating environments are relaxed:

- The assumption of order (that underlying cause-and-effect relationships always exist and can always be detected);
- The assumption of rational choice (humans always make rational decisions based on maximising utility and minimising loss); and
- The assumption of intentional capability (actions by adversaries or other organisations are the result of intentional behaviour i.e. no action is accidental).

Kurtz and Snowden also argue that whilst these assumptions sometimes hold, they are not universally true; in accepting them, organisations may fail to understand the actual complexities of the environment that they operate within. This has particular relevance as the UK adopts an Effects-Based Approach, which places the identification of cause-and-effect relationships at the heart of operational processes (analysis, planning, execution and assessment).

Environment	Cause-and-effect	Concepts, methods, tools	Sensemaking approach
KNOWN	Cause and effect relations repeatable, perceivable and predictable	Legitimate best practice Standard operating procedures Process reengineering	Sense-Categorise-Respond
KNOWABLE	Cause and effect separated over time and space	Analytical / reductionist Scenario planning Systems thinking	Sense-Analyse-Respond
COMPLEX	Cause and effect are only coherent in retrospect and do not repeat	Pattern management Perspective filters Complex adaptive systems	Probe-Sense-Respond
CHAOTIC	No cause and effect relationships perceivable	Stability-focused intervention Enactment tools Crisis management	Act-Sense-Respond

Increasing perceived environmental complexity

Table 1; Cynefin Framework (adapted from Kurtz & Snowden) [6]

Within the context of the Command-ISTAR relationship, there are two key points to note from the Cynefin framework. Firstly, as perceived environmental complexity increases, the appropriate sensemaking approach shifts from one that is observation-led (Sense-Categorise-Respond in KNOWN environments and Sense-Analyse-Respond in KNOWABLE environments) to one that is action-led, or ‘enactive’ (Probe-Sense-Respond in COMPLEX environments and Act-Sense-Respond in CHAOTIC environments). Secondly, the concepts, methods and tools (which may be thought of as elements of military capability) that are most appropriate for operating in ‘Known’ and ‘Knowable’ environments are easily recognised in current military organisations whereas those most appropriate for ‘Complex’ and ‘Chaotic’ environment are not.

Daft & Weick's model of organisations as interpretation systems

Military organisations may be described as 'interpretation systems'. Indeed, the relationship between ISTAR and both the Commander and its Consumers directly supports the military organisation's interpretation of its operating environment. Daft and Weick's 'model of organisations as interpretation systems' [8] is based on the abstraction of this relationship, illustrated in Figure 1, above. The model, summarised in Table 2, below, asserts that organisations adopt different interpretation modes according to both their beliefs about how complex (or 'unanalysable') the environment is and how intrusive they are prepared to be in that environment. Since most military organisations are intrusive (actively engaged in their environment) we focus on the two corresponding modes of interpretation: enacting (active interpretation of unanalysable environments) and discovering (active interpretation of analysable environments). These map onto Kurtz & Snowden's sensemaking approaches within the Cynefin framework (e.g. Act-Sense-Respond and Probe-Sense-Respond are both 'enactive') and, in common with that framework, Daft & Weick's model explores the effect of environmental complexity upon sensemaking.

Enactment concerns "experimentation, testing, coercion... learn by doing" [8] as a means of making sense about an unanalysable environment and, in doing so, creates (or maintains) a frame of reference for the problem[9]. One example of enactment in military operations is Armoured Reconnaissance, which may employ 'fighting for information' – taking deliberate action to generate behaviour that can be sensed and interpreted. The need for enactment is underlined in an article by Elaine Grossman in the US publication, the Insider [11]. Grossman writes, "Drawing off lessons U.S. troops have learned from combat in Iraq and Afghanistan, cavalry leaders — many of them now war veterans themselves — say the best understanding U.S. forces have developed about insurgents and other enemy fighters has come only after making direct contact in battle. Before forcing an enemy's hand, it is often difficult to understand his true intentions, motives, morale or capabilities, these officers say. Wartime lessons show that reliably predicting an adversary's behavior prior to engaging in battle could be impossible, they say." Grossman also quotes Col H. R. McMaster, Commander of the 3rd (US) Armored Cavalry Regiment in 2005:

"We must acknowledge the fact that forces will have to continue to fight for information and we must continue to organize, train and equip formations to do so… The information we desire most about the enemy — his real fighting power and his intentions — lie in the psychological and human dimensions rather than the physical… We must … acknowledge that the enemy plays a role in the future course of events and recognize that the enemy will develop countermeasures (tactical as well as technological) to any capability we develop."

Thus adversarial behaviour directly creates the need for enactment. This is because it increases the perceived complexity in the environment, which raises uncertainty – both in 'what is going on' and 'what questions we need to ask'.

Discovering organisations are concerned with more formal methods of scanning and interpretation, e.g. using guidelines, known factors and key indicators, as typified by branch Estimates in the UK Joint Force Headquarters Campaign Planning process.

The power of Daft & Weick's model is in its extension to predictions of typical organisational behaviours in support of these modes.

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[9] General Sir Rupert Smith refers to this phenomenon as both 'operating to learn' and 'shaking the tree' [12]

ENACTING	DISCOVERING
<u>Scanning characteristics</u> 1. data sources: external, personal 2. acquisition: no department, irregular reports and feedback from environment, selective information <u>Interpretation process</u> 1. some equivocality reduction 2. moderate rules & cycles <u>Strategy & decision-making</u> 1. strategy: prospector 2. decision process: incremental trial & error	<u>Scanning characteristics</u> 1. data sources: internal, impersonal 2. acquisition: separate departments, special studies and reports, extensive information <u>Interpretation process</u> 1. little equivocality reduction 2. many rules, moderate cycles <u>Strategy & decision-making</u> 1. strategy: analyser 2. decision process: systems analysis, computation

Table 2; Predictions of organisational behaviours in support of interpretation modes (adapted from Daft & Weick) [8]

Table 2 introduces the following generic attributes of interpretation systems:

- Scanning characteristics concern the data sources that are used and how data is acquired within the organisation. It is noted that enacting organisations rely on informal, often external data sources and are less likely to rely on formal organisational structures for acquisition; they also acquire *selective* information by filtering, rather than processing extensive information internally.
- Interpretation processes within discovering organisations are more procedural and less iterative than those within enacting organisations. They are therefore less well-equipped for reducing data equivocality: they provide greater support both for creating different perspectives on acquired data (because interpretation processes are less rule-based) and for subsequently challenging interpretations of those data (because interpretation processes iterate through more cycles).
- Strategy/decision-making within discovering organisations is grounded in analysis; its methods and tools are geared accordingly. For enacting organisations, prospecting activity (learning through action, 'shaking the tree', etc.) is critical to strategy and decision-making.

As within the Cynefin framework, the distinction between observation-led and action-led sensemaking is determined by environmental complexity. Similarly, organisational behaviours in less complex environments, i.e. in support of discovery-mode interpretation, are more easily recognised in military organisations, whilst those behaviours that support enacting-mode interpretation are less easily recognised.

Summary

The sensemaking research outlined in this section indicates that organisational interpretation mode differs according to perceived environmental complexity. Specifically, the sensemaking frameworks describe the relationship between interpretation mode (or 'sensemaking approach') and complexity.

The sensemaking landscape

This section reintroduces the operational landscape and maps sensemaking approaches, identified in the previous section, onto it. This defines the operational context for sensemaking behaviours within military organisations. Military organisations must be prepared to operate across the landscape and therefore must support all such approaches that appear. Further, the four types of Consumer

(Plans, Operations, Targeting and Force Protection) are also mapped to the landscape to illustrate the need for the Command & Consumer and ISTAR CoIs to adopt different approaches concurrently.

Sensemaking approaches within the landscape

The operational landscape, as discussed earlier in this paper, is based on two independent variables: 'familiarity-strangeness' and 'rate of significant change'. Familiarity-strangeness is equivalent to perceived environmental complexity. Rate of significant change is a factor of perceived environmental variability and perceived importance of events (hence 'significant').

Figure 2, below, describes the 'sensemaking landscape' by mapping Daft & Weick's interpretation modes and Kurtz & Snowden's sensemaking approaches onto the operational landscape to indicate the types interpretation behaviours military organisations should adopt in different operational circumstances.

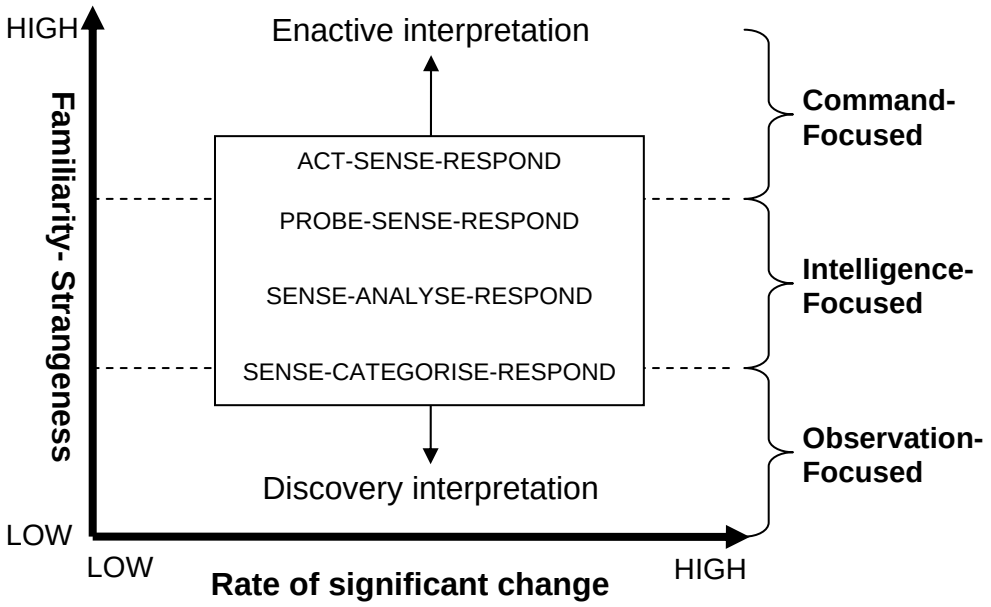

Figure 2; ISTAR modes mapped onto the sensemaking landscape

Figure 2 also overlays different explicit 'modes' for ISTAR: Command-focused, Intelligence-focused and Observation-focused. These modes reflect a spectrum of approaches to problem-structuring and problem-solving within military organisations operating in differing regions of the landscape – principally along the familiarity-strangeness dimension. These modes support appropriate sensemaking behaviours according to both Kurtz's and Snowden's Cynefin framework [6] and Daft & Weick's model [8].

Observation-focused ISTAR is most appropriate in relatively simple, or 'known', environments and is characterised by the sensemaking approach sense-categorise-respond. It assumes a relatively stable effective frame of reference within which data are categorised as information. Thus the interpretation process is relatively mechanistic and equivalent to a simple form of discovery; reports only need to be sanity checked and collated by ISTAR to form a clear 'picture', which is itself based upon the frame. Collection (scanning) is directed towards the identification of 'items'.

It is thus appropriate to encapsulate within standard operating procedures, which can be effectively and efficiently conducted by ISTAR staff.

Intelligence-focused ISTAR is most appropriate in moderately complex, or 'knowable', environments and is characterised by the sensemaking approach sense-analyse-respond. ISTAR collection and interpretation of reports needs to be focused and supplemented by consideration of hypotheses and Courses of Action (CoAs). Problem solving is non-trivial, but possible through systems thinking and an analytical approach, which represents a more advanced form of discovery-based interpretation than Observation-focused ISTAR. Equivocality reduction is possible through the ongoing modification of the frame of reference, yet the means by which this is achieved is further collection and analysis. This mode is encapsulated within current doctrine [1] and requires a broader range of ISTAR skills than Observation-focused ISTAR, including the ability to consider hypotheses (e.g. by weights of evidence) and reduce equivocality (by modifying frames). There is less reliance upon procedure than in Observation-focused ISTAR but less of a requirement for experience and creativity than in Command-focused ISTAR, since it is still primarily concerned with knowable 'items'[10] that can be reduced from the Commander's i2 needs.

Command-focused ISTAR is most appropriate in highly complex environments, termed 'complex' or chaotic' in the Cynefin framework [6]. It is characterised by the sensemaking approaches probe-sense-respond and act-sense-respond; this differs from the previous two modes in its focus upon action as a means of making the environment 'sensable'. This type of action is denoted as 'prospecting', since it has a purpose of learning in addition to (or rather than) achieving a specified effect in the battlespace[11]. The possession of an effective organisational frame of reference is at best transient (or, more likely, elusive) and the Commander will seek to shape operations accordingly. The lack of an effective stable frame will give rise to a relatively high level of data equivocality and therefore the need to reduce it. The internal approach to equivocality reduction includes complex adaptive systems (CAS) thinking, the development of multiple perspectives on the data and pattern management; the complimentary external approach is through prospecting activity. Both elements of the approach additionally support the modification of the frame of reference. In such highly complex environments, the ISTAR function will raise matters of judgement (e.g., critical assumptions) that ought to be referred to the Commander; thus the Commander will also sometimes need to become closely involved in ISTAR activities. The collaborative relationship between the Commander and his key Intelligence staff is critical since his i2 needs, which will be primarily concerned with intentions[12], are not easily reduced into information requirements that can be handled within the ISTAR function; further, since the Commander is his own 'Chief Intelligence Officer' [12], he will be instrumental in problem-framing and the supporting activities under the 'internal approach' discussed above. Under the Command-focused approach, procedures remain valid only where they can be

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[10] General Sir Rupert Smith argues that our current ISTAR capabilities are "very well developed to answer questions about items (i.e. men and materiel) and to find and attack these items. We want to know the time, place, amount and activity; our systems provide such data in profusion…the information is objective, can be assessed by calculation and lends itself to presentation in tabular and graphical forms such that the staff procedure in the HQ supports the process for making the decision and then acting on it." [5] Hence current ISTAR capabilities are well-suited to observation-led and intelligence-led ISTAR.

[11] "Operating to learn" or "shaking the tree" [12]

[12] General Sir Rupert Smith [5] underlines the importance of considering intentions over items in warfare, the complexities of which are perhaps recognised more than now than in the past. "If, as is the case today, the opponent does not join with us in seeking a strategic decision on the battlefield, if our shared objective is the will of the people, if he fights amongst the people and below the threshold of utility of our weapon systems, endeavouring to provoke us into reinforcing his position by our actions, then our questions are mostly to do with intentions rather than things. The information required to answer questions in these circumstances is to do with intentions, timing and consequences rather than items. This is subjective information that deals with probabilities and sentiment; it requires judgment and an understanding of the opponent's logic in assessment."

adjusted, and iterated, according to the demands of the problem-solving activity they are required to support.

Thus the Command-ISTAR relationship will differ according to perceptions of the operational environment. Any military organisation, however, comprises different functions and enablers that support the Command process, and each other, in different ways and have different requirements for i2. Military functions also perceive the environment in different ways since they are engaged in different tasks and therefore assign differing importances to aspects of that environment. Hence a military organisation will not perceive environmental circumstances as a single point on the landscape, but as a region. This argument is expanded below.

ISTAR Consumers and the sensemaking Landscape

The perceptions of the four exemplar ISTAR Consumers, regarding the operational environment, are mapped onto the sensemaking landscape in Figure 3. This is an indicative mapping, provided to illustrate differences and similarities between functions. Its most important aspect is the *relative* placement of the functions on the landscape. The actual placement is dependent upon the organisational perception of environmental strangeness-familiarity and rate of significant change, and this perception is naturally led by the Commander. Thus the four ellipses in Figure 3 will be shifted upwards for 'stranger' environments and to the right for those environments whose significant aspects are changing more rapidly.

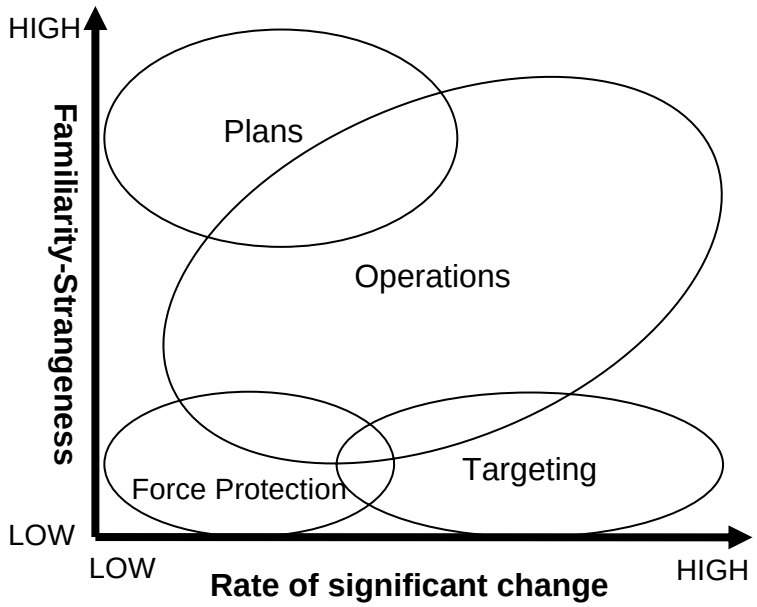

Figure 3; Indicative mapping of Consumers' perceptions of the operational environment mapped onto the sensemaking landscape

The Plans function generally operates in the high-complexity, low-variability[13] quadrant of the landscape. Whilst complexity is dependent upon the Operation itself, Plans is considered to adopt the enacting mode of sensemaking and spends a proportionally high amount of time 'framing the problem' with the Commander. Consequently, it is less likely that Plans can provide specific IRs than any other Consumer. A purpose of the Plans function is to reduce the apparent complexity in the environment, through sensemaking (including equivocality reduction), for the

[13] Although the environment may be changing rapidly, the Plans function tends to focus upon longer-term trends and broader patterns of behaviour than, e.g. Operations. Hence the rate of significant change is *relatively* low.

higher-tempo Operations function. The mode of interpretation that Operations employs may be *enacting* or *discovery* depending on both the inherent complexity in the environment and the success of the Plans function in making it more 'sensible'. (Armoured Reconnaissance, as noted previously, may be considered 'enactive' and would be situated near the top of the Operations region in Figure 3). The needs of Consumers within the specialised Force Protection and Targeting functions are more specific; they are more likely to be able to frame IRs for the ISTAR function to process. Targeting tends to operate in circumstances that are highly sensitive to change, thus discovery-mode interpretation, adopted by ISTAR, must handle potentially changing IR sets and adjust *its* tempo accordingly.

Since the requirements of each Consumer type for the Command-ISTAR relationship differ in terms of the mode of interpretation, both enactment and discovery must be supported, *concurrently*, by military organisations.

Summary

By the mapping of 'ISTAR modes' and exemplar Consumers onto the sensemaking Landscape (see Figure 3), it is concluded that Command-focused ISTAR – primarily in support of Plans and Operations – supports sensemaking (primarily enactment) through the following behaviours:

- Operating without clearly defined IRs;
- Working to relatively loose procedures and highly iteratively (to reduce equivocality);
- Learning about the environment both through action-based observation and the application of experience and expertise to hypothesis formulation and testing, and equivocality reduction – rather than structured observation;

Intelligence-focused ISTAR supports sensemaking (primarily discovery) through the following behaviours:

- Operating with IRs that can be reduced from expressed i2 needs;
- Working to formal procedures but not bound by them;
- Learning about the environment by hypothesis formulation and testing, and some equivocality reduction, primarily based on collected data.

Observation-focused ISTAR supports sensemaking (a relatively simple form of discovery) through a different set of behaviours:

- Operating with clearly defined IRs;
- Working to standard operating procedures;
- Learning about the environment by collecting within a framework of established factors or indicators.

Whilst all three sets of behaviours are recognised in most military organisations, the first set is not well-understood or well-supported by capability.

Characterisation of the Command-ISTAR relationship

This section introduces an organisational activity model that characterises the Command-ISTAR relationship. The model is grounded in a human sciences approach, whereby the relationship is viewed as set of human activities conducted within overlapping CoIs, and is motivated by the key arguments of the previous sections: military organisations must be prepared to operate, concurrently, within

different regions of the operational landscape and therefore must support both enactment and discovery through different ISTAR modes.

Whilst UK doctrine [1] describes ISTAR activity in terms of the Intelligence Cycle (Direction, Collection, Processing and Dissemination), the model presented here is concerned only with the mode of employment for DCPD, rather than the (re)specification of these component activities. The model represents DCPD in two complimentary parts (Procedural ISTAR Activity and Adaptive ISTAR Activity) that are explained below.

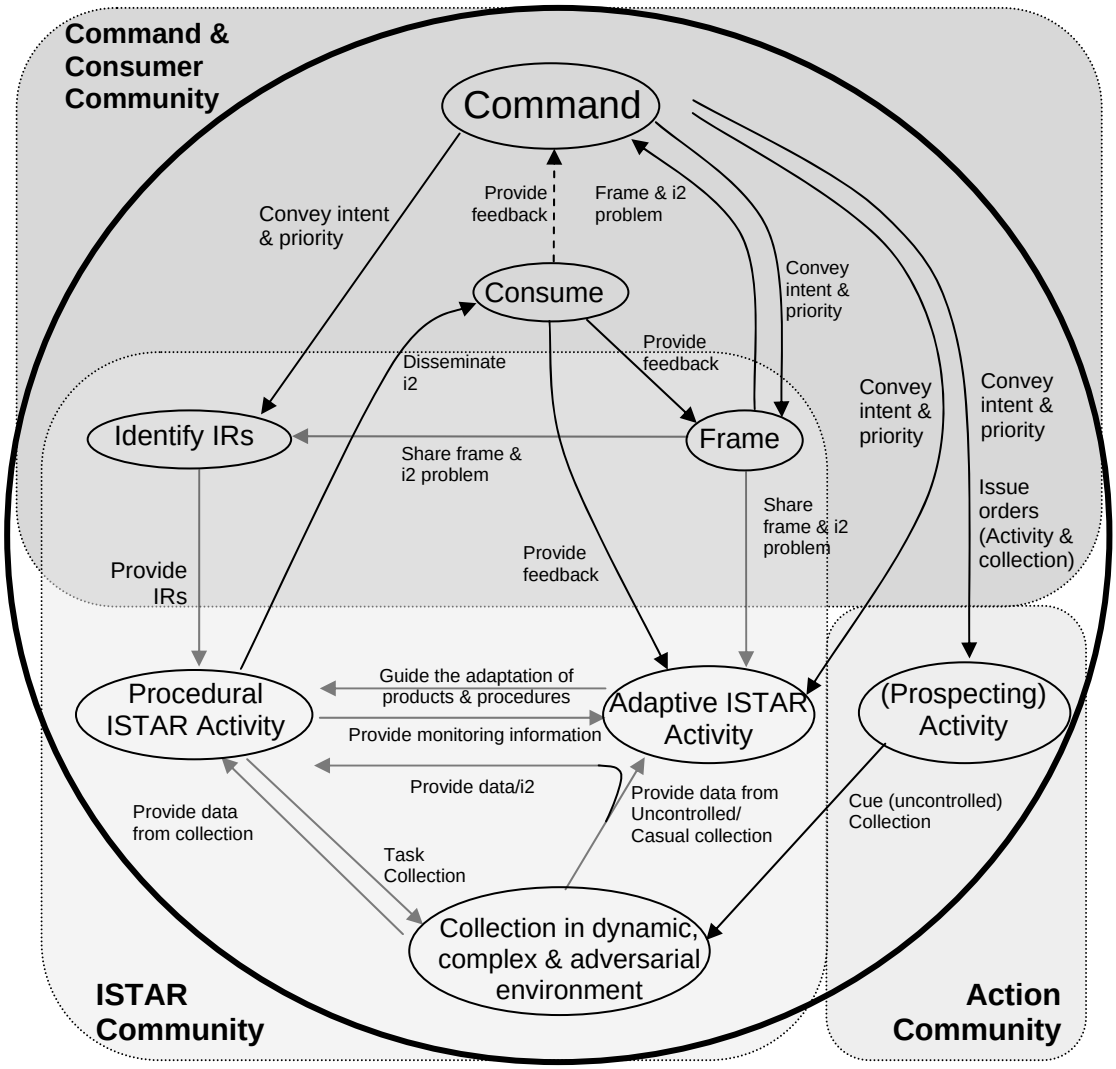

Figure 4; Command-ISTAR activity model

The model describes those interrelated activities of a military organisation that involve the relationship between Command and ISTAR. The 8 activities (denoted by ellipses) are assigned to one or more CoIs (denoted by shaded areas). The overlap between the 'Command & Consumer' and 'ISTAR' communities represents shared activities. The links denote interactions, which include both direction and the provision of information.

Note that sensemaking (nor enactment or discovery) does not appear as a single activity within the model. This is because sensemaking (in both enactment and

discovery modes) is conceptualised as a *pattern* of activities across the model. We therefore seek to describe these patterns. First, however, we define some of the terms that appear in the model and then describe the activities individually.

Definitions

The following definitions are provided in support of the activity descriptions:

- Complex, dynamic and adversarial environment. 'Environment' is used in the same sense as previously in this paper, i.e. the operating environment. Both 'complex' and 'dynamic' reflect the range of operational circumstances described by the landscape. 'Adversarial' recognises that environmental complexity and dynamics are due, in no small part, to adversarial behaviour.
- i2 problem. This describes an individual's or organisation's overall need for i2 as the basis for problem solving, and therefore decision making. It may not always render itself to expression as a set of IRs (see the description of Frame activity, below) and is subject to change as Command intent and priorities, the environment (and the sense made of that environment) change.
- Frame of reference. A frame of reference is a shared cognitive construct that provides a context within which i2 can be placed to give it meaning. It provides the means by which critical cues in the environment can be identified and thus the means by which sensemaking occurs. For any given environment there is no objectively 'correct' frame, and its effectiveness can only ultimately be judged by the effectiveness of those actions that it shapes through sensemaking and decision-making. At any given time and for any given problem (encountered within a complex and dynamic environment), a frame may be incomplete or inadequate and is subject to modification, based on i2. Since frames are cognitive constructs, they are not easily expressed (unless trivial). External representations of frames, e.g. in terms of ontologies, are therefore also likely to be incomplete or inadequate. Further, to 'share' a frame is *not* simply to share an ontology; it also includes sharing perspectives, examples and experience to support the development and maintenance of the shared cognitive construct. Note that this is a key activity within sensemaking.

Activities

The activities within the Command-ISTAR model are described as follows. For those activities that are not encapsulated within current UK doctrine [1], a justification for their inclusion, within the model, is provided.

- Command is solely the authority and responsibility of the Commander and includes problem-solving and decision making. It serves to formulate and communicate intent, guidance and priorities.
- Consume concerns the receipt and exploitation of disseminated i2 by Consumers. The exploitation of this i2 for problem-solving, within the activity model[14], is described by feedback links to both Command and Frame.
- Frame activity is concerned with setting the conditions for problem-solving through the ongoing generation, maintenance and modification of a frame of reference (a 'way of perceiving') and provides the means for conceptualising the i2 problem. Framing is a Command-led activity, drawing on the ISTAR Community as appropriate, for which experience is a key factor – senior Commanders are more likely to possess effective and robust frames of

[14] The exploitation of i2 by other military functions is not included in the model.

reference, and the ability to generate and maintain them, than junior Commanders. It provides a frame and a view on the i2 problem to Command[15], Identify IRs and Adaptive ISTAR. Framing may also require 'sensemaking tools' to support the Commander and ISTAR Staff in constructing meaningful and plausible explanations for i2[16]. Note that framing is not explained within current UK doctrine. It is required to support discovery and enactment (see below) although will be more instrumental in the latter. Doctrine [1] describes activities that contribute to discovery-mode interpretation, but not 'framing'. In this mode, however, framing is relatively inactive; it generates the context within which IRs are identified but does not necessarily modify the frame itself.

- Identify IRs interprets Command intent and priority in the context of a frame of reference for sensemaking to generate meaningful Intelligence Requirements for ISTAR to process. It is a shared Command-ISTAR activity, thus ISTAR staff provide support to the Commander (and other Consumer types) in the identification of IRs. The mechanisms by which IRs are identified are expected to include dialogue, collaboration, innovation and procedure. The first two demand Command and Consumer involvement, usually with ISTAR staff; the third is employed across the Command & Consumer and ISTAR Communities; the last is in the domain of ISTAR Staff.
- Prospecting Activity is activity conceived with the purpose of generating environmental behaviour that can be observed and interpreted[17]. It is therefore concerned with action itself. It is not purely collection, although it must be associated with some form of collection[18] to support interpretation. It thus provides the ways for what Daft & Weick term 'learning by doing' and what, in military parlance, can be described as 'operating to learn' [12] or 'fighting for information' [11]. It is recognised, however, that Prospecting is likely to form a component of Activity that also seeks to realise operational effect (shaping of the operational environment); thus 'prospecting' may not be its only purpose. Other than through the concept of armoured reconnaissance, Prospecting Activity is not encapsulated in doctrine and its role in supporting sensemaking is not explored. Together with framing, it is fundamental to enactment (see below) and is therefore included within the model.
- Collection includes that conducted by traditional means (by ISTAR resources to address IRs) and that conducted by means of Non-Traditional ISTAR (NTI), using uncontrolled or casual methods[19]. Collection is tasked by either Procedural ISTAR (when it is associated with an IR) or by Command, via Prospecting Activity (where i2 needs cannot be expressed in terms of IRs). In this latter case, collection tasking may be fairly broad and the need to interpret

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[15] The two-way interaction between Command and Frame may be attributed purely to the Commander's cognitive processes, since he may be the only individual involved in both activities. This highlights that the model does not describe explicit processes; and that interactions do not necessarily imply explicit information flows.

[16] Sensemaking tools must be able to operate on unstructured data which is likely to include a relatively high degree of 'noise' (since there may be no frame of reference into which this data can be placed). It may therefore consist of verbal and textual reports and other artefacts. Such tools must support indexing and filtering of such data, construction of multiple views on that data and the development of models. The Cognitive Edge SenseMaker Suite is an example of such tool. (Source from http://www.cognitive-edge.com/sensemaker_suite.php)

[17] It may be dangerous to assume a cause-and-effect relationship between activity and environmental behaviour; such terms are purposefully omitted here. See also the earlier discussion of the Cynefin framework.

[18] It is assumed that NTI (in particular, HUMINT) will play a key role. This extends to the Commander himself engaging with personalities in the environment to understand 'what is going on'. Thus the Commander may himself be part of NTI.

[19] "There are two categories of non-traditional ISTAR asset, which are uncontrolled and casual. Uncontrolled assets can be requested to perform an ISTAR task but with no assurance of performance. Casual assets cannot be tasked or requested to perform an ISTAR role but may provide information that has not been solicited". [14]

environmental behaviour must be balanced against the use of collection resources.

- Procedural ISTAR Activity maps onto the Direction, Processing and Dissemination (D.PD) activities of the Intelligence Cycle. It is concerned with the efficient processing of IRs and the generation of corresponding i2 to Consumers. It also tasks ISTAR resources to collect within the operating environment and expects data to be provided for processing as i2. Procedural ISTAR is achieved through 'mixed initiative' working, whereby humans and computers undertake different tasks according to their most effective and efficient employment. Procedural ISTAR Activity is, therefore, tailored to support discovery-mode interpretation. It is also well-established within current military organisations and encapsulated within doctrine [1].
- Adaptive ISTAR Activity, like Procedural ISTAR, maps onto D.PD. The distinction between the two is that the former adopts a holistic view of ISTAR in its interactions, both internally and with Command and other military functions. Examples of Adaptive ISTAR are: maintaining a view on Commanders'/Consumer's i2 problems, maintaining a view on the IRs being handled by Procedural ISTAR, adjusting the products and/or procedures of ISTAR and managing non-traditional inputs to D.PD (e.g. collection from NTI sources). In its interaction with Procedural ISTAR Activity (see below), Adaptive ISTAR Activity supports enactment. It is less well-established within current military organisations and not well-covered within doctrine [1].

The activity model encapsulates three key patterns of behaviour[20]: discovery interpretation, enactive interpretation and adaptation of ISTAR procedures. The first two of these describe different approaches to sensemaking within a military organisation, as introduced previously. The last of these describes the way in which the same ISTAR function can be adjusted, as appropriate, to support discovery or enactment.

Discovery-mode interpretation

The discovery mode of interpretation is undertaken through the Intelligence Cycle, as encapsulated in doctrine [1]. This is because it places an emphasis on ISTAR (and particularly the formulation of the 'correct' questions), rather than action, as the means by which interpretation is undertaken.

Within the Command-ISTAR activity model, Discovery is characterised by Command, Frame, Identify IRs, Procedural and Adaptive ISTAR Activity, Collection and Consume. Here, Command and Frame can provide sufficient context for the identification of IRs. Framing itself will develop and maintain this frame based on available i2 and shared interpretation of that i2. IRs are passed to Procedural ISTAR Activity (D.PD) for processing. Collection tasking is generated here and passed to the Collection activity; collected data is fed back into Procedural ISTAR Activity for processing as i2, which is packaged and disseminated to Consumers. As stated above, Procedural and Adaptive ISTAR Activity together maintain ISTAR efficiency and effectiveness.

Enactive-mode interpretation

The enactive mode of interpretation is undertaken outside the doctrinal Intelligence Cycle, but is recognised in practice [12][13]. It is characterised by Command, Frame, Procedural and Adaptive ISTAR Activity, Prospecting Activity, Collection and

[20] Although chains of activities can be deduced by tracing links around the model, none are mutually exclusive. Thus all such activities may be taking place concurrently.

Consume. Here, Command and Frame are insufficient for the development of IRs since the Commander cannot adequately express his i2 problem through Framing (and the i2 available to it from discovery-based interpretation). This demands that Framing itself draws on other sources of i2 – which cannot be generated by collection alone – and he seeks to 'shake the tree' through Prospecting Activity. Since Prospecting Activity is not associated with IRs, it is likely that it cannot be associated with 'traditional' collection tasking. Instead, it is likely that uncontrolled collection is tasked and Adaptive ISTAR Activity handles the receipt of the collected data. (This may mean the short-circuiting of i2 processing so that i2 can be provided rapidly to Framing. It is noted that Procedural ISTAR may actually be unable to handle such data because there is no effective frame of reference within which it can do so.)

It is recognised that Prospecting Activity is not the only means by which i2 is generated in support of Framing. In theory, any Activity that gives rise to collection may provide critical i2, thus opportunistic collection from casual sources may provide data to Adaptive ISTAR for handling.

Adaptation of ISTAR Procedures

Together, Procedural ISTAR Activity and Adaptive ISTAR Activity describe the Direction, Processing and Dissemination stages of the Intelligence Cycle[21], with Collection a separate activity. Procedural ISTAR is concerned with the efficient throughput of IRs. It is noted, however, that no procedure is fully reliable and accurate in complex changing circumstances. Thus Procedural ISTAR cannot be treated as a 'black box'. The Commander will require engagement with Procedural ISTAR to maintain its effectiveness as well as its efficiency. This is achieved through Adaptive ISTAR, which is concerned with ISTAR effectiveness. For Adaptive ISTAR to perform its function it requires direct access to:

- The Command & Consumer Community's frame of reference and i2 problem;
- Monitoring information from Procedural ISTAR (e.g. IRs 'in the system'); and
- Consumer satisfaction with i2 produced in response to IRs.

Although the 'i2 problem' is not necessarily expressible in terms of an IR set, comparison of the i2 problem with IRs in the system, by experienced Intelligence staff, can support an assessment of the effectiveness of ISTAR (essentially, "are we answering the right questions?" 'Consumer satisfaction' provides a direct assessment of effectiveness ("are we answering the questions right?"). Both assessments must be considered to address ISTAR effectiveness.

The feedback from Adaptive to Procedural ISTAR is through the adjustment of products (e.g. IRs) and the procedures themselves. Both actions seek to improve effectiveness by ensuring that the changing i2 problem is being addressed. Whilst new IRs are continually raised in response to change by the combination of Framing and Identify IRs, Adaptive ISTAR will support this chain of activity, where required, by making rapid and systemic adjustments to the product set. The adjustment of procedures recognises that 'short-circuiting' may be required, e.g. truncating i2 processing when timeliness is more important than certainty.

Other interactions between discovery and enactment

Whilst enactment and discovery are supported by common activities, they do so in different ways for different purposes, e.g. Framing simply provides output (i.e. a

[21] It is stressed that Adaptive and Procedural ISTAR are complementary, rather than alternative, ISTAR activities.

frame) to support discovery whereas, in enactment, it is actually undertaken as an activity.

Other interactions between the two modes of interpretation include:

- (Prospecting) Activity may lead to the generation of i2 that addresses IRs in the system.
- Likewise, i2 generated from collection tasking in support of IRs may be exploited by Framing. This is because i2 and frames are reliant upon each other for their validation.

Summary of the model – what is new?

The Command-ISTAR activity model includes a number of activities, and patterns on those activities, that are not easily or completely recognised within current UK practice. These are:

- Frame (shared between the Command & Consumer CoI and the ISTAR CoI);
- Prospecting Activity (as an additional type of battlespace activity that is associated with collection and is conducted by the Action CoI);
- Enactment-mode interpretation (as a pattern of activities including Command, Frame, Procedural and Adaptive ISTAR Activity, Prospecting Activity, Collection and Consume);
- Adaptive ISTAR Activity (as a development of process management activities conducted within the ISTAR CoI that enables both discovery and enactment to be conducted within the same military organisation).

Each of these new activities will generate capability requirements, some of which will themselves be novel. These are likely to concern organisational structures (to reinforce the overlap between CoIs), support to collaborative working across and between CoIs, personnel and training (to engender complex adaptive systems thinking and sensemaking practices) and information/equipment to support sensemaking practices such as the generation and maintenance of multiple perspectives on data and pattern management. Whilst these capability requirements are yet to be developed in detail, the arguments put forward here provide a basis for that work.

Summary of Arguments

This section summarises the key arguments in this paper, which include likely capability requirements, as discussed above, to support the Command-ISTAR relationship.

1. Human interaction between the Command & Consumer and ISTAR Communities is critical to the Command-ISTAR relationship. The key part of this relationship is, in fact, between Command and Intelligence.
2. The Command-ISTAR relationship is characterised by sensemaking, which supports decision-making. Sensemaking describes how organisations interpret their operational environment, an activity that ISTAR plays a key role in supporting. A body of sensemaking research indicates that sensemaking behaviours in organisations differ according to perceptions about the environment, principally its complexity and variability.
3. The more complex and dynamic the environment is perceived to be, the more likely it is that the Commander may not always possess an effective ‘frame of

reference' for recognising critical elements within that environment. The impact for ISTAR is that it cannot be assumed that Commanders (and Consumers) will be able to express their 'i2 problem' as specific intelligence questions. Instead ISTAR – particularly Intelligence – must work with Command to develop and maintain the frame of reference within which questions can be raised.

4. The Command-ISTAR relationship must support both enactment (learning through action) and discovery (learning through observation) approaches. Enactment relies, critically, on interactions between the Command & Consumer and ISTAR Communities. ISTAR must be more closely integrated with Command and must possess the appropriate ways of working for enactment.

5. Plans and Operations may perceiving the environment as more complex and tend to rely upon enactment more often than Targeting/Force Protection, which may rely more on discovering.

6. Military organisations must be prepared to operate across the entire landscape of operations, which may be described on two dimensions: strangeness-familiarity (perceived complexity) and rate of change of significant events (perceived variability mediated by perceived importance), and often in multiple regions of the landscape at the same time due to differing environmental perceptions across military functions. Thus military organisations must support, concurrently, enactment and discovery.

7. The Intelligence Cycle (DCPD) is tailored to the discovery-based approach, whilst enactment relies, additionally, upon a Command-ISTAR activity of framing the intelligence problem, as well as upon the tasking of 'prospecting activity' within the environment to stimulate behaviour ("shaking the tree"). Enactment, in particular, calls for an approach to ISTAR that is adaptive rather than purely procedural, because environmental uncertainty may reduce ISTAR effectiveness. Adaptive ISTAR is identified as an activity that adjusts ISTAR products and procedures to maintain this effectiveness.

8. Under an enacting approach, ISTAR will be more reliant on Non-Traditional ISTAR (NTI) – as an important means of collecting data following prospecting activity – and will not follow the series of activities within the ISTAR Process representations.

9. The Command & Consumer and ISTAR Communities would benefit from appropriate sensemaking tools that allow the construction of meaningful/plausible patterns of events from i2.

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