16th ICCRTS

"Collective C2 in Multinational Civil-Military Operations"

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)

ABSTRACT

In the intelligence domain, the collection and processing of information and intelligence from multiple ISR sources (including sensors, human, open sources, etc.) is essential to produce actionable intelligence of high value in order to counter threat operations. In current practice, the outputs of different disciplines 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 all-source intelligence model to be effective 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 critics and discussions were addressed towards the intelligence cycle [1], [2], [3], [4], [5], [6], [7], [8], [9]. Since the 1980, the CIA's Arthur S. Hulnick notes that

> *"...The cycle is less a series of discrete phases, one leading to another, than a matrix of steady interaction between producers and consumers of intelligence with multiple loops".*

Later, 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 info rmation services that fit the 1940s, when the intelligence community was establis hed and pe ople began to dis cuss 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 critics are formulated in the literature but despite all these critics, the cycle continues to be considered as the core representation of how intelligence is functioning [5]. In addition, some authors in the op en literature [1] [2], [3], [4] fost er the development of a m ore complete representation of all elem ents of the process as well as the factor s that influence them. There is an agreement towards the ne ed to have a model that would cap ture the entire intelligence process, from the request for intelligence to it s delivery, including the roles and responsibilities of all stakeholders.

This paper highlights m any deficiencies and issu es of the traditional intelligence cycle and particularly focuses on the fact that this cycle la cks in representing the intelligence process from an all-source perspective. On one hand, the a ll-source activities are not represented in the traditional cycle. They are encom passed within the process ing step of the cycle. O n 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 be tter understand, define and repres ent the all-source intelligence process based on a collaborative approach.

The traditional intelligence cycle is reviewed a nd the m ain critics tha t were addre ssed in the literature are highlighted. Then, the modelling of the inte lligence process is rethought from an all-source perspective and a m odified model is proposed. The proposed m odel is com posed of many activities and p rocesses: intelligence tasking; direction; single source collection & processing; all-source discovery & fusion; dissem ination; and evaluation & feedback. Three levels of detail of the m odel are provided. Level 1 is a high level representation of the intelligence process. Le vel 2 in troduces the roles of intelligence per sonnel in e ach phase and specifies the main activities in th e direction phase. Level 3 details the a ctivities in the "sing le source collection & processing" and the "all-source discovery & integration" 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 d iscusses the challenges and issues and presents factors that enable or impede such collaboration.

The intelligence cycle

The intelligence cycle is a conceptual m odel showing how intelligence operations are conducted. It is an end-to-end process presenting all stag es from finding out (or anticipating) what th e decision-maker needs to know to the reception of the answer that he asked for. The sa me intelligence cycle repr esentation is generally considered for the civilian and the m ilitary intelligence organizations. In this pa per, we report the definitions of the intelligence cycle from the military context, but all along the paper, we tak e the option to remain general so that th e 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, US and 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].

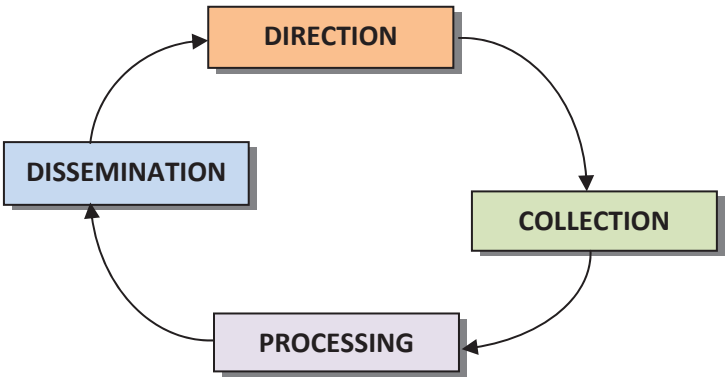

Figure 1: The intelligence cycle [10]

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 (Annex 1, Figure 9). 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.

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 (Annex 1, Figure 10). They occur throughout the process and can affect any step at any time.

The NATO representation (Annex 1, Figure 11) of the intelligence cycle adds to the Canadian representation a continuous phase "evaluation and feedback" performed all along the process [14][15]. Annex 1 presents the different representations of models discussed in this section.

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:

- 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.

Critics and previous work on the intelligence cycle

Main critics on the intelligence cycle

Many discussions and critics 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 critics 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 feeling the knowledge gaps.

- *Intelligence support decision maker rather than inform it.* In [5], the author infirms 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 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 is functioning in parallel.

- *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]. It gives the feeling that all inputs are constant and flow automatically, but it does not address elements that may influence the movement of the cycle, positively or negatively [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 (Figure 2). 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. The 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.

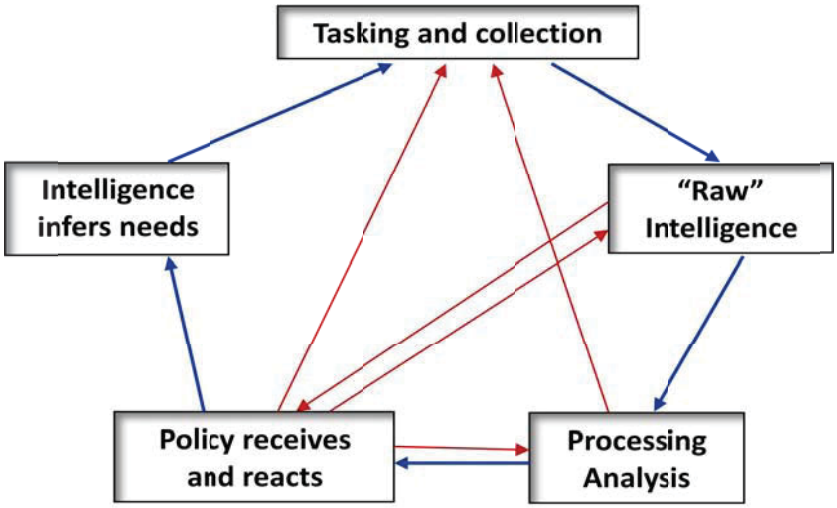

Figure 2: Treverton's "real intelligence cycle"

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 3). 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.

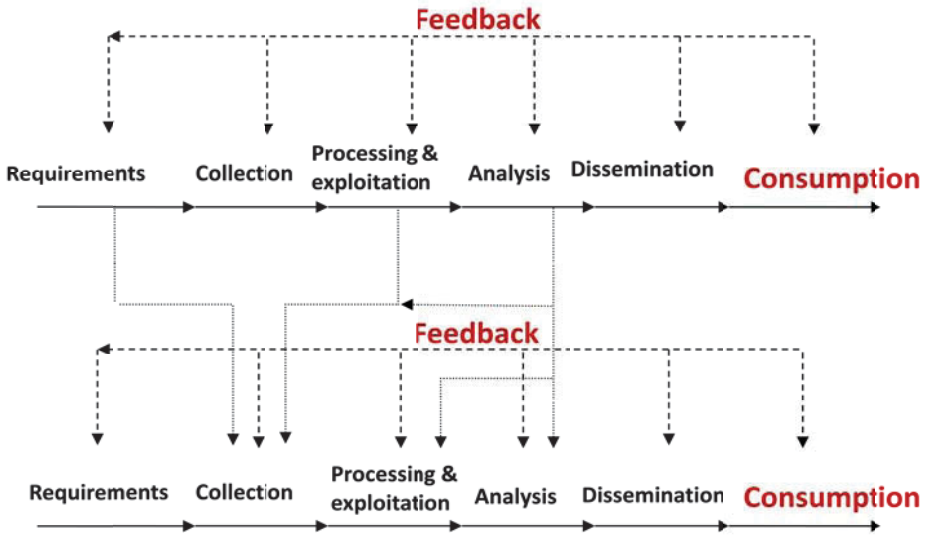

Figure 3: The multilayered intelligence cycle [4]

In [3], Evans proposes a hub and spoke model for the military intelligence process (Figure 4). 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].

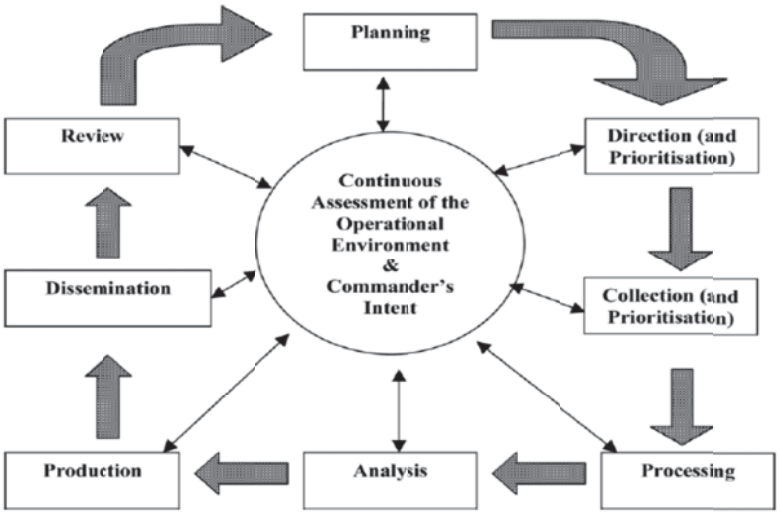

Figure 4: The Hub and Spoke Intelligence model [3]

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 critics formulated towards the traditional intelligence cycle do not discuss the fact that this cycle lacks in representing the intelligence process from an all-source perspective. This paper put emphases 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 to the understanding of 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 modified 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 U S Army doctrine for intelligence [13], 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*".

In this paper, all-source intelligence is considered as the process that consists of incorporating intelligence resulting from all intelligence disciplines (HUMINT, IMINT, GEOINT, SIGINT, MASINT, TECHINT, OSINT, and BIOINT) to produce consolidated intelligence of great value (as illustrated in Figure 5). Multi-source is a particular case of all-source intelligence, where only some of these disciplines are considered.

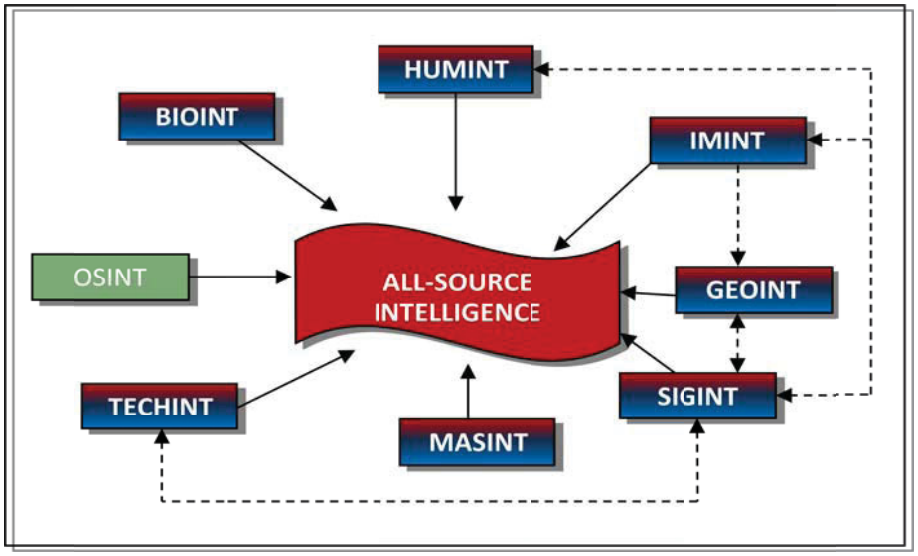

Figure 5: All-source intelligence

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)

- Promotes a collaborative environment where information is accessible and discoverable and routinely shared (between collectors, analysts, and end users). More specifically, the model favour:
    - Exchanging intelligence/information between collectors, analysts, and end users in order to improve the quality of intelligence products.
    - Information accessible, available, and discoverable at the earliest point possible and whenever it is in the intelligence information life cycle.

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 and relationships between single source and all-source processes and we represent this synergy in the modified model of the intelligence process.

Three levels of detail of the model are provided here. Level 1 is a high level representation of the intelligence process (Figure 6). Level 2 introduces the roles of intelligence personnel in each phase and precise the main activities in the direction phase (Figure 7). Level 3 details the activities in the "single source collection & processing" and the "all-source discovery & integration" phases (Figure 8).

Level 1 representation

A high level representation of the modified model is illustrated in Figure 6. The intelligence process is composed of the following steps: intelligence tasking; direction; single source collection & processing; all-source discovery & fusion; dissemination; and evaluation & feedback.

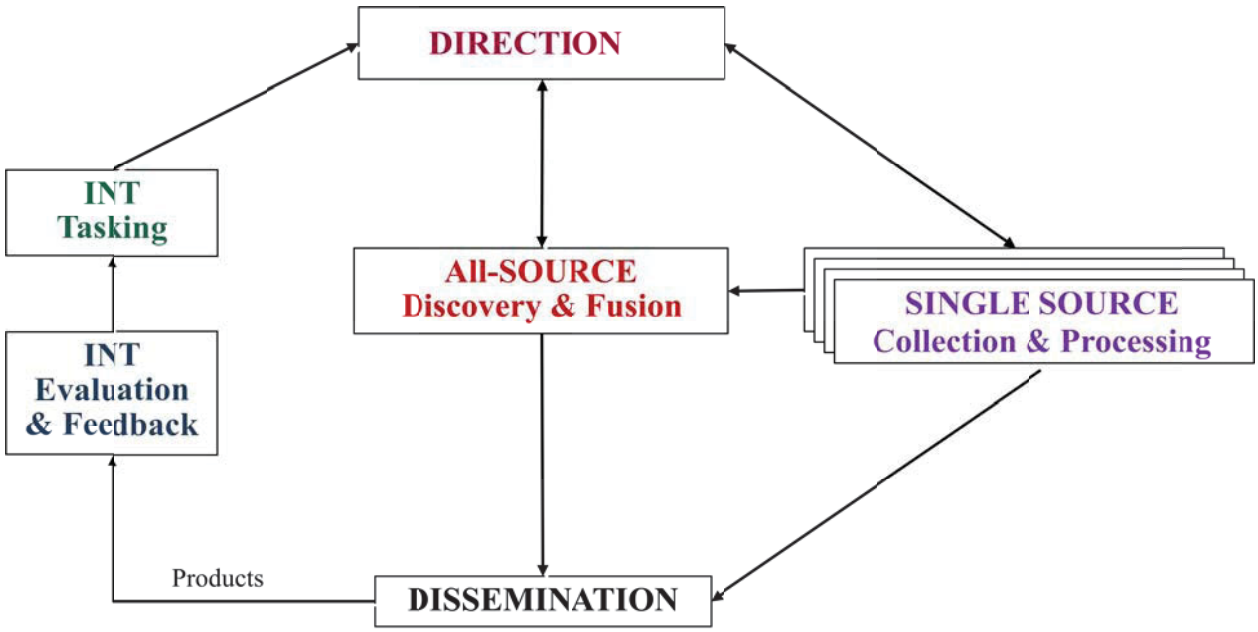

Figure 6: An all-source intelligence model (Level 1)

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 defining 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 notice 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 AS discovery & fusion regroup the discovery of the SS intelligence and its fusion in order to produce further actionable intelligence. The discovery consists to get the SS intelligence either by querying the databases or by communicating and collaborating with the SS analysts. SS intelligence is then evaluated, analyzed and fused in order to produce AS actionable intelligence of high value. Concerning the dissemination, it is 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 term of reliability and credibility), for single source intelligence (SS intelligence quality) and all-source intelligence (in term of user satisfaction). Finally, the users of intelligence should give feedback to intelligence producers, detailing what is useful, what has not, which area need continuing or increased emphases. Based on these feedbacks, new intelligence requirements will come out. 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 precise the main activities in the direction phase. Let us start with a recall of the main roles that we considered in this paper within the intelligence community.

- 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.

Figure 7 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 it and provides feedbacks. The model specifies also that intelligence consumers and produces might ask for intelligence to be produced depending on their needs.

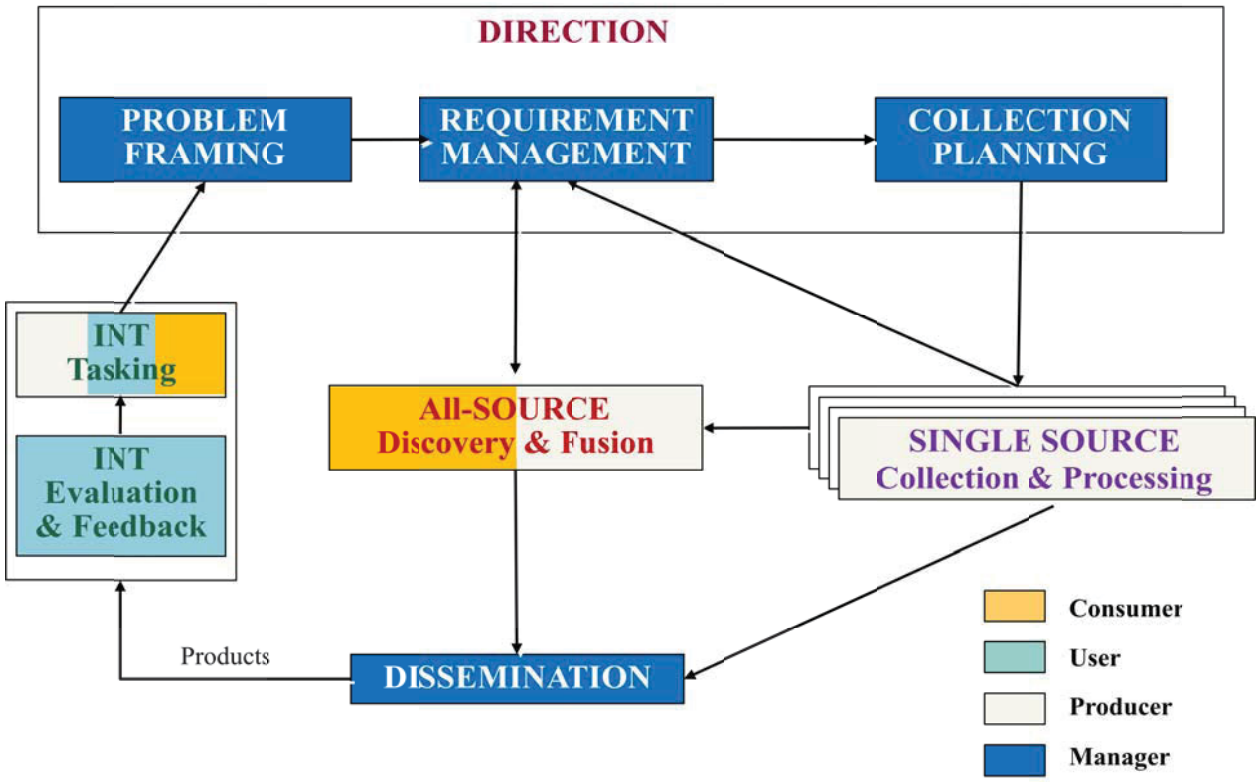

Figure 7: An all-source intelligence model (Level 2)

Level 3 representation

The intelligence process model illustrated in Figure 8 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 synthesizing) 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 could be tasked from collectors or as 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).

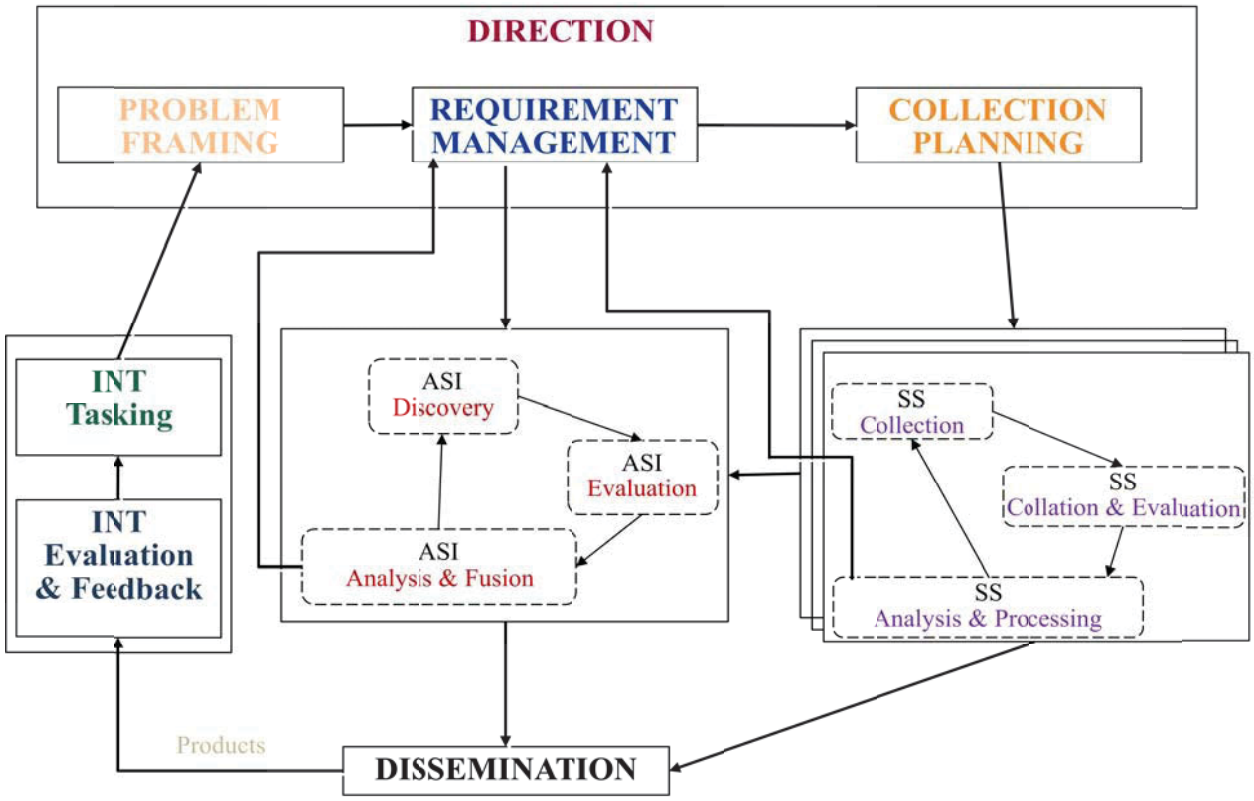

Figure 8: An all-source intelligence model (Level 3)

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

The all-source intelligence model proposed in last 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 providing of feedback 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 reality and security threats. Introduced in [9], the new paradigm replaces the notion of intelligence as "solving puzzles" with that of intelligence as 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. In addition, the situation is more dynamic. Single pieces of information can change their value, becoming much 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 it 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 all-source intelligence model to be effective and actually based on 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 comprising 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 did not facilitate 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 hypothesis which, in the aggregate, could provide valuable warning. More and more, large amounts of data/information/intelligence is 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. In this paper, we think at least these 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 of 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 available 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 the common trust. However, it still

remains a trade-off to be developed between this common 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 related 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 the collaboration and information sharing among actors.

Conclusion

This paper starts with a review of the traditional intelligence cycle and the main critics that were addressed in the literature. 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. 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, and all-source discovery & fusion, dissemination, and evaluation & feedback. Three level 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 precise the main activities in the direction phase. Level 3 details the activities in the "single source collection & processing" and the "all-source discovery & integration" 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 discusses what are the challenges and issues to the all-source intelligence model to be effective and actually based on a collaborative approach. We then provide ideas that enable the functioning of this model. Three factors that allow and enable the all-source intelligence model to be effective based on a collaborative spirit are 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.

Annex 1: Intelligence cycle models

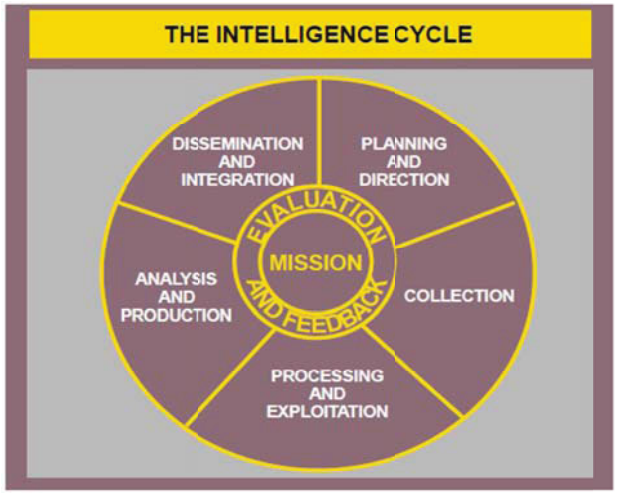

Figure 9: The US Joint Intelligence Cycle [12]

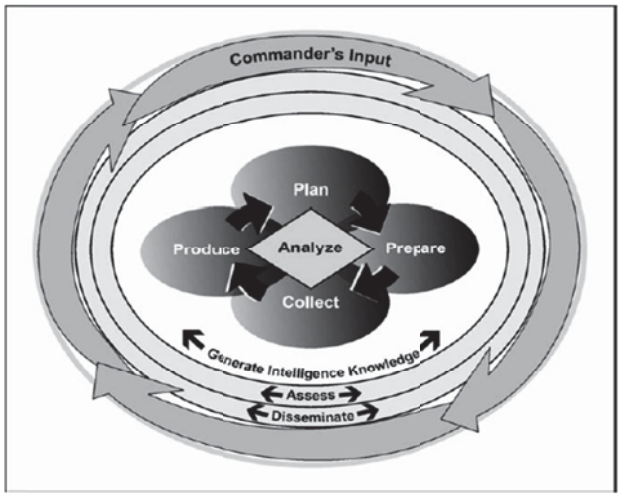

Figure 10: The US army intelligence process [13]

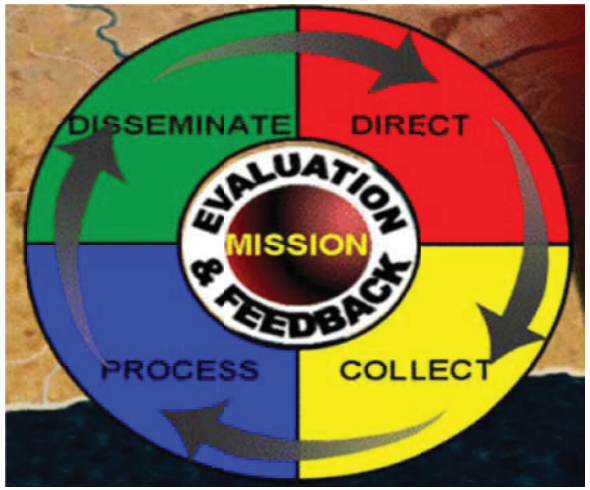

Figure 11: The NATO Intelligence Cycle