16th ICCRTS

"Collective C2 in Multinational Civil-Military Operations"

(PAPER 113)

An intelligence process model based on a collaborative approach

Anissa Frini

Anne-Claire Boury-Brisset

Defence R&D Canada – Valcartier
2459 Pie-XI North
Quebec, QC, G3J 1X5

Point of contact: Anissa Frini
Tel.: (418) 844-4000 #4418
Anissa.Frini@drdc-rddc.gc.ca

TOPIC

Collaboration, shared awareness and decision-making (# 5)

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JUN 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
An intelligence process model based on a collaborative approach	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Defence R&D Canada - Valcartier,2459 Pie-XI North,Quebec, QC, G3J 1X5,**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Presented at the 16th International Command and Control Research and Technology Symposium (ICCRTS 2011), Qu?c City, Qu?c, Canada, June 21-23, 2011. U.S. Government or Federal Rights License.

14. ABSTRACT
In the intelligence domain, the collection and processing of information and intelligence from multiple Intelligence, Surveillance and Reconnaissance (ISR) sources (including sensors, human, open sources, etc.) is essential to produce actionable intelligence of high value in order to counter threat. In current practice, the outputs of different sources are more often separated from one another and thus, cross-checking is limited. Further, the traditional intelligence cycle model lacks in representing the process from an all-source perspective. In this paper, we propose an all-source intelligence process model that represents elements of the intelligence process from an all-source perspective. The proposed model is composed of several activities and processes: intelligence tasking; direction; single source collection & processing; all-source discovery & fusion; dissemination; and evaluation & feedback. Three levels of detail of the model are provided. The proposed model presumes a collaborative approach that enables the analysis of a greater quantity of single source data by sharing analysis tasks and results between all actors from different military and non-military intelligence organizations. In addition, this paper discusses the issues and challenges to the effectiveness of all-source intelligence model and presents factors that enable such a collaborative approach.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**47**	

An intelligence process model based on a collaborative approach

ABSTRACT

In the intelligence domain, the collection and processing of information and intelligence from multiple Intelligence, Surveillance and Reconnaissance (ISR) sources (including sensors, human, open sources, etc.) is essential to produce actionable intelligence of high value in order to counter threat. In current practice, the outputs of different sources are more often separated from one another and thus, cross-checking is limited. Further, the traditional intelligence cycle model lacks in representing the process from an all-source perspective. In this paper, we propose an all-source intelligence process model that represents elements of the intelligence process from an all-source perspective. The proposed model is composed of several activities and processes: intelligence tasking; direction; single source collection & processing; all-source discovery & fusion; dissemination; and evaluation & feedback. Three levels of detail of the model are provided. The proposed model presumes a collaborative approach that enables the analysis of a greater quantity of single source data by sharing analysis tasks and results between all actors from different military and non-military intelligence organizations. In addition, this paper discusses the issues and challenges to the effectiveness of all-source intelligence model and presents factors that enable such a collaborative approach.

Introduction

The traditional intelligence cycle is a conceptual model showing how intelligence operations are conducted. It consists of four steps (direction, collection, processing, and dissemination) from defining what the decision-maker needs to know to the reception of the answer that he asked for. During the last decades, many criticisms and discussions were addressed towards the intelligence cycle [1], [2], [3], [4], [5], [6], [7], [8], [9]. Gregory F. Treverton in his book *Reshaping national intelligence for an age of information* [2] asserts that

> *"…The changes in the world that are already apparent are more than enough to require a complete reshaping of intelligence, and the extension of those changes into the future of the market state will only sharpen that need".*

On his side, Mark Lowenthal affirms in his book *Intelligence: from secrets to policy* [4] that:

> *"…The intelligence cycle representation misrepresents some aspects and misses many others. First, it is overly simple. Its end to end completeness misses many of the vagaries in the process. It is also oddly unidimensional. A policy maker asks questions and after a few steps gets an answer. There is no feedback, and the diagram does not convey that the process might not be completed in one cycle".*

In a publication of the Center of the Study of Intelligence of the CIA, it is stated that:

> *"…The model omits elements and fails to capture the process accurately" and "the traditional intelligence cycle model should either be redesigned to depict accurately the intended goal, or care should be taken to discuss explicitly its limitations whenever it is used" [1].*

In [8], the author notices that:

> *"…The cycle reflects a conception of information services that fit the 1940s, when the intelligence community was established and people began to discuss how intelligence could be made more effective. But from the perspective of today's information consumer, the model falls short on several counts".*

Many other criticisms are formulated in the literature but despite all these criticisms, the cycle continues to be considered as the core representation of how intelligence is functioning [5]. In addition, some authors in the open literature [1] [2], [3], [4] foster the development of a more complete representation of all elements of the process as well as the factors that influence them. There is an agreement towards the need to have a model that would capture the entire intelligence process, from the request for intelligence to its delivery, including the roles and responsibilities of all stakeholders.

This paper highlights many deficiencies and issues of the traditional intelligence cycle and particularly focuses on the fact that this cycle lacks in representing the intelligence process from an all-source perspective. On one hand, the all-source activities are not represented in the traditional cycle. They are encompassed within the processing step of the cycle. On the other hand, the intelligence cycle does not provide a good basis for the understanding of the processes, the involved actors, the relationships between single source and all-source activities. The objective in this paper is to better understand, define and represent the all-source intelligence process based on a collaborative approach.

The traditional intelligence cycle is reviewed and the main criticisms that were addressed in the literature are highlighted. Then, the modelling of the intelligence process is rethought from an all-source perspective and a modified model is proposed. The proposed model is composed of many activities and processes: intelligence tasking; direction; single source collection & processing; all-source discovery & fusion; dissemination; and evaluation & feedback. Three levels of detail of the model are provided. Level 1 is a high level representation of the intelligence process. Level 2 introduces the roles of intelligence personnel in each phase and specifies the main activities in the direction phase. Level 3 details the activities in the "single source collection & processing" and the "all-source discovery & fusion" phases. The proposed model presumes a collaborative approach that enables the analysis of a greater quantity of single source data by sharing analysis tasks and results between all actors from different military and non-military intelligence organizations. In addition, this paper discusses the challenges and issues and presents factors that enable or impede such collaboration.

The intelligence cycle

The intelligence cycle is a conceptual model showing how intelligence operations are conducted. It is an end-to-end process presenting all stages from finding out (or anticipating) what the decision-maker needs to know to the reception of the answer that he asked for. The same intelligence cycle representation is generally considered for the civilian and the military intelligence organizations. In this paper, we report the definitions of the intelligence cycle from the military context, but all along the paper, we take the option to remain general so that the results of this study could be applied for the civilian and the military intelligence context.

Different representations, but with the same logic and main phases, are proposed by Canadian, United States (US) and North Atlantic Treaty Organization (NATO) doctrines. According to the Canadian Joint Intelligence Doctrine [10] and the Canadian land force intelligence field manual [11], the intelligence cycle is composed of four steps: *direction*, *collection*, *processing*, and *dissemination* (see Figure 1). The intelligence process may not continue through the complete cycle and there are no firm boundaries delineating the points at which each stage of the cycle starts and stops [10].

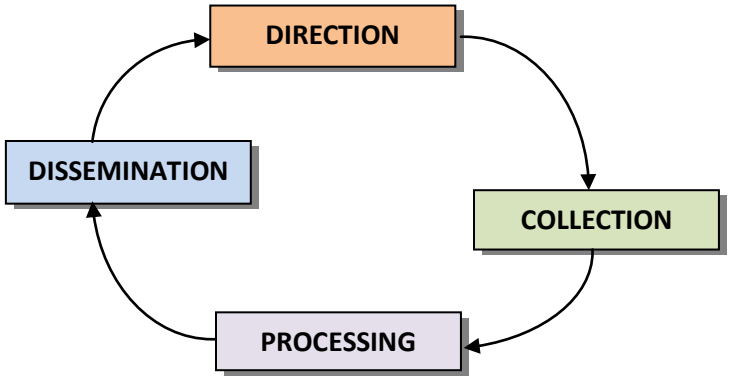


Figure 1: The intelligence cycle [10]

The Canadian intelligence cycle model is composed of four phases:

Direction consists of determining the intelligence requirements, planning the collection effort, issuing orders and requests to collection agencies and maintaining a continuous check on the productivity of such agencies [10].

Collection is the process during which information and intelligence are collected from sources and agencies in order to meet the intelligence requirements.

Processing regroups a series of actions which consists of collation; evaluation; analysis and integration; and interpretation of information and/or other intelligence.

Dissemination is the delivery of intelligence and is defined as "The timely conveyance of intelligence, in an appropriate form and by any suitable means, to those who need it" [10].

From the US side, the joint doctrine intelligence model [12] is composed of six phases: planning and direction; collection, processing and exploitation; analysis and production, dissemination and integration; and evaluation and feedback (see Figure 2). Here, processing refers to the conversion of the information into forms that can be readily used in the production phase. Also, the US model separates, in different phases, the activities that are not performed by the same resources (activities done by collectors and activities done by the intelligence analysts). The US model also includes integration in the last stage which refers to the integration of intelligence into the planning process and to a continuous dialogue between the user and the producer of intelligence. In addition, evaluation & feedback is a continuing activity during which intelligence personnel at all levels assesses how well each phase is being performed.

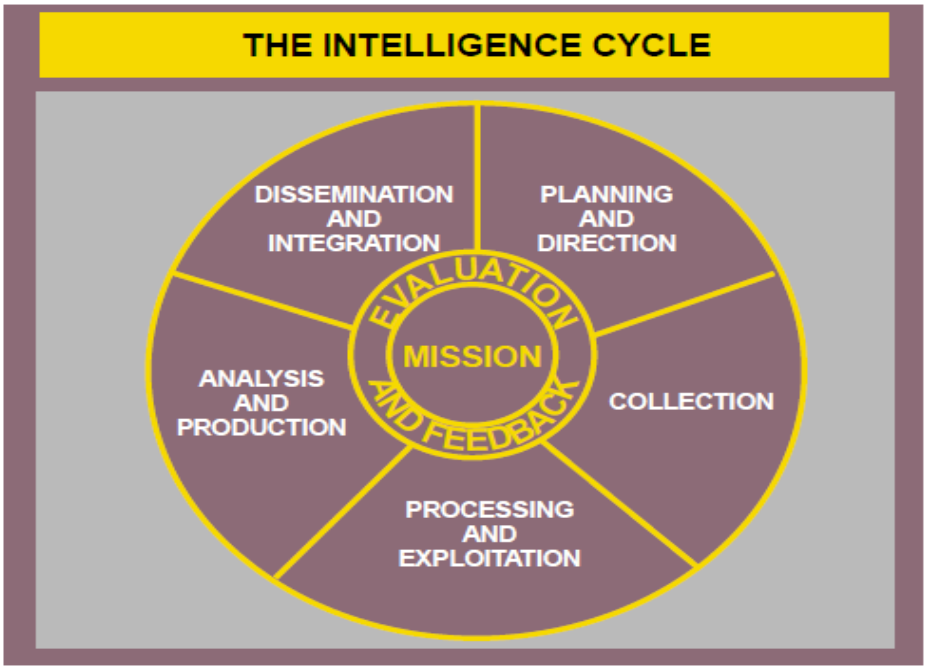


Figure 2: The US Joint Intelligence Cycle [12]

More recently, the US Department of the Army published a model of the intelligence process [13], which describes intelligence operations by four steps (plan, prepare, collect and produce) and four continuing activities that occur across the four intelligence process steps (generate intelligence knowledge, analyze, assess, disseminate). The four continuing activities shape the intelligence process (see Figure 3). They occur throughout the process and can affect any step at any time.

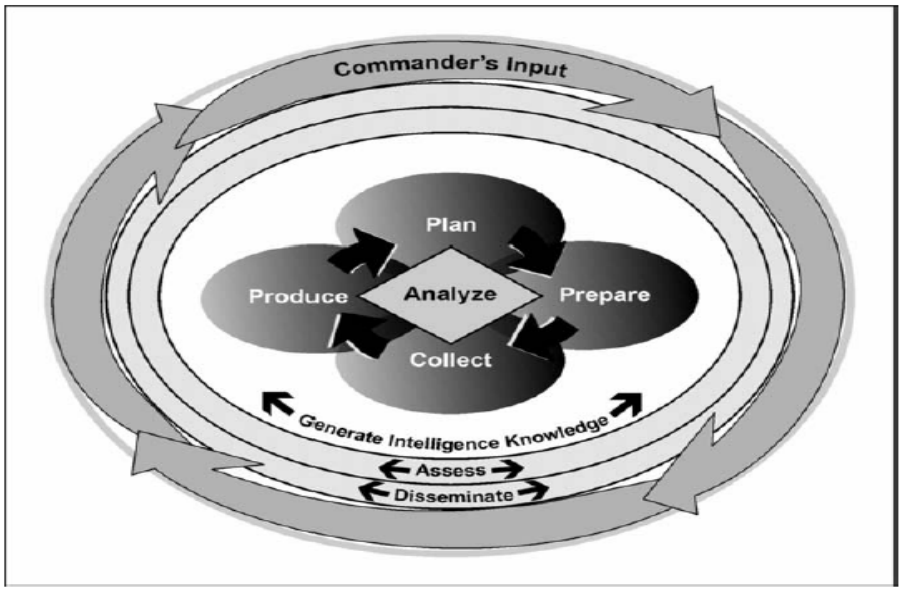


Figure 3: The US army intelligence process [13]

The NATO representation (see Figure 4) of the intelligence cycle adds to the Canadian representation a continuous phase "evaluation and feedback" performed all along the process [14][15].

Figure 4: The NATO Intelligence Cycle

As we specified earlier, we do not favour in this study a specific context (civilian or military) and in order to do so, we choose a general terminology that applies in both contexts. More specifically, we consider the following definitions:

Table 1: Terminology

Intelligence producers	Personnel from intelligence community who produce intelligence
Intelligence consumers	Personnel from intelligence community who consume intelligence produced in order to enrich and deduce further intelligence
Intelligence managers	Personnel from intelligence community who perform requirement management, collection planning and distribution of intelligence to users
Intelligence users	Personnel who ask for the intelligence to be produced and who use it to make decisions

Criticisms and previous work on the intelligence cycle

Main criticisms on the intelligence cycle

Many discussions and criticisms were addressed in the literature towards the intelligence cycle representation [1], [2], [3], [4], [5], [6], [7], [8], [9]. Many of these authors foster the development of a more complete and accurate representation of all elements of the process as well as the factors that influence them. They highlight the need to have a model that would capture the entire intelligence process, from the request for intelligence to its delivery, including the roles and responsibilities of all stakeholders. The main criticisms that were formulated in the literature are:

- *Intelligence collection process is not only driven by the decision makers.* According to the intelligence cycle, the decision-makers are responsible for driving the intelligence process by providing their needs (intelligence products to be developed, formats, etc.). However, when requirements are formulated, they remain vague. Hulnick in [5] asserts that the notion that intelligence consumers/users provide guidance to intelligence managers to begin the intelligence process is incorrect. Intelligence consumers/users do sometimes indicate their main concerns to intelligence managers, but they also assume that the intelligence system will alert them about problems, or provide judgments about the future. Therefore, intelligence collection process is not only driven by the decision makers but also by intelligence personnel that look for filling the knowledge gaps.

- *Intelligence support decision maker rather than inform him.* In [5], the author infirm the idea that the decision makers wait for the delivery of intelligence before making decisions; they rather want intelligence to support them rather than to inform them. He explains that they often have a confirmation bias to some information and they often know what they want to do even before they receive the intelligence estimate, and hope that this product will confirm in some way the wisdom of the path they have already chosen [5].

- *Collection and analysis actually work in parallel.* The intelligence cycle representation shows the collection and analysis phases as two discrete phases working in a sequential manner [5]. But in the reality, collection managers do not wait for guidance in regard to gaps in the intelligence database to begin the collection process. The collection process is a continuous one and depends on opportunities. On the other hand, the analysts do not always need new intelligence material to understand world events. According to [5], the database is already "so large that a competent analyst could write about most events without anymore than open sources to spur the process". New intelligence from human or technical sensors is added incrementally; it may modify the analytic process but rarely drives it. Therefore, collection and analysis are functioning in parallel and not in a continuous cycle.

- *The traditional intelligence cycle is not iterative.* The intelligence cycle representation is prescriptive, structured, made up of discrete steps, and expected to yield a specific product. This traditional representation does not represent the iterative nature of the process; it assumes that the steps will proceed in the prescribed order and that the process

will repeat itself continuously with reliable results [1]. However, the intelligence cycle needs to be iterative at any stage of the process [1] [4]. For instance, the phase of defining intelligence needs and shaping collection could necessitate repeated refinement of requirements [1]. In addition, initial collection may prove unsatisfactory and may either lead to new collections or to a change in the requirements. Processing and exploitation may reveal gaps, resulting in new collection requirements. Intelligence consumers may change their needs or ask for more intelligence. And, on occasion, intelligence personnel may receive feedback, which should be considered in the process [1].

- *The traditional intelligence cycle does not include consumption and feedback.* The intelligence cycle does not include the consumption and feedback phases that should take place particularly after the intelligence production is completed and has been delivered [4]. Ideally, the decision-makers should give feedback to the intelligence producers, detailing what has been useful, what has not, which areas need continuing or increased emphases, which can be reduced, etc. [4]. The feedback phase needs to be included in any representation of the intelligence process in order to make it more common. In the reality, communications between the decision-maker and the intelligence community are imperfect. Intelligence staff receives feedback less often than it desires and not in a systematic manner [4] for many reasons (lack of time, work from issue to issue with little time to reflect on what went right or wrong before pushing on to the next issue, etc.).

- *The traditional intelligence cycle assumes the same process whatever the objective.* The representation of the intelligence cycle assumes the process works the same way whatever the objective, regardless of complexity and cognitive demands (e.g, in preparing a long-range assessment, a national intelligence estimate, a brief on a current situation, etc.).

- *Stovepiping*. A major problem in the cycle is stovepiping. Stovepiping keeps the output of different collection systems separated from one another and thus, it prevents one discipline from cross-checking another.

- *The traditional intelligence cycle complicates the tasks of recognizing from where errors can occur.* According to [1], the classical representation of the intelligence cycle complicates the tasks of recognizing from where errors can occur and who is responsible for them. Although several actors intervene in performing the different steps, the model does not provide useful information about what each actually contributes to the cycle, nor does it accurately represent the path a request takes as it is addressed [1]. It does not indicate who or what may affect the completion of a step (in term of responsibilities) and the resources needed to begin the next step. In the same thought, such representation does not accurately represent the impact of resource availability on analysts [1].

- *The traditional intelligence cycle lack in representing evaluation activities.* The intelligence cycle does not put the emphasis on assessment and evaluation, most likely due to the inherent complexity of the evaluation process. Current evaluation activities concern only the reliability of the source and the credibility of the information; the assessment of the intelligence product is not considered in the cycle. Evaluating intelligence products is a difficult task since intelligence is fundamentally predictive in

nature and there is no statement of objectives that would help the evaluation process. Thus, the traditional model does not help identify ways of developing a consistent product.

- *The traditional intelligence cycle fits with the industrial mindset of the mid-twentieth century.* According to [8], the intelligence model fits the industrial mindset of the mid-twentieth century. Actually, the intelligence cycle resembles an assembly line, where specialization and a division of labour are supposed to improve efficiency. However, the assembly-line approach does not transfer well to the intelligence process.

Literature proposals for the representation of the intelligence cycle

In his book *Reshaping National Intelligence for an Age of Information* [2], Gregory F. Treverton proposes a different picture of the steps in the process and their iterative tendencies (5). This representation recognizes that intelligence users seldom have the time or patience to articulate their information requirements precisely. Thus, the intelligence process is more likely to be driven by what intelligence can collect and what it can infer about the needs of policy. Treverton's representation of the intelligence process is driven by "intelligence pushing, not policy pulling" [2]. In Treverton's model, the output of the intelligence process consists of a better understanding in the heads of people who must act or decide. As explained in [2], building those understanding is a continuous process, and not a series of discrete cycles.

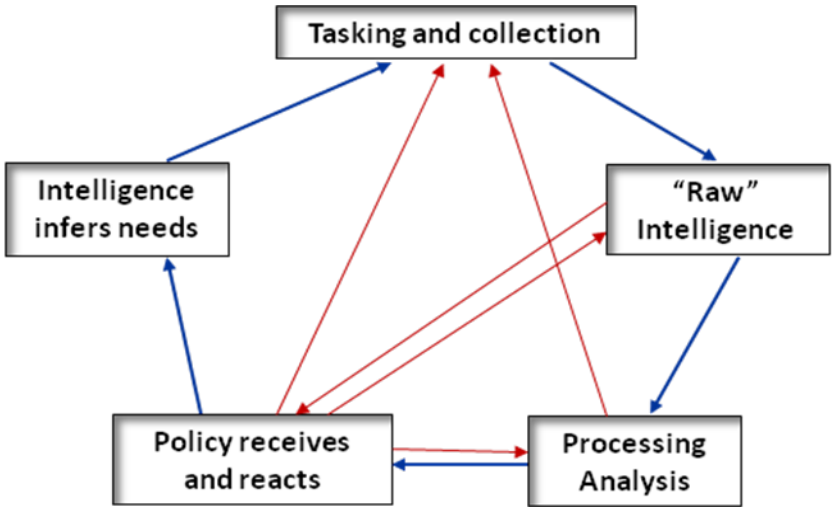


Figure 5: Treverton's "real intelligence cycle"

Another representation is proposed by Mark Lowenthal in his book *Intelligence: from Secrets to Policy* [4]. He proposes a multilayered intelligence process model, which focuses on the areas where revisions and reconsiderations should take place (Figure 6). His model represents the iterative aspects in a different way and introduces two important phases: consumption and feedback (e.g, how they consume intelligence and the degree to which the intelligence is used). On one hand, it takes into account the needed iterations in order to answer issues that would likely arise (the need for more collection, uncertainties in processing, results of analysis, changing requirements, etc.). On the other hand, this representation introduces the consumption

and feedback phases. A dialogue between intelligence consumers and producers (detailing what has been useful, what has not, which areas need continuing or increased emphases, which can be reduced, and so on) should take place after the intelligence has been received.

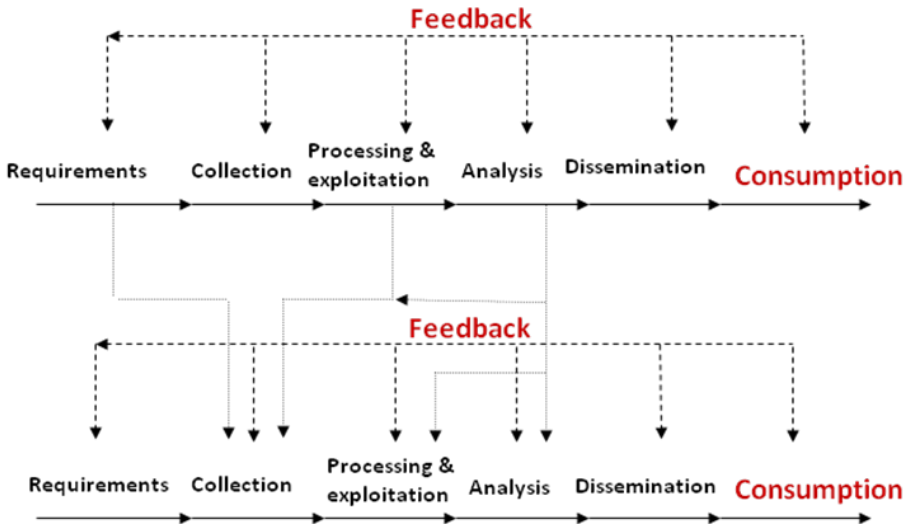


Figure 6: The multilayered intelligence cycle [4]

In [3], Evans proposes a hub and spoke model for the military intelligence process (Figure 7). Key amendments that are incorporated to the model are i) the early intervention of the commander into the planning of an operation, ii) the need to plan intelligence activities, and more specifically prioritise both the direction and collection phases, iii) continuous review and assessment of intelligence produced (which will in turn influence new requirements and direction) and, iv) continuous assessment of the operational environment and the commander's intent. The model is entitled Hub-and-Spoke because of its graphical representation. Continuous assessment of the operational environment and the commander's intent is the 'hub' of the model that aims to prioritize and focus on the main efforts. All other phases (spokes of the model) need to adapt to the potential change in the commander's intent. The Hub-and-Spoke model explicitly breaks down functional parts of the traditional intelligence cycle in order to avoid blurring or duplication of effort [3].

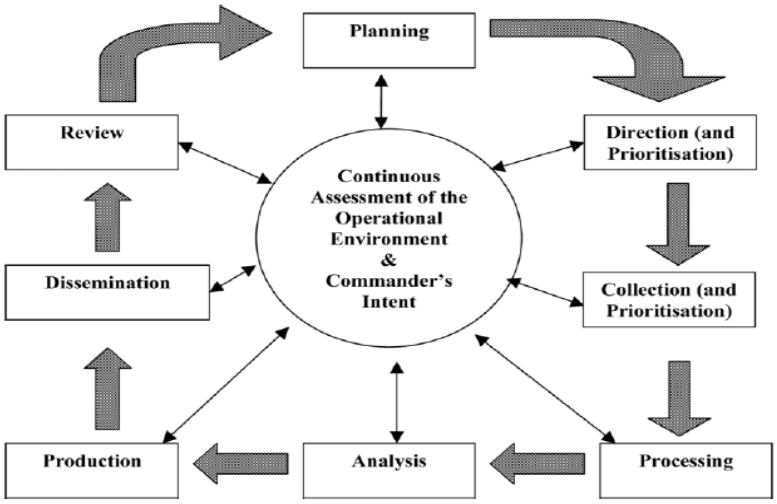


Figure 7: The Hub and Spoke Intelligence model [3]

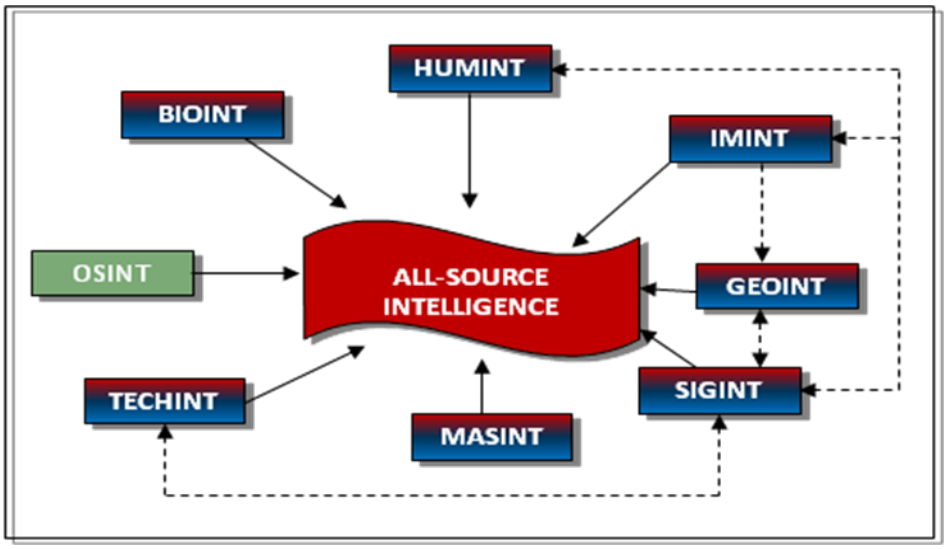
Compared to Treverton's 'real' Intelligence Cycle and Lowenthal's advocacy of 'Feedback', which draw more from study of intelligence in a civilian context, the Hub and Spoke model would be best applied in a military environment due to the principles upon which it is based.

An all-source intelligence process model

The criticisms formulated towards the traditional intelligence cycle do not discuss what this cycle lacks in representing the intelligence process from an all-source perspective. This paper put emphasis on the fact that the all-source activities are not represented in the cycle. They are always encompassed within the production step of the cycle. In addition, the traditional model and the proposed models in the literature do not provide elements for understanding the processes, the involved actors, the relationships between single source and all-source activities. The objective of this section is to better understand, define and represent the all-source intelligence process. A model is proposed for the intelligence process, rethought from an all-source perspective and based on a collaborative approach.

To better understand the all-source intelligence process, let us start with a definition of the all-source intelligence. According to the US Army doctrine for intelligence [13], all-source intelligence is "*the products, organizations, and activities that* ***incorporate all sources of information and intelligence****, including Open Source (OSINT), in the production of intelligence. All-source intelligence is both a separate intelligence discipline and the name of the process used to produce intelligence from multiple intelligence or information sources*".

In this paper, all-source intelligence is considered as the process that consists of incorporating intelligence resulting from all intelligence disciplines (Human intelligence (HUMINT), Imagery intelligence (IMINT), Geospatial intelligence (GEOINT), Signal intelligence (SIGINT), Measurement and signature intelligence (MASINT), Technical intelligence (TECHINT), Open source intelligence (OSINT), and Biometric intelligence (BIOINT)) to produce consolidated intelligence of great value (as illustrated in Figure 8). Multi-source is a particular case of all-source intelligence, where only some of these disciplines are considered.



Key:
Human intelligence - (HUMINT)
Imagery intelligence (IMINT)
Geospatial intelligence (GEOINT)
Signal intelligence (SIGINT),
Measurement and signature intelligence (MASINT),
Technical intelligence (TECHINT),
Open source intelligence (OSINT),
Biometric intelligence (BIOINT)

Figure 8: All-source intelligence

What is the all-source intelligence process? Answering this question is our main concern in this paper. More specifically, we propose an all-source intelligence model which:

- Highlights the all-source intelligence activities;
- Regroups the activities according to the involved resources;
- Reinforces the relationships between intelligence producers and the users (continuous dissemination and feedback);
- Promotes an enhanced evaluation approach at all levels:
    - Raw data (source credibility, data reliability)
    - Single source Intelligence Products (intelligence quality)
    - All-source Intelligence Products (user satisfaction); and,
- Promotes a collaborative environment where information is accessible and discoverable and routinely shared (between collectors, analysts, and end users). More specifically, the model favours:
    - Exchanging intelligence/information between collectors, analysts, and end users in order to improve the quality of intelligence products.
    - Making information accessible, available, and discoverable at the earliest point possible.

To develop such a model, we started by understanding the Single Source activities and characterizing the processes for each discipline (HUMINT, SIGINT, OSINT, IMINT, GEOINT, etc.). Then, we analyzed the All-Source activities and processes. Afterwards, we identified the differences, relationships and synergy between single source and all-source processes.

Three levels of detail of the model are provided here. Level 1 is a high level representation of the intelligence process (*Figure 9*). Level 2 introduces the roles of intelligence personnel in each phase and indicates the main activities in the direction phase (*Figure 10*). Level 3 details the activities in the "single source collection & processing" and the "all-source discovery & fusion" phases (Figure 11).

Level 1 representation

A high level representation of the modified model is illustrated in *Figure 9.* The intelligence process is composed of the following steps: intelligence (INT) tasking; direction; single source collection & processing; all-source (AS) discovery & fusion; dissemination; and INT evaluation & feedback.

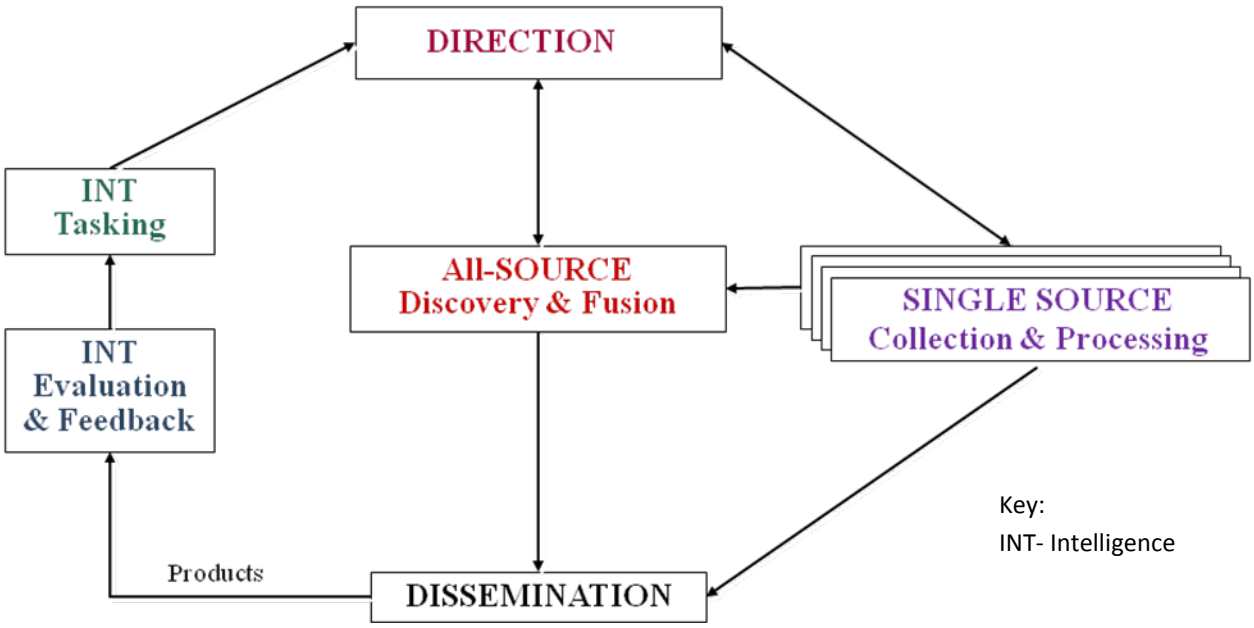


Figure 9: An all-source intelligence model (Level 1)

The intelligence process starts with intelligence tasking. Often, the decision makers ask what they need to know with a deadline on its provision and a priority order. But, intelligence could also be tasked by intelligence producers/consumers who provide guidance to intelligence managers in order to fill the gaps in their intelligence database. Then, the direction phase consists of a series of steps such as framing the problem, defining and managing the intelligence requirements, planning the collection effort, preparing the collection plan and issuing orders and requests to collection agencies.

Afterwards, depending on the intelligence requirements and the associated indicators, one or more disciplines (ex: HUMINT, IMINT, GEOINT, SIGINT, MASINT, TECHINT, OSINT, and BIOINT) might be tasked to perform single source collection & processing of data and information in order to produce Single Source (SS) intelligence. The decision of which discipline(s) would be considered in the collection activity depends on what is tasked in the

collection plan. Let us note that the collection activities are done at the SS level. The SS processing step consists of all the activities (collation, evaluation, analysis, and interpretation) that will transform the collected raw data to single source intelligence. Collation corresponds to the receiving, grouping and recording of data. The evaluation process consists of assessing the reliability of the source and the credibility of the information. The analysis step concerns the scanning of the collated and evaluated information for significant facts. These are then related to other facts that are already known and deductions are made from the comparison. Interpretation is a mental process that consists of comparisons and deductions based on common sense, life experience, military knowledge of adversary and friendly forces, and existing information and intelligence.

The All-Source (AS) discovery & fusion step regroups the discovery of the SS intelligence and its fusion in order to produce further actionable intelligence. The discovery consists in getting the SS intelligence either by querying the databases or by communicating and collaborating with the SS analysts. Intelligence coming from different sources (HUMINT, IMINT, SIGINT, etc.) is then evaluated, analyzed and fused in order to produce AS actionable intelligence of high value.

In the C2 domain, CCRP has been advocating the task-collect-post-utilize as an improved alternative to the task-collect-analyze-post with the objective of reducing the cycle time to improve decisions. Within the traditional task-collect-analyze-post alternative, information/intelligence is pushed by the analysis entity. Within the improved task-collect-post-utilize alternative, information/intelligence is pulled by the user and then utilized. This is a high valued approach particularly for the posting of blue information. However in the domain of intelligence, because of classification issues and the value added by intelligence analysts to the raw data/information (by establishing links between the SS intelligence), the collected data could not be systematically posted before being analyzed. Ultimately, this could be the case of some raw data or SS intelligence of high value that do urge to be disseminated to the user within a tight deadline without being further analyzed by the AS analyst. That's why the dissemination appears in the model as a continuous activity all along the intelligence process. Information and intelligence could be disseminated after collection, after processing at the single source level or after all-source fusion.

Evaluation is also a continuing activity that has to be done for raw data (in terms of reliability and credibility), for single source intelligence (SS intelligence quality) and all-source intelligence (in terms of user satisfaction, usefulness, quality, etc.). Finally, the users of intelligence should give feedback to intelligence producers, detailing what is useful, what is not, which area needs more emphasis. Based on these feedbacks, new intelligence requirements are produced. Levels 2 and 3 representations provide more detail for the model.

Level 2 representation

Level 2 representation of the model introduces the roles of intelligence personnel in each phase and indicates the main activities in the direction phase (see Table 1 for the main roles that we considered in this paper within the intelligence community). Figure 10 represents the role of intelligence personnel in each box. The direction and dissemination steps are performed by intelligence managers. Intelligence personnel intervening in the "single source collection and processing" are producers. Personnel doing the "all-source discovery and fusion" step are

simultaneously intelligence consumers and producers. They consume intelligence coming from single source disciplines in order to produce all-source intelligence. Finally, the intelligence user asks for intelligence and when received, evaluate this intelligence and provides feedbacks. The model specifies also that intelligence consumers and produces might ask for intelligence to be produced depending on their needs.

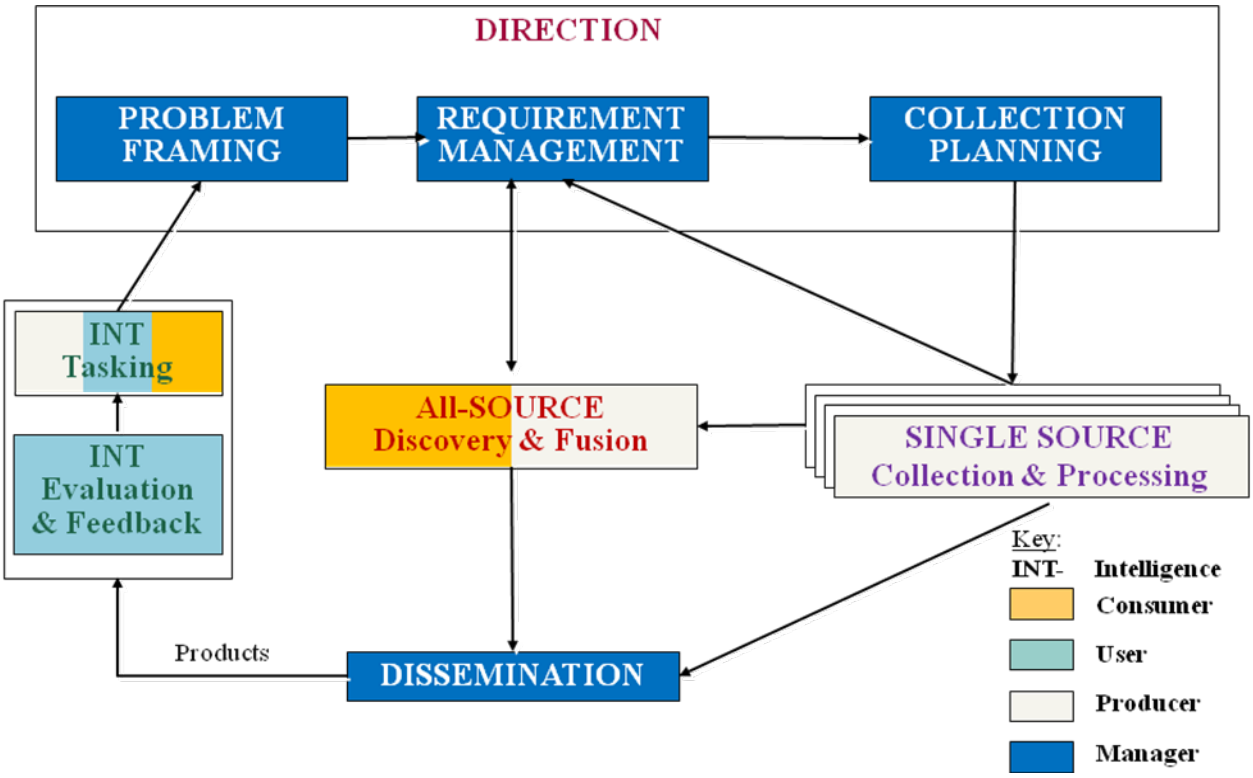


Figure 10: An all-source intelligence model (Level 2)

Level 3 representation

The intelligence process model illustrated in Figure 11 details the "SS collection & processing" and the "AS discovery & fusion" boxes.

The SS intelligence process involves a process that moves from raw data toward intelligence products (SS intelligence). The SS intelligence process consists of:

- Step 1: Acquiring *raw data*;
- Step 2: Sorting, filtering, indexing and organizing *information*;
- Step 3: Evaluating information reliability and source credibility;
- Step 4: Reasoning (analyzing and processing) to create *intelligence*.

Therefore, three activities are required for the SS process: collection (step 1); collation & evaluation (step 2 and 3); analysis & processing (step 4). During analysis & processing, the

analyst could need more raw data and information than those collected initially to derive his conclusions. These raw data and information are asked in a request for information (RFI) submitted to the requirement manager.

The AS intelligence process will incorporate SS intelligence produced individually within each discipline in order to provide intelligence of higher value. The all-source process consists of:

- Step 1: A discovery of single source intelligence produced within each discipline (HUMINT, IMINT, GEOINT, TECHINT, etc.);
- Step 2: Evaluation of the quality of SS intelligence products;
- Step 3: Analysis and fusion to produce all-source intelligence.

The AS analyst discovers the SS intelligence already produced, evaluates its quality and tries to derive actionable intelligence after analysis and fusion. It could happen that he needs more data/information/intelligence to derive the conclusions. In such case, supplementary data/information/intelligence could be tasked from SS analysts or as an RFI submitted to the requirement manager. In all cases, no collection is performed at the all-source level (this is a single source concern).

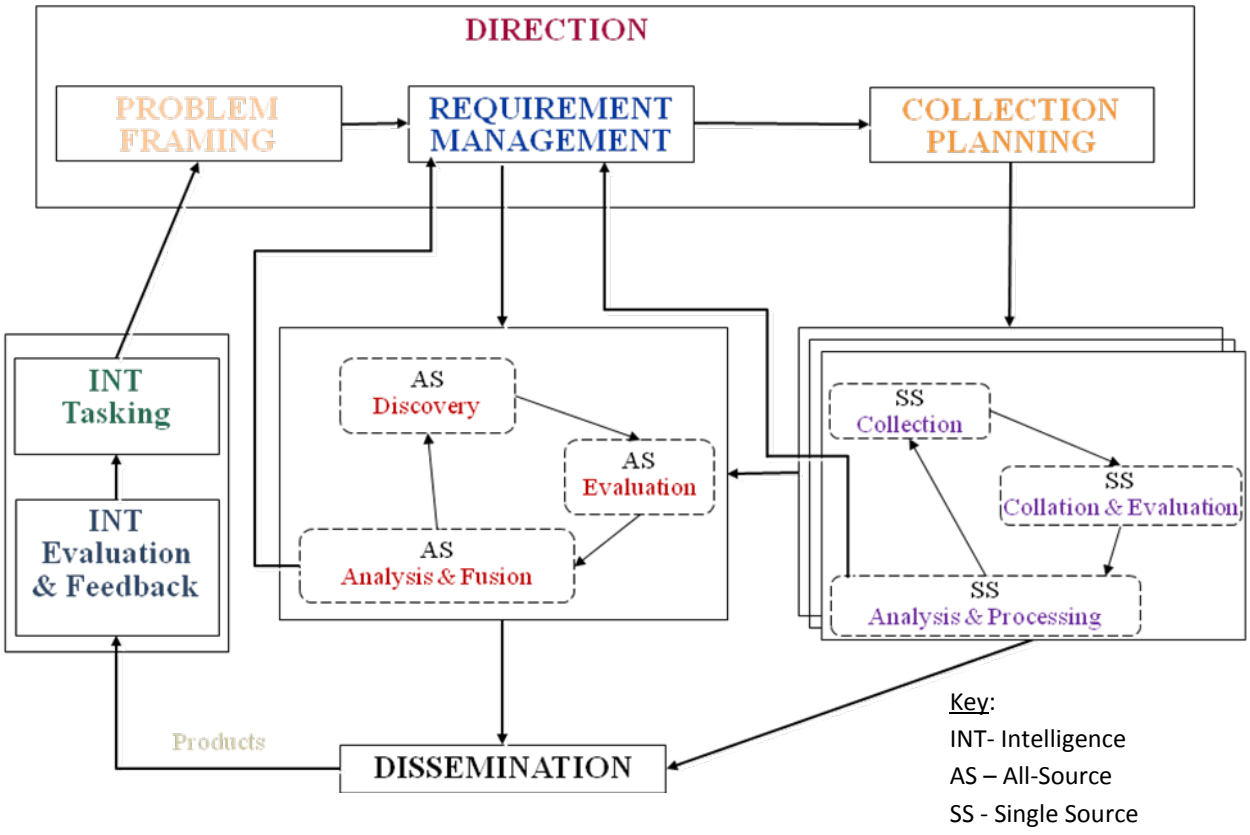


Figure 11: An all-source intelligence model (Level 3)

A collaborative approach: an imperative for the success of the model

The all-source intelligence model proposed in the previous section answers the question asked earlier in this paper: *What is the all-source intelligence process*? The model illustrates the different steps and activities of the all-source intelligence process. In this section, we will be interested in the following question: "*What makes the success of the all-source intelligence process*"? In particular, we will examine to what extent a collaborative approach could favour the success of the AS intelligence process and we will discuss challenges, issues and enablers.

The model proposed earlier in this paper presumes collaborative behaviour between all stakeholders. Collaboration is central to the model. In particular, the model is based on the fact that information sharing between SS and AS analysts is facilitated. It presumes that personnel within the different organizations and agencies communicate, share information and intelligence and that their technological infrastructures favour that. It also assumes that i) there is a dialogue between intelligence producers, consumers and managers within the intelligence community; and ii) a continuous dialogue and feedback provision from the users of this intelligence.

In theory, this model is based on the novel paradigm of Lahneman (2010) published recently in the literature [9]. This new paradigm for intelligence is proposed to better understand and deal with the new security threats. Introduced in [9], the new paradigm replaces the vision of intelligence as "solving puzzles" with that of performing "adaptive interpretations". Adaptive interpretations involve constructing extremely complicated puzzles for which virtually all of the pieces are available [9]. This new paradigm involves processing large quantities of information in a dynamic environment where each piece is only a small portion of the overall picture. The puzzles have no large pieces. Single pieces of information can change their value, becoming more or less significant, in short periods of time. Pieces that are relatively unrelated one moment can become related next. In addition, small pieces of the puzzle can be decisive and the value attached to them changing with time. Therefore, the picture of the puzzle constantly changes, sometimes in dramatic ways. Compared to the traditional paradigm, most pieces to these adaptive interpretations are not secrets or mysteries [9].

The all-source intelligence process model proposed in this paper is thought-based on the adaptive interpretation paradigm. Performing adaptive interpretations requires openness, which requires mutual trust among organizations, agencies and partners. Consequently, the all-source intelligence model depends on a new category in addition to secret and open information which consists of "trusted information" as discussed in [9]. Trusted information is contained in trusted networks, which have many participants, including external entities. Such category will facilitate the collaborative behaviour on which the all-source intelligence process model is based. In the following, we discuss the challenges and issues for the effectiveness of all-source intelligence model using a collaborative approach. We then provide ideas that enable the collaborative approach.

Challenges and issues

The way traditional intelligence model works is not based on a collaborative approach. For instance, as affirmed by Arthur Hulnick, "*because of restrictions, psychological barriers, fears of compromising sources, and security concerns, the intelligence collection process and the*

intelligence analytic process are sometimes quite independent of each other due essentially to reciprocal mistrust" [5]. Many other challenges and issues prevent collaborative behaviour. The limited sharing between organizations and systems complicates collaboration. In fact, today, each intelligence agency has its own networks and data repositories which make it very difficult in an all-source perspective to assemble facts and hypotheses which, once aggregated, could provide valuable warning. More and more, large amounts of data/information/intelligence are collected from many sources without being analyzed because of the fact that it is difficult to discover or access them outside of collection stovepipes. Analysts may often be unaware that information has been collected. In addition to these technological issues, there is also a cultural issue. As well known, the intelligence community culture is that of a "Need to know" rather than a "Need to share". The traditional paradigm requires learning secrets, which engenders mistrust and makes collaboration more difficult.

Enablers

In the following, we discuss the factors that allow and enable the all-source intelligence model to be effective based on a collaborative approach. We think that at least three main factors need to be examined: Information/Knowledge Management (IKM) services, security concerns, and the establishment of a trust environment and a trust-based culture. These factors are discussed in [16],[17] and constitute the basis for an effective information sharing and collaborative approach.

The first factor concerns the IKM services. A prerequisite to a collaborative approach consists of having IKM services that allow the discovery, the filtering, and the delivery of the knowledge that users need while guarding against information overload. This supposes the establishment of common information standards and core services (metadata tagging standards, security marking); advanced discovery processes and procedures; and retrieval protocols. Advanced IKM services will allow analysts to push and pull data across networks, and thus facilitate collaboration by having access to data/information/intelligence available to different organizations.

The second factor concerns the security aspects associated to the collaborative approach. Before information sharing could take place and be effective, it is necessary from a security point of view that information be protected and auditable. We need to develop tools and mechanisms to manage identities, authorize, authenticate, and audit users through uniform identity attributes, identity management, uniform security standards, information access rules, user authorization, auditing, access control, etc. In addition, rules and procedures for accessing information and a sharing policy should be established.

The third factor concerns the establishment of a trust environment and a trust-based culture. First, the different actors need to trust the systems in order to have collaborative behaviour in the future. The security concerns discussed earlier (identity management standards for authentication, authorization, and auditing) will favour trust. However, it still remains a trade-off between trust and continuing the protection of sources and methods as well as sensitive information from disclosure. Second, changing the culture by focusing on the "responsibility to provide" and sharing knowledge and expertise will certainly favour such collaboration. This is not an easy task because of the established "need to know" culture and the fear associated to information sharing, particularly relatively to the quality (credibility, reliability) of the information/intelligence produced by other actors. However, establishing a trust culture could be

achieved by developing incentives (at the institutional, leadership, and workforce levels), awards and assessment programs encouraging the collaborative approach. At the technological level, the establishment of a virtual collaboration environment will also facilitate collaboration and information sharing among actors.

Conclusion

This paper presented a review of the traditional intelligence cycle and the main criticisms that were addressed in the literature. This paper highlighted many deficiencies and issues of the traditional intelligence cycle and particularly focused on the fact that this cycle lacks in representing the intelligence process from an all-source perspective. The modelling of the intelligence process was rethought from an all-source perspective and a new model proposed. The proposed model is composed of many activities and processes: intelligence tasking, direction, single source collection & processing, and all-source discovery & fusion, dissemination, and evaluation & feedback. Three levels of detail of the model were provided. Level 1 is a high level representation of the intelligence process. Level 2 introduces the roles of intelligence personnel in each phase and indicates the main activities in the direction phase. Level 3 details the activities in the "single source collection & processing" and the "all-source discovery & fusion" phases. The proposed model presumes a collaborative approach that enables the analysis of a greater quantity of single source data by sharing analysis tasks and results between all actors from different military and non-military intelligence organizations. Additionally, this paper discussed the challenges and issues of the all-source intelligence model based on a collaborative approach. We then provided ideas that enable the improved functioning of this model. Three factors that allow and enable a collaborative all-source intelligence model were discussed: Information/Knowledge Management (IKM) services, security concerns, and the establishment of a trust environment and a trust-based culture.

References

[1] Johnston, J.M., Johnston, R., (2008), Testing the intelligence cycle through systems modeling and simulation, CIA, Center of the study of intelligence.

[2] Treverton Gregory F., (2003) Reshaping National Intelligence for an Age of Information, Cambridge University Press, 266p.

[3] Geraint Evans (2009), "Rethinking Military Intelligence Failure, Putting the Wheels Back on the Intelligence Cycle", Defense Studies, vol 9, no 1, pp. 22-46.

[4] Lowenthal Mark M., (2009), Intelligence from Secrets to Policy, Fourth Edition, CQ Quarterly, 364 p.

[5] Hulnick Arthur S., (2006) "What's Wrong with the Intelligence Cycle", Intelligence and national Security, vol 21, no 6, pp. 959-979.

[6] Treverton, Gregory F., Jones Seth G., Boraz Steven, Lipscy Phillip, (2006), "Toward a Theory of Intelligence", RAND Corporation Conference Proceedings series.

[7] Johnson, Loch K., (1986) "Making the intelligence "cycle" work", International Journal of Intelligence and CounterIntelligence, Vol 1, No 4, pp 1-23.

[8] Berkowitz, Bruce D., (1997) “Information Technology and Intelligence Reform”, Orbis, ol 41, Issue 1, p. 107, 12p.

[9] Lahneman, W.J., (2010), “The Need for a new Intelligence Paradigm”, International Journal of Intelligence and CounterIntelligence, vol 23, pp 201-225.

[10] Joint Intelligence Doctrine Manual, Department of National Defence, B-GJ-005-200/FP-000, 21 May 2003.

[11] Intelligence field manual, Department of National Defence, land forces information operations, B-GL-357-001/FP-001, 30 Jan 2001.

[12] Doctrine for intelligence support to joint operations, JP 2-0, 9 March 2000.

[13] FM 2-0, “Intelligence”, Headquarters Department of the Army, Washington, DC, 23 March 2010.

[14] AJP 2-0 Allied Intelligence, counter intelligence and security doctrine

[15] NATO Intel PfP ADL-WG, 2006

[16] US Intelligence community information sharing strategy, February, 22, 2008.

[17] D’Agostino, D.M., (2010), ISR overarching guidance is needed to advance information sharing, Director US Defence Capabilities and Management, GAO 10-500T.

DEFENCE R&D DÉFENSE

Defence Research and Development Canada

An intelligence process model based on a collaborative approach

Anissa Frini
Anne-Claire Boury-Brisset
I2 Section

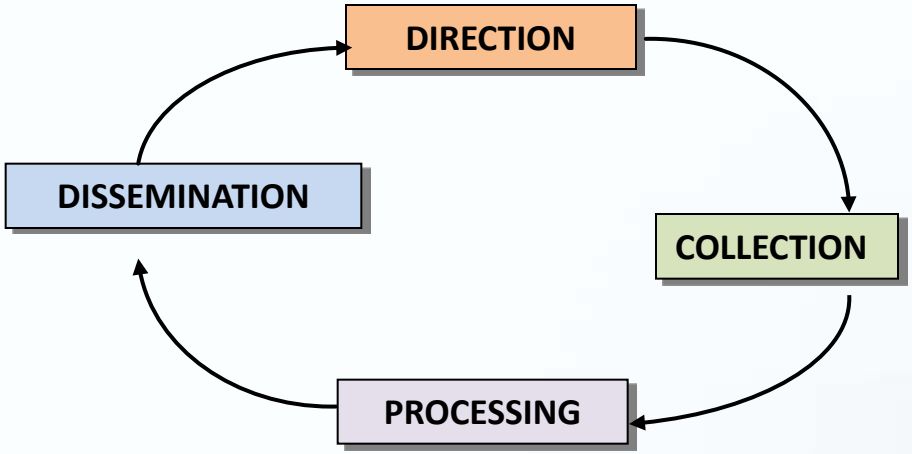
16th ICCRTS
June 2011

Outline

- **The Intelligence cycle**
  - **Canadian, US, NATO**
  - **Criticisms and previous work**
- **All-source intelligence process model**
  - **Level 1 representation: high level model**
  - **Level 2 representation: roles**
  - **Level 3 representation: detailed model**
- **A collaborative approach: an imperative to the success of the model**
  - **Challenges and issues**
  - **Enablers**

Intelligence cycle

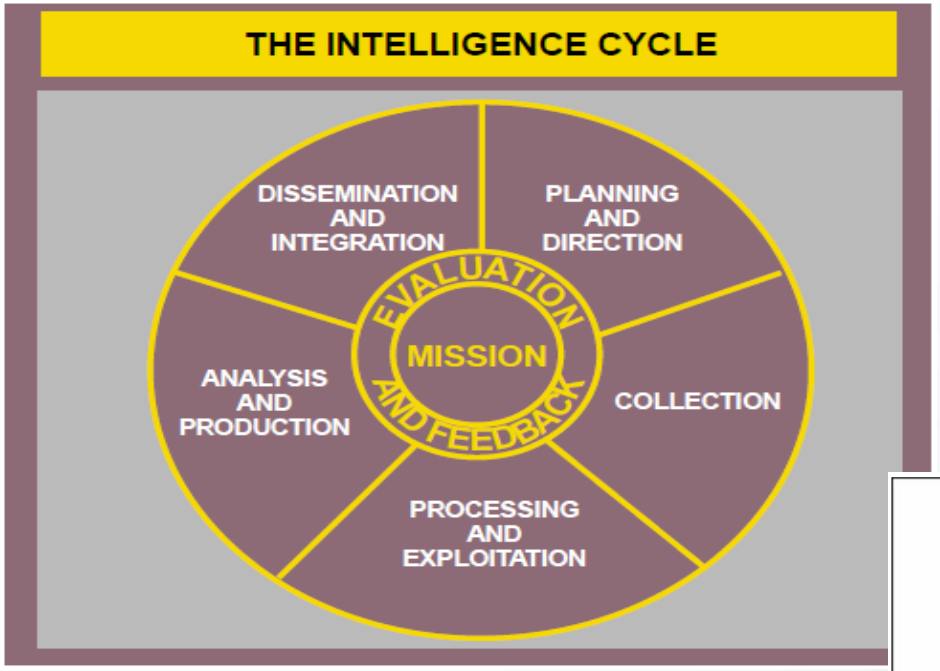
The Canadian Intelligence Cycle (Joint and Land)



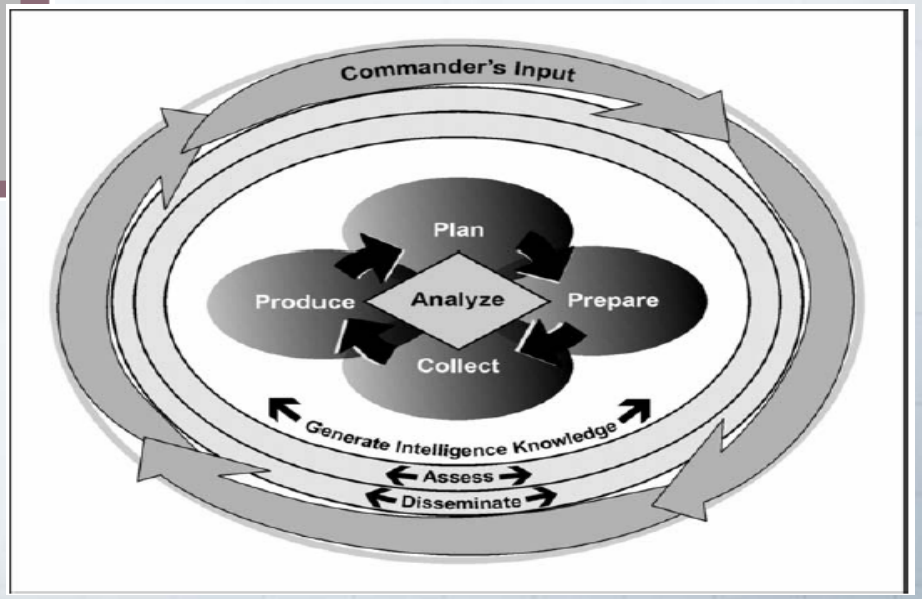
The Allied Joint Intelligence Doctrine Representation

Intelligence cycle

The US Joint Intelligence Cycle



The US Army Intelligence Process



Main critics on the intelligence cycle

- Treverton Gregory F., (2003) **Reshaping National Intelligence for an Age of Information**, Cambridge university Press, 266p.
- Geraint Evans, (2009) "**Rethinking Military Intelligence Failure, Putting the Wheels Back on the Intelligence Cycle**", Defense Studies, vol 9, no 1, pp. 22-46.
- Lowenthal Mark M., (2009), **Intelligence from Secrets to Policy**, Fourth Edition, CQ Quarterly, 364 p.
- Hulnick Arthur S., (2006) "**What's Wrong with the Intelligence Cycle**", Intelligence and national Security, vol 21, no 6, pp. 959-979.
- Treverton, Gregory F., Jones Seth G., Boraz Steven, Lipscy Phillip, (2006), "**Toward a Theory of Intelligence**", RAND Corporation Conference Proceedings series.
- Agrell Wilhelm, (2002) "**When everything is intelligence – nothing is intelligence**", The Sherman kent Center for Intelligence Analysis, Occasional Papers, vol 1, no 4.
- Treverton (2005) "**The next step in reshaping intelligence**", RAND occasional paper.
- Richard A. Best Jr. (2010) "**Intelligence Issues for Congress**", Congressional Research Service Report for Congress.
- Lahneman, W.J., (2010), **The Need for a New Intelligence Paradigm**, International Journal of Intelligence and CounterIntelligence, Vol 23, pp. 201-225.
- Etc.

Main critics on the intelligence cycle

- **Intelligence collection process is not only driven by the decision makers**
  - Intelligence “pushing”, not policy “pulling”
  - The intelligence cycle is more likely to be determined by what intelligence can collect and what it can infer about the needs of policy.
- **Intelligence support the decision-maker rather than to inform it**
  - Infirm the idea that the decision makers wait for the delivery of intelligence before making policy decisions.
- **Collection and analysis actually work in parallel**
  - Because of restrictions of information sharing, psychological barriers, fears of compromising sources, and security concerns, the intelligence collection process and the intelligence analytic process not only operate in parallel, they are sometimes quite independent of each other.
- **The traditional intelligence cycle is not iterative**
  - Repeated refinement of requirements, initial collection may reveal gaps, resulting in new collection requirements, consumers may change their needs or ask for more intelligence, etc.
- **The traditional intelligence cycle does not include consumption and feedback**
  - What has been useful, what has not, which areas need continuing or increased emphases, which can be reduced, etc.

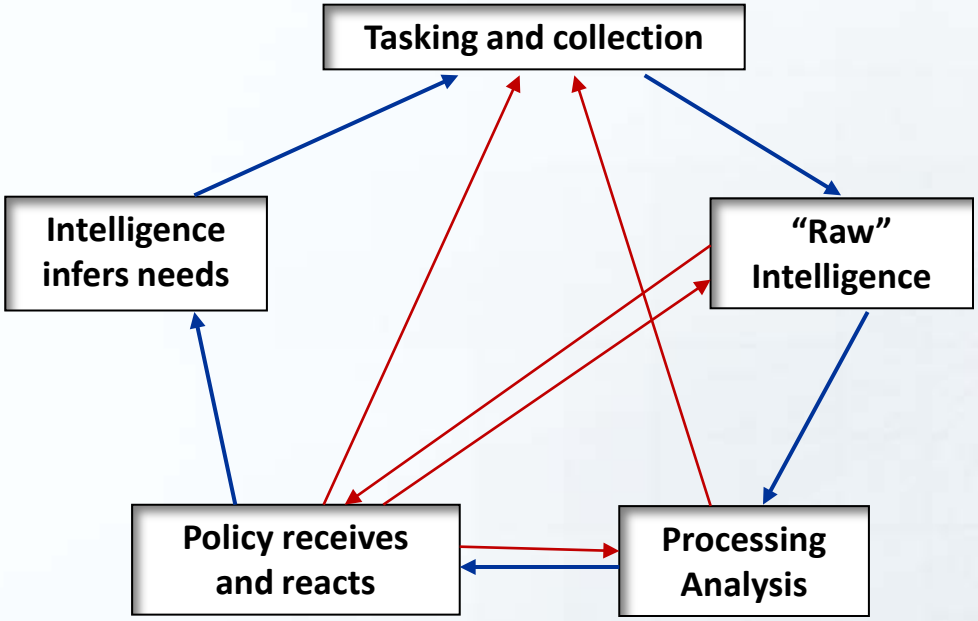
Main critics on the intelligence cycle

- **The traditional intelligence cycle assumes the same process whatever the objective**
  - Regardless of complexity and cognitive demands (e.g. in preparing a long-range assessment, a national intelligence estimate, a brief on a current situation, etc.).
- **Stovepiping: A major problem for the cycle**
  - The output of different collection systems separated from one another and thus, it prevents one discipline from cross-checking another.
- **The traditional intelligence cycle complicates the tasks of recognizing from where errors can occur**
  - Cannot recognize from where errors can occur. It does not indicate who or what may affect the completion of a step and the resources needed to begin the next step.
- **The traditional intelligence cycle lack in representing evaluation activities**
  - What about data/information/intelligence quality ?
- **The traditional intelligence cycle fit with the industrial mindset of the mid-twentieth century**

Other intelligence models

- **Treverton's "real intelligence cycle"**

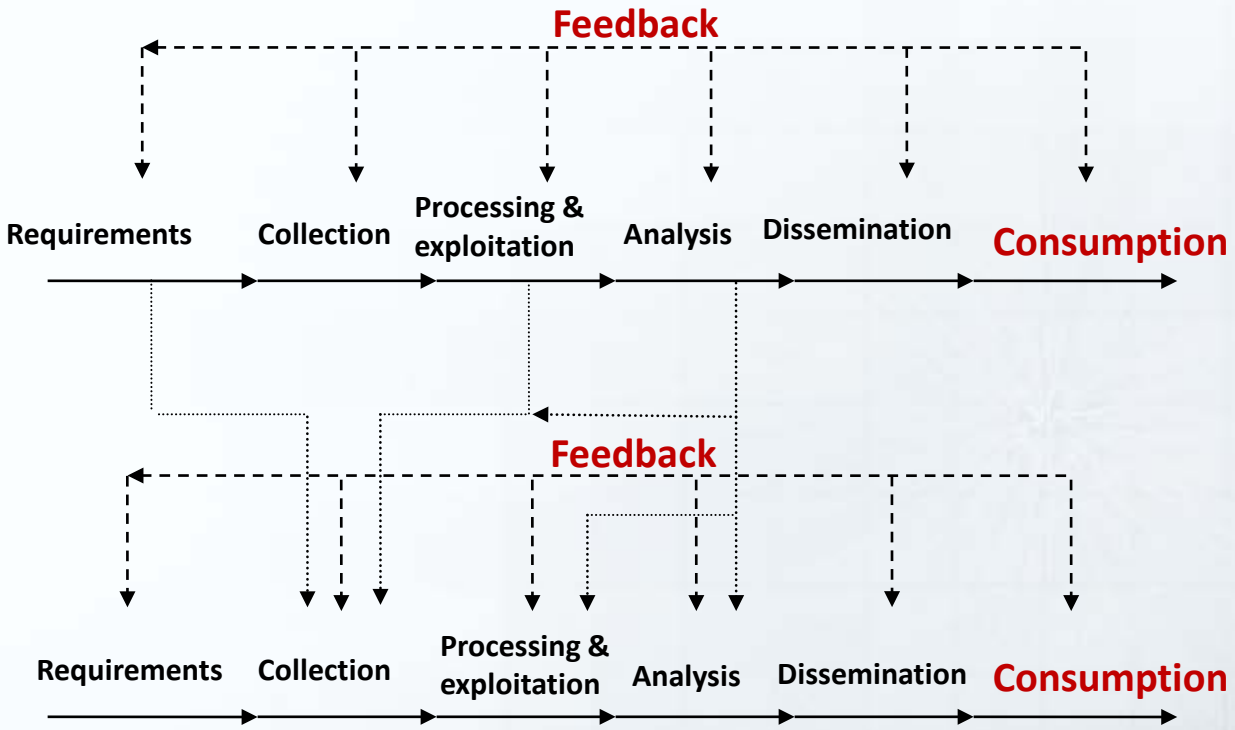
  Treverton Gregory F., (2003) *Reshaping National Intelligence for an Age of Information*, Cambridge University Press, 266p.



Other intelligence models…

- The multilayered intelligence cycle

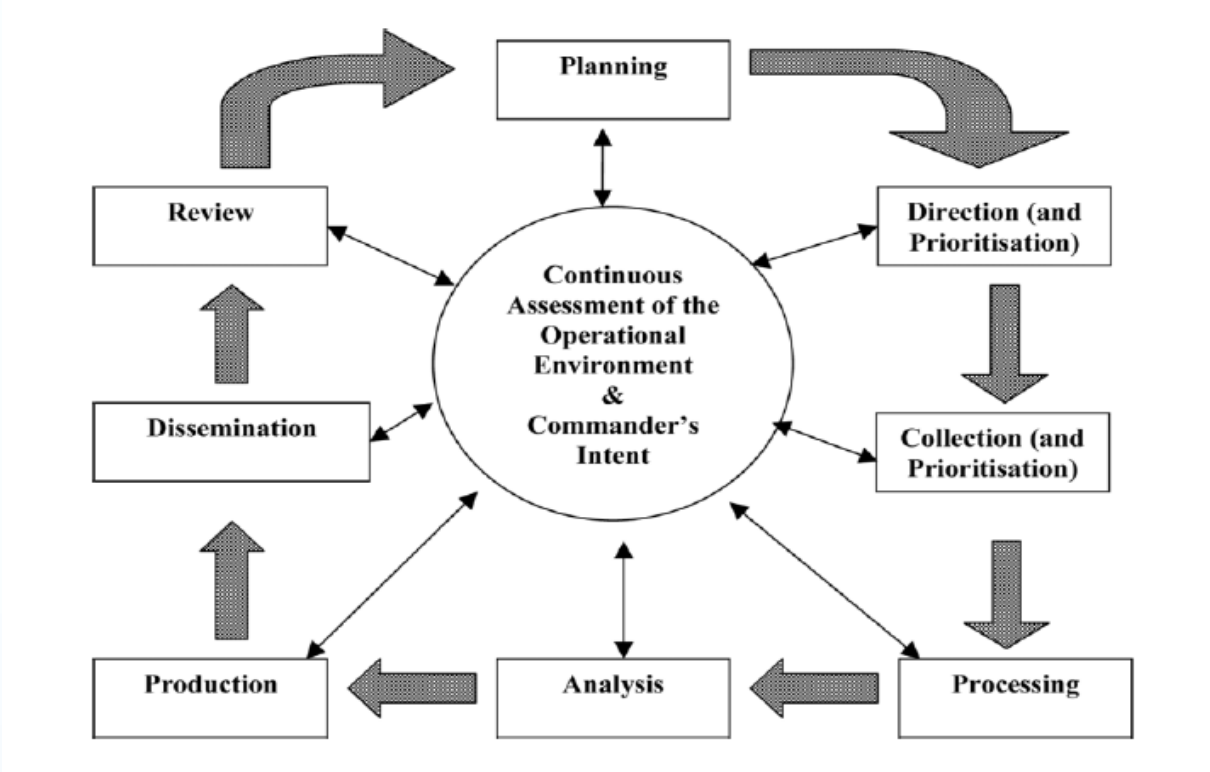
Lowenthal Mark M., (2009), *Intelligence from Secrets to Policy*, Fourth Edition, CQ Quarterly, 364 p.



Other intelligence models…

- The Hub and Spoke intelligence cycle

Geraint, E., (2009), "Rethinking Military Intelligence Failure: Putting the Wheels Back on the Intelligence Cycle", Defence Studies, vol 9 no 1, pp. 22-46.



An All-Source Intelligence Model

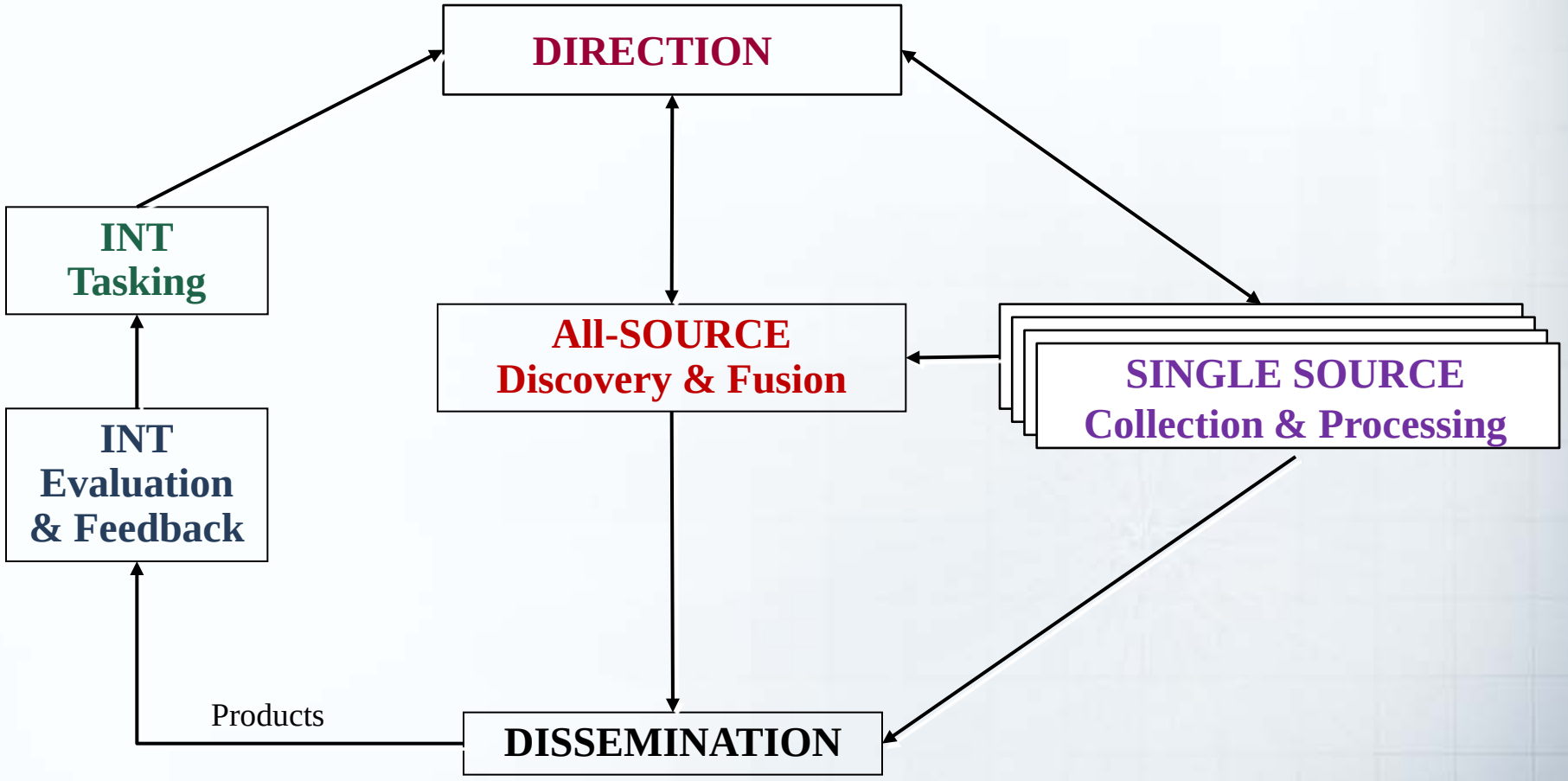
All-Source Intelligence Model

- **Definition**
  - All-source intelligence is the products, organizations, and activities that **incorporate all sources of information and intelligence**, including OSINT, in the production of intelligence. All-source intelligence is both a separate intelligence discipline and the name of the process used to produce intelligence from multiple intelligence or information sources. (US Army doctrine for intelligence).
- The traditional intelligence cycle model lacks in representing the process from an all-source perspective.
  - All-source activities are encompassed within the processing step of the process
  - Lack of understanding of the processes, the involved actors, the relationships of all activities single source and all-sources…

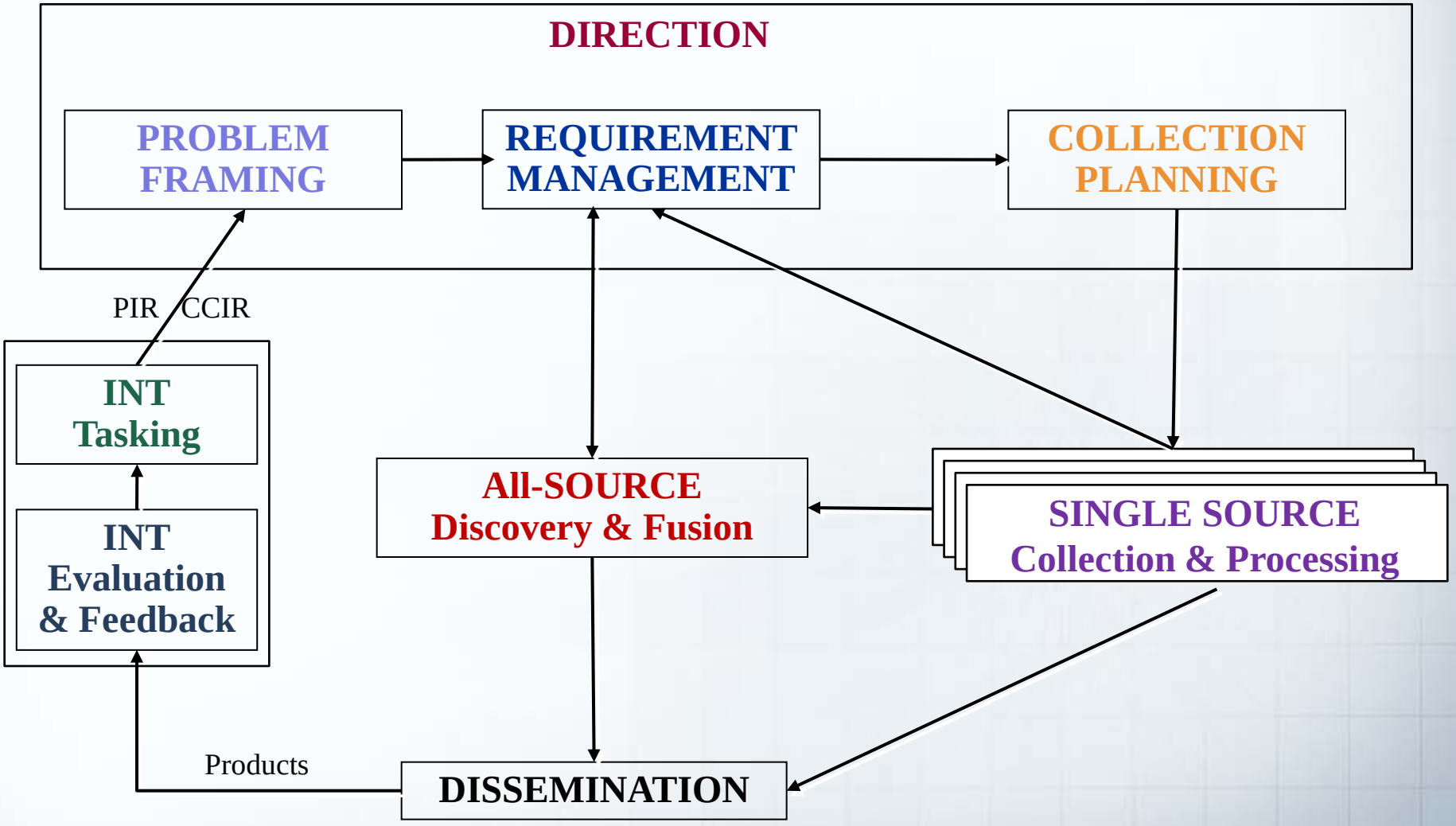
All-Source Intelligence Model

- **Objective of this work**
  - To propose a model for the all-source intelligence process.
    - Highlight the all-source intelligence activities.
    - Regroup the activities according to the resources doing the job
    - Reinforce the relationships between intelligence producers and the users (continuous dissemination and feedback)
- **Approach**
  1. Understand Single Source Intelligence Processes
  2. Single Source VS All-Source: difference and relationship
  3. All-source activities/processes: Where in the intelligence cycle ?
  4. What does it imply ? What makes the success of All-Source activities.

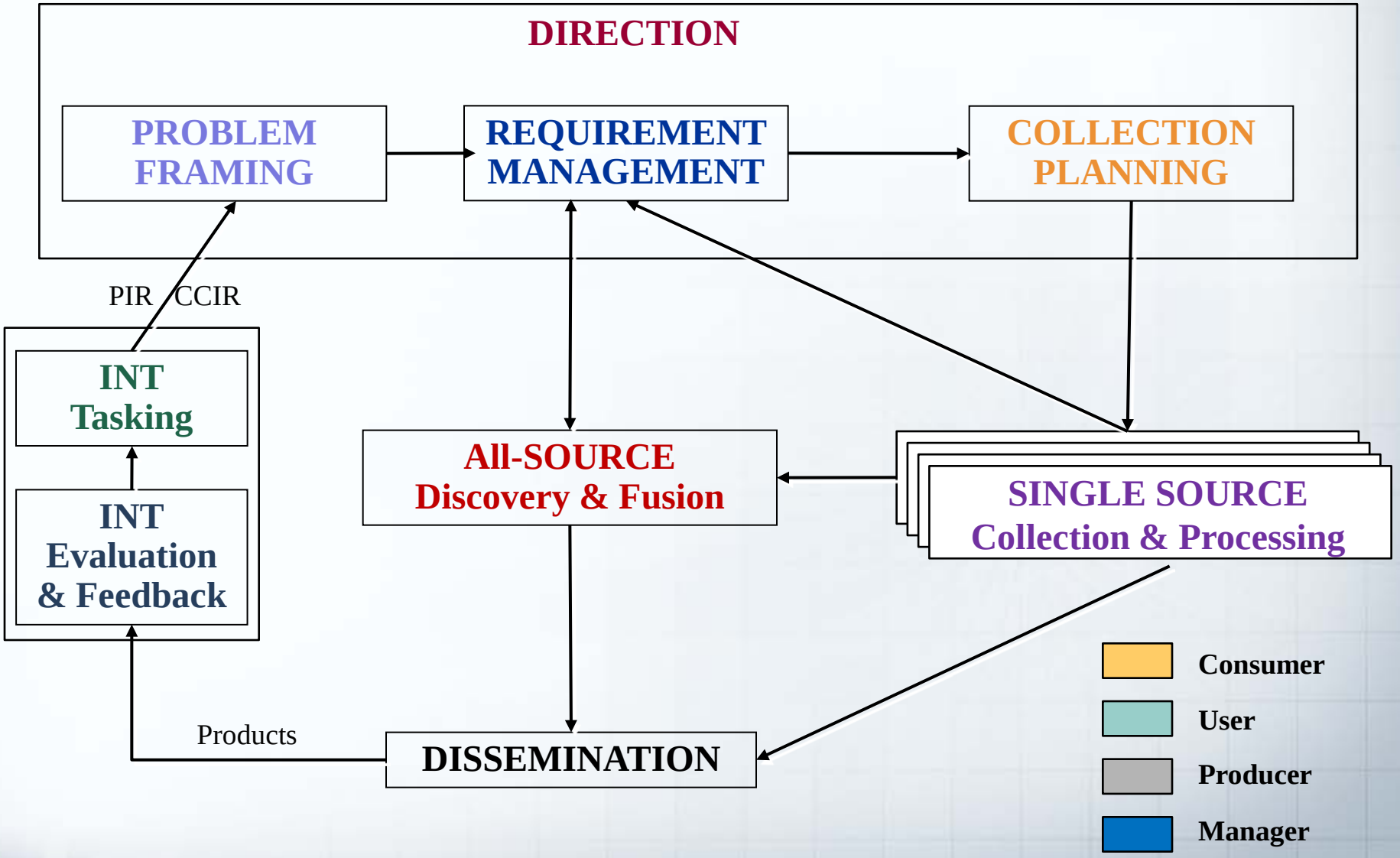
All-Source Intelligence Model (level 1)



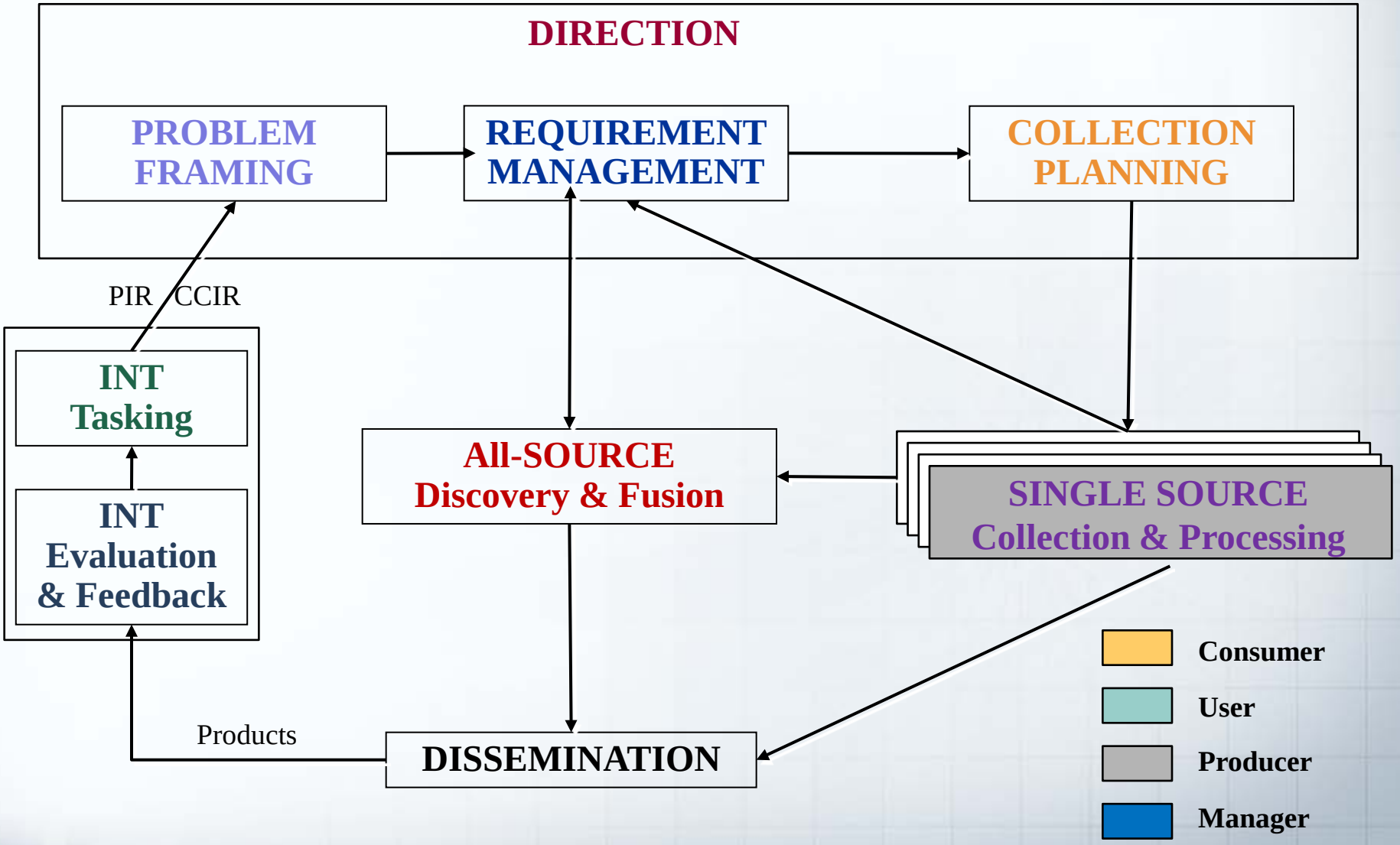
All-Source Intelligence Model (level 2)



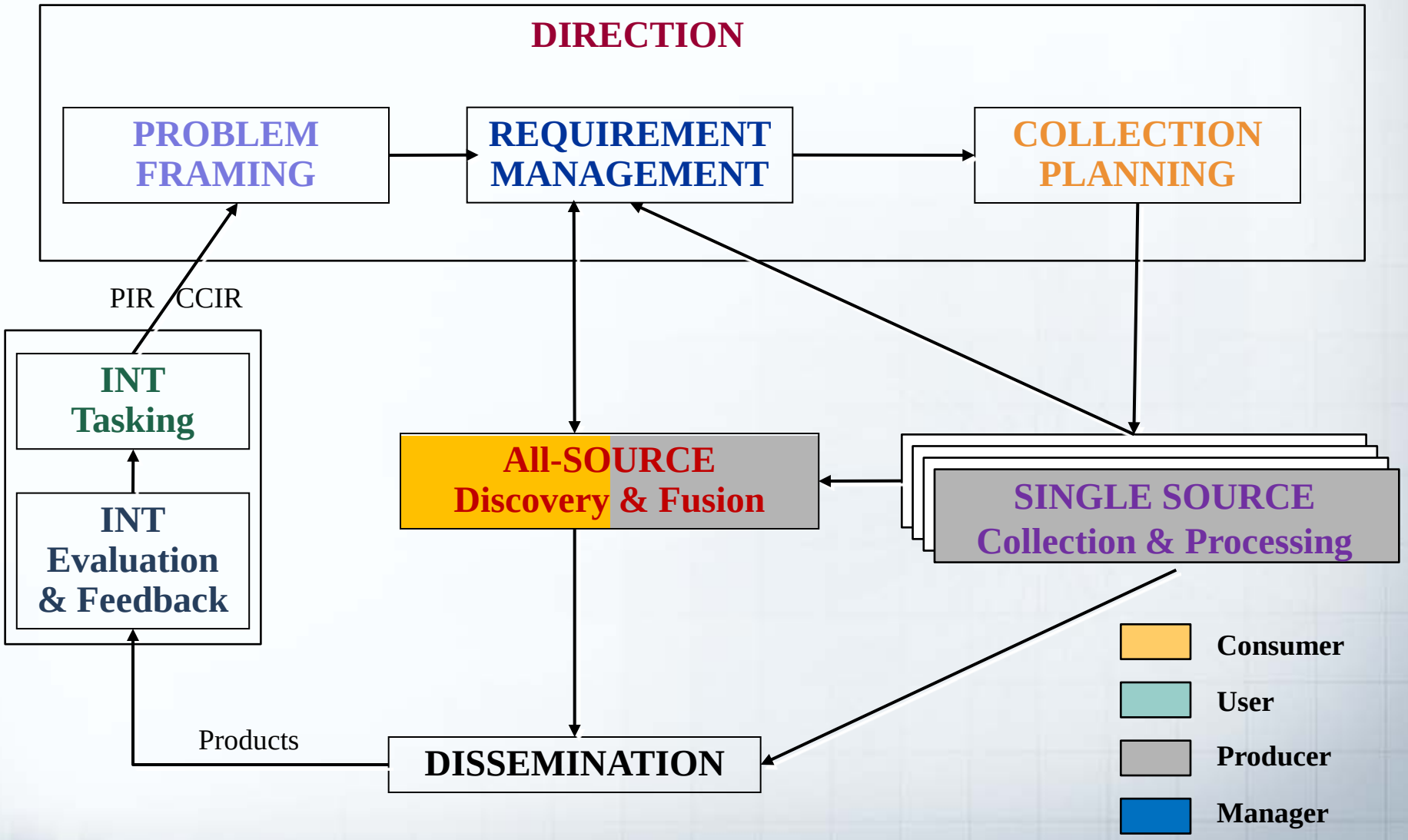
All-Source Intelligence Model (level 2)



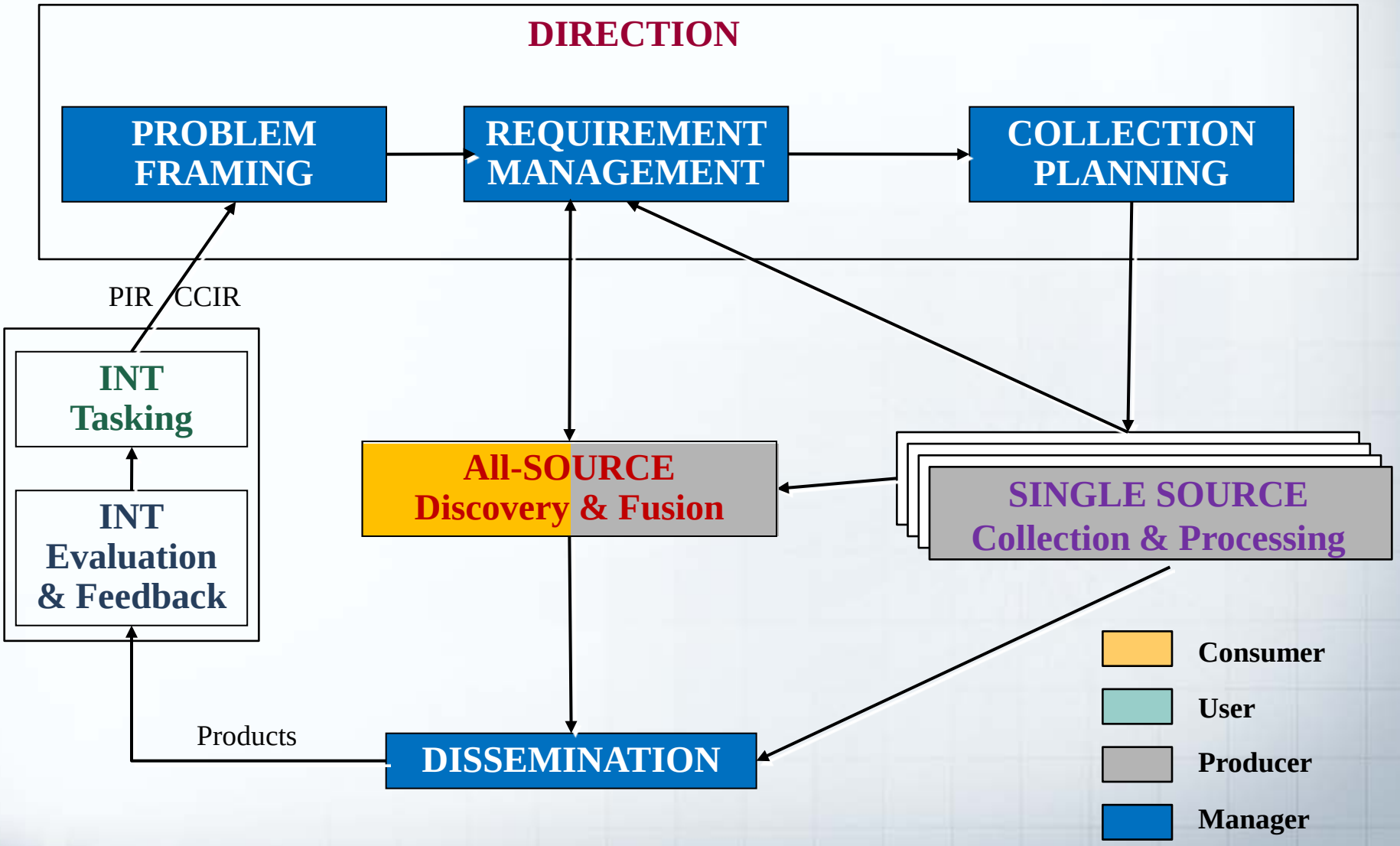
All-Source Intelligence Model (level 2)



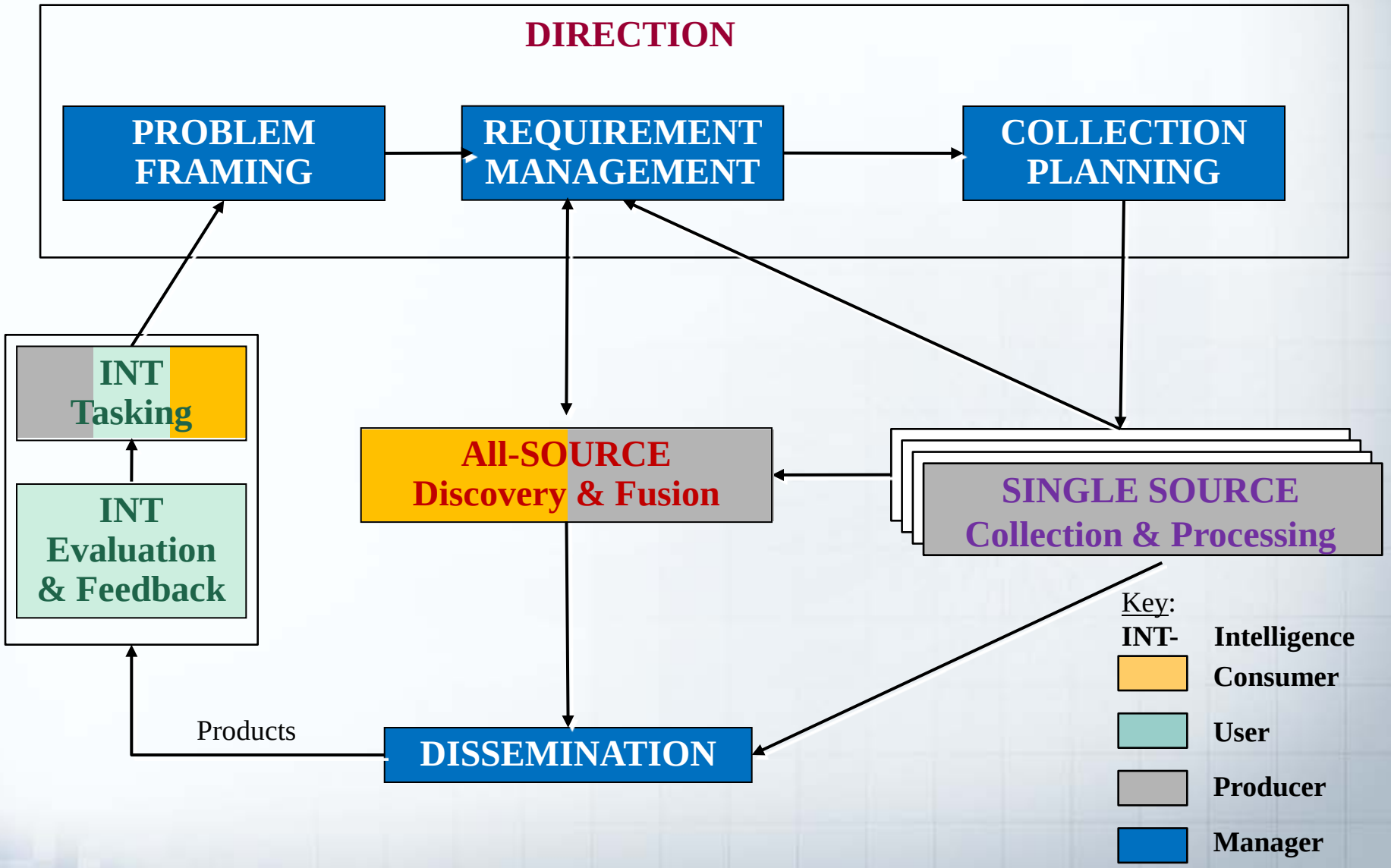
All-Source Intelligence Model (level 2)



All-Source Intelligence Model (level 2)

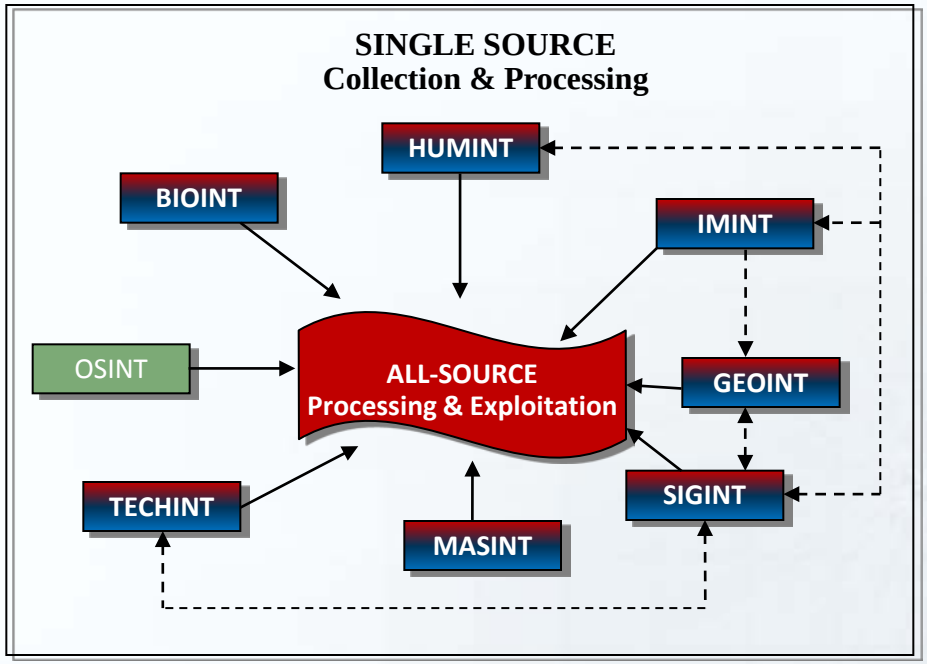


All-Source Intelligence Model (level 2)



All-Source Intelligence Model (level 3)

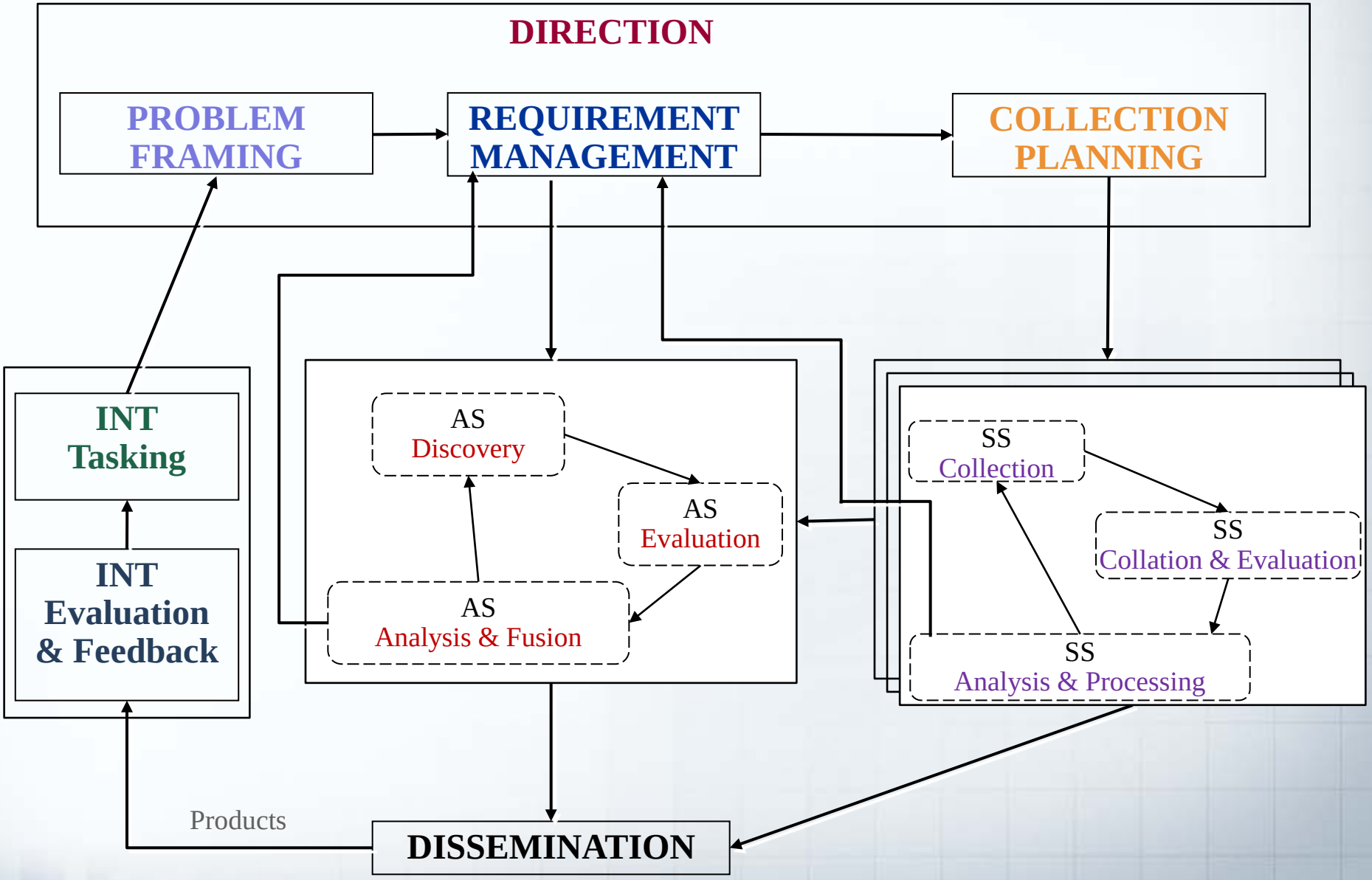
- Detailing Single Source (SS) and All-Source (AS) processes



All-Source Intelligence Model (level 3)

- The Single Source intelligence processes consist of:
  - Acquiring (data),
  - Sorting, filtering, indexing and organizing (information),
  - Evaluating (information reliability and source credibility)
  - Reasoning (analyzing and synthesizing) to create intelligence,
  - Disseminating that intelligence to users.
- The All-Source intelligence process consists of:
  - A discovery of single source intelligence produced within each discipline (HUMINT, IMINT, GEOINT, TECHINT, etc.);
  - Evaluation of the quality of SS intelligence products
  - Analysis and fusion to produce AS intelligence
  - Dissemination to the user.

All-Source Intelligence Model (level 3)



A collaborative approach: an imperative to the success of the model

- **Challenges and issues:**
  - **Technological issues**
    - Limited sharing: no link between different organisations and systems.
    - Stove piping: each intelligence agency has its own networks and data repositories that make it very difficult in an all-source perspective to piece together facts and suppositions that, in the aggregate, could provide valuable warning.
    - Difficult to discover or access collected information outside of collection stovepipes. Analysts could often be unaware that information has been collected.
  - **Cultural issues:**
    - Collection and analysis processes are independent (restrictions, psychological barriers, fears of compromising sources, security concerns, etc.)
    - "Need to know" culture rather than "Need to share", focused on "Data ownership" rather than "Data stewardship".

A collaborative approach: an imperative to the success of the model

- **Enablers**
  - **IKM services**
    - Common data standards (metadata tagging standards, security marking) and core services for organizing, discovery, filtering and delivery of information while guarding against information overload.
    - Advances discovery processes and procedures
    - Retrieval protocols
  - **Security concerns**
    - Information protected and auditable.
    - Tools and mechanisms to manage identities, authorize, authenticate, and audit users and ensure confidentiality
    - Establishing rules and procedures for accessing information and a sharing policy should be established

A collaborative approach: an imperative to the success of the model

- **Enablers**
  - **Trust environment**
    - Trusted systems
    - Virtual collaboration environment
    - Tradeoff between common trust and protection of sources, methods and sensitive information
  - **Trust-based culture**
    - Need to share culture VS need to know culture
    - Developing incentives (at the institutional, leadership and workforce levels), awards and assessment programs.


DEFENCE
R&D
DÉFENSE