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NGSI STUDENT ACTIVITIES IN OPEN SOURCE INFORMATION ANALYSIS IN SUPPORT OF THE TRAINING PROGRAM OF THE U.S. DOE LABORATORIES FOR THE ENTRY INTO FORCE OF THE ADDITIONAL PROTOCOL

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ABSTRACT

In 2008 a joint team from Los Alamos National Laboratory (LANL) and Brookhaven National Laboratory (BNL) consisting of specialists in training of IAEA inspectors in the use of complementary access activities formulated a training program to prepare the U.S. Doe laboratories for the entry into force of the Additional Protocol. As a major part of the support of the activity, LANL summer interns provided open source information analysis to the LANL-BNL mock inspection team. They were a part of the Next Generation Safeguards Initiative's (NGSI) summer intern program aimed at producing the next generation of safeguards specialists. This paper describes how they used open source information to "backstop" the LANL-BNL team's effort to construct meaningful Additional Protocol Complementary Access training scenarios for each of the three DOE laboratories, Lawrence Livermore National Laboratory, Idaho National Laboratory, and Oak Ridge National Laboratory.

INTRODUCTION

In the summer of 2008 a joint team from Los Alamos National Laboratory (LANL) and Brookhaven National Laboratory (BNL) consisting of specialists in training of IAEA inspectors in the use of complementary access activities formulated a training program to prepare the U.S DOE laboratories for the entry into force of the Protocol Additional to the agreement between the United States of America and the International Atomic Energy Agency for the application of safeguards in the United States of America (the Additional Protocol). Since the U.S. version of the Additional Protocol would allow for access to the DOE laboratories under the aegis of Complementary Access activities, the DOE laboratories would need to be prepared for such visits. The goal of the training was to insure that the DOE laboratories would provide the IAEA with the information that the IAEA needed to comply with the Additional Protocol and also protect the equities of the national laboratories which is a right of the Additional Protocol. Hence, the laboratories could protect U.S. assets under the National Security Exclusion of the U.S. Additional Protocol and proprietary information under the general Additional Protocol. The LANL-BNL team performed training at Lawrence Livermore National Laboratory, Idaho National Laboratory, and Oak Ridge National Laboratory to cover the situations that these laboratories deemed weapons labs, nuclear energy labs, and science labs would encounter. The training was in the form of each of the three labs hosting a mock complementary access activity by mock inspectors from the LANL-BNL team. The LANL-

BNL team used the draft declarations from each of the host labs and did open source research in a similar manner as IAEA inspectors would to research the activities at each lab and to prepare questions for the labs to answer that would make a case for the mock inspection team to be allowed complementary access activities. The host labs and other labs attending the training found the training to be extremely useful and helpful in making sure that each lab's Additional Protocol team had made correct declarations of nuclear activities, had provisions to insure that informed staff could be ready to host and answer IAEA inquiries, and proper security existed to allow for smooth access by the IAEA team and to control access to sensitive areas.

BACKGROUND INFORMATION

With the close of the Gulf War and the discovery of a clandestine nuclear weapons program in Iraq, the international community called for a revaluation and strengthening of the nuclear safeguards regime[1]. This, among other examples, proves that significant insufficiencies in the Nonproliferation Treaty (1968) existed and, as such, it lacked the capacity to detect covert nuclear weapons programs[2]. In response to demands to strengthen the nuclear nonproliferation regime, the IAEA began work on the Model Additional Protocol (INFCIRC 540)[3]. The Additional Protocol (AP) expanded the capacity of the IAEA safeguards inspections with the hope that it would provide increased and early detection of elicit nuclear activities[4]. The Additional Protocol expanded the IAEA's rights of access to both information and the site, including complementary access visits. The purpose of these visits is to allow the IAEA to verify any inconsistencies or questions that cannot be clarified through written communication[5]. Before the U.S. Additional Protocol could enter into force, United States Department of Energy laboratories needed to be prepared to host IAEA complementary access inspectors. As part of the preparation for these visits a LANL-BNL team performed extensive open source research and prepared mock inspections, focusing their research on Lawrence Livermore National Laboratory, Idaho National Laboratory, and Oak Ridge National Laboratory, all sites that may be subject to Complementary Access activities under the Additional Protocol.

The Additional Protocol contains key expansions of the information a State provides to the IAEA and, most noticeably, provides expanded access for inspectors to a State's nuclear activities, giving inspectors access to all parts of the nuclear fuel cycle within a particular State[6]. This includes uranium mines, fuel fabrication, enrichment plants, nuclear waste sites, research laboratories, and any other location where nuclear activities occur or where nuclear material may not be used, but research and material outside safeguards are present such as the use of yellow cake[7]. The Additional Protocol also allows the IAEA to obtain complementary access, on short notice, to any building within a site declared by a State in the AP. Complementary access provides the opportunity for inspectors to reevaluate any inconsistencies and provide assurance on the accuracy of the State's declaration of the scope of its peaceful nuclear fuel cycle activities[8]. As shown in Figure 1, Complementary Access visits are used during the IAEA review process when further

information on consistency, proliferation pathways, or proliferation indicators is necessary. While on a complementary access visit inspectors may examine records, perform visual observation and environmental sampling, use both radiation detection and measurement devices, and apply seals. During these complementary access visits the State must allow the use of international communication systems and provide renewable entry visas for inspectors[9]. The State will also provide information and verification for its nuclear fuel cycle related research and development as planned for the future. Finally, the Additional Protocol requires that the state provide information and verification on the manufacture, import, and export of nuclear related technology[10].

As one of the five nuclear weapons states, the United States (U.S.) has negotiated the right to restrict inspectors' activities and access by invoking the National Security Exclusion clause as defined by the U.S. Additional Protocol Article 1.b and c. This states that the IAEA provisions apply within the U.S. "excluding only instances where its application would result in access by the Agency to activities with direct national security significance to the United States or to location or information associated with such activities"[11]. In essence, this allows U.S. officials to deny access or limit the access of IAEA inspectors if deemed that such access would place U.S. security at risk. This designation is at the sole discretion of the United States government and it cannot be challenged by the IAEA[12]. Furthermore, the National Security Exclusion allows the United States to apply managed access within any declared area that contains sensitive information.

The model Additional Protocol was approved by the IAEA Board of Governors on May 16, 1997. The United States signed the Additional Protocol on June 13, 1998, but its entry into force was delayed for over a decade, finally coming into force on January 6, 2009[13]. In preparation for this entry into force, it was necessary to ensure that all U.S. national laboratories subject to Additional Protocol complementary inspection were capable of hosting such an inspection. Preparations by laboratories included knowledge of the National Security Exclusion as applied to each specific laboratory, inspector badging, understanding managed access, adequately responding to IAEA inspector inquiry, and site security throughout the inspection. In order to sufficiently prepare the laboratories for IAEA complementary inspections, mock inspections were organized by the LANL-BNL team. The team was comprised of LANL and BNL staff members as well as Next Generation Safeguards Initiative student interns.

While readying for the mock complementary inspection, our team of open source researchers looked at each laboratory's draft declaration line items (DLI) individually. Following the IAEA review process we looked for DLIs that contained international collaboration, showed obvious inconsistencies, or needed further clarification. After extensive online open source research on the flagged DLIs, our team compiled a list of questions and clarification requests to be submitted to each laboratory. These questions were formatted to mirror an IAEA official letter and were then submitted to the laboratory. Following the IAEA timeline, each lab was given the opportunity to respond to each question. If sufficient responses were returned to our "IAEA" team, the question

was eliminated from consideration in the complementary access visit. If, however, after the laboratory's response, clarification and further information was still needed, notification of a mock complementary access visit was given. For the purposes of the exercise and the preparation of the laboratory complex, all three host laboratories were notified of a mock complementary access visit on the planned training dates even if our team felt they had answered the questions sufficiently.

During the mock inspection, members of our team arrived at the laboratory as mock IAEA inspectors. They presented similar identification to laboratory security personnel to familiarize them with inspection protocol. The mock inspections also included an overview of the Additional Protocol, Complementary Access, and justification for inspector activities. All mock inspection activities were conducted in a similar manner to actual IAEA Complementary Access activities to accurately prepare each host laboratory and other DOE laboratories attending the training.

OPEN SOURCE INFORMATION ANALYSIS

As the primary focus of our research team was the investigation of the DLIs and identification of areas that were in need of further clarification, the team used exclusively online open source material. Each DLI was examined using a number of criteria; in particular any DLI with international collaboration was considered for further research. After a brief initial search on the laboratory's project, any indication of proliferation risk was noted and those DLIs submitted for extensive research. This task included finely researching the extent and degree of international collaboration, investigation of published papers, official laboratory website content, laboratory site maps, satellite imagery, media sources, and any other online source connected to the DLI. Figure 2 examines the analytical hierarchy used to investigate and categorize each laboratory's DLIs.

Extent and degree of international collaboration: In order to identify the DLI that required further investigation, we focused on the DLIs that contained international collaboration. Because international collaboration provides increased proliferation risks, our team felt that it was necessary to look at these projects most closely. In the case of the United States, it would seem that the key reason that the IAEA would want to examine in detail the AP declaration of a nuclear weapon state would be to rule out the passing of proliferation sensitive research and equipment to a nonnuclear weapon state with designs on a nuclear weapon. Once all foreign collaboration projects were identified, we worked to determine the degree of involvement of the foreign collaborators. To verify this involvement, we utilized online sources to confirm that collaboration was indicated both by the U.S. laboratory and the foreign laboratory or company. Because this was a mock inspection and we, of course, did not have access to foreign states' own declarations to the IAEA, all collaboration between the U.S. laboratory and foreign partner had to be confirmed though open sources such as websites, laboratory publications, and news media. For example, if a laboratory was working on a new method of fuel reprocessing with a foreign country it would be essential to know what technology and information was being shared. With this sort of collaboration, the

potential for proliferation risk increases significantly because techniques and knowledge involved with the project may be misused in the future.

Investigation of published papers: Our team searched libraries and journals for published papers with references to projects described on the DLI. Initially we began looking at the online library of the indicated national laboratory, and then expanded our search to look at papers within the libraries of other national laboratories, including Los Alamos National Laboratory. We then expanded our search to published papers in university libraries and as well as broad literature searches using search engines such as Google Scholar and other scientific search engines. When a published paper appeared in our literature searches we looked to see if the experiment and methods found within the papers were consistent to the declared purpose and objective described in the DLI. If further clarification was necessary, the team formulated questions and sent them to the laboratory in our mock IAEA letter. For example, if a DLI indicated that research was being done using thorium, but a paper was published using uranium isotopes, this incongruity would be particularly significant. One of the most significant challenges that we faced during our literature searches was the possibility of classified published material. Because the projects indicated on the DLIs were related to nuclear material, it is possible that published research was not available to the public. Since we confined our search to only open sources, there is the potential for an incomplete literature search.

Official laboratory website: When investigating a specific DLI, we looked at each of the DOE laboratory's official websites. On each website our team searched for references to the project within the laboratory or division mission statement, description of current projects, or within employee profiles. If a description of the project was found, we compared stated objectives and applications to the DLI content. For example, should the DLI state the objective as a modeling project, yet the website clearly states that the project is under research and development, the laboratory would need to clarify what activities were actually occurring. Any inconsistencies or contradictions were noted as needing further clarification by the laboratory. Furthermore, we looked at each laboratory's mission statement and objectives to see if the project was within the scope of the laboratory's mission. This is particularly important because if the project was outside the scope of the U.S. laboratory research focus, there is some inherent contradiction. Particularly, if this project was combined with foreign collaboration, such activity would raise uncertainty and indicate a potential proliferation risk. Furthermore, we located key contacts cited on the DLI and searched for any mention of the researchers' names in conjunction with aspects of the project. This search was done simultaneously with our literature searches, looking for consistency between the DLI project description, the researcher's published works, and the laboratory website description.

Site maps and satellite imagery: Within each DLI the building and room where the project's primarily location is declared. As a simple check to ensure that the DLI was consistent and accurate we compared the declared locations to laboratory maps, building plans, and satellite images. Our team wanted to verify that the declared building and room existed and that it had the capacity to

host the project. For example, if the project involved field testing of seashore dock portal monitors yet it was located in an administrative building, this contradiction would be need to be clarified. It is possible that the building cited was simply the office of the project's leading researcher, but from the information indicated on the DLI this was unclear. Similarly, if our searches showed that the indicated building or room did not exist on laboratory maps or satellite imagery, this deviation would need to be corrected prior to the submittal of the DLI to the IAEA for review.

Media sources: Additionally, media sources both within the United Stated and foreign States were used to verify consistency and proliferation risk of each project. We searched popular newspapers, magazines, and books for references to the project and any domestic or international collaboration. Media sources were also used to verify the duration and dates that the project was active. For example, if the DLI indicated that the project was concluded in March, yet newspapers reported that testing was still occurring in October, the laboratory would need to clarify this discrepancy in timing. Furthermore, if the DLI indicated collaboration with only one other entity, yet media sources reported an additional party the role of the third party, as well as the extent of collaboration, would require clarification. Because any international collaboration, with either a national laboratory or any foreign commercial company, poses an automatic proliferation risk, it is essential for the DLI to be both clear and accurate. We primarily looked at United States media sources such as the *New York Times*, in addition to foreign sources such as the BBC, *Le Monde*, and *Der Spiegel*.

Other online sources: Finally, our team concluded the open source research by looking at broad searches of keywords from the DLIs. This included online blogs, the IAEA website, sites such as About.com, HowStuffWorks.com, eHow.com, and Arms Control. We also looked at presentations posted online, PowerPoint lectures, and conference proceedings. Not only did we look at sources from the U.S. but also abroad. For example, we explored several blogs posted on Yahoo!, as well as a Pakistani blog site translated into English. The majority of these broad searches were performed using the search engine Google.

CONCLUSION

The Additional Protocol to the Nuclear Nonproliferation Treaty was established in 1997. In preparation for the entry into force of the U.S. Additional Protocol, the LANL-BNL team worked to organize and perform mock inspections similar to inspections performed by the IAEA while on a complementary access visit. These mock inspections were designed to prepare the U.S. Department of Energy national laboratories to properly host IAEA inspectors by promoting knowledge of the National Security Exclusion as applied to each specific laboratory, inspector badging, understanding managed access, adequately responding to IAEA inspector inquiry, and site security throughout the inspection. Prior to the mock inspections, a team of open source researchers examined each laboratory's draft DLIs and identified areas that included international collaboration, showed obvious inconsistencies, or needed further clarification. Online open sources were used to

investigate those declarations that required further clarification consider the extent and degree of international collaboration, investigate published papers, official laboratory website content as well as, laboratory site maps, satellite imagery, media sources, and any other online source connected to the DLI. The team submitted questions, requests for clarification, and notice of the mock inspection to the laboratory following the IAEA's protocol. The LANL-BNL team completed all three mock inspections in the fall of 2008 with the open source information compiled by the LANL student intern team providing the key background and rationale for the Complementary Access activities. The U.S. Additional Protocol entered into force on January 6, 2009 with the DOE laboratories well trained to make correct and complete AP declarations and to host with confidence IAEA inspectors' Complementary Access activities.

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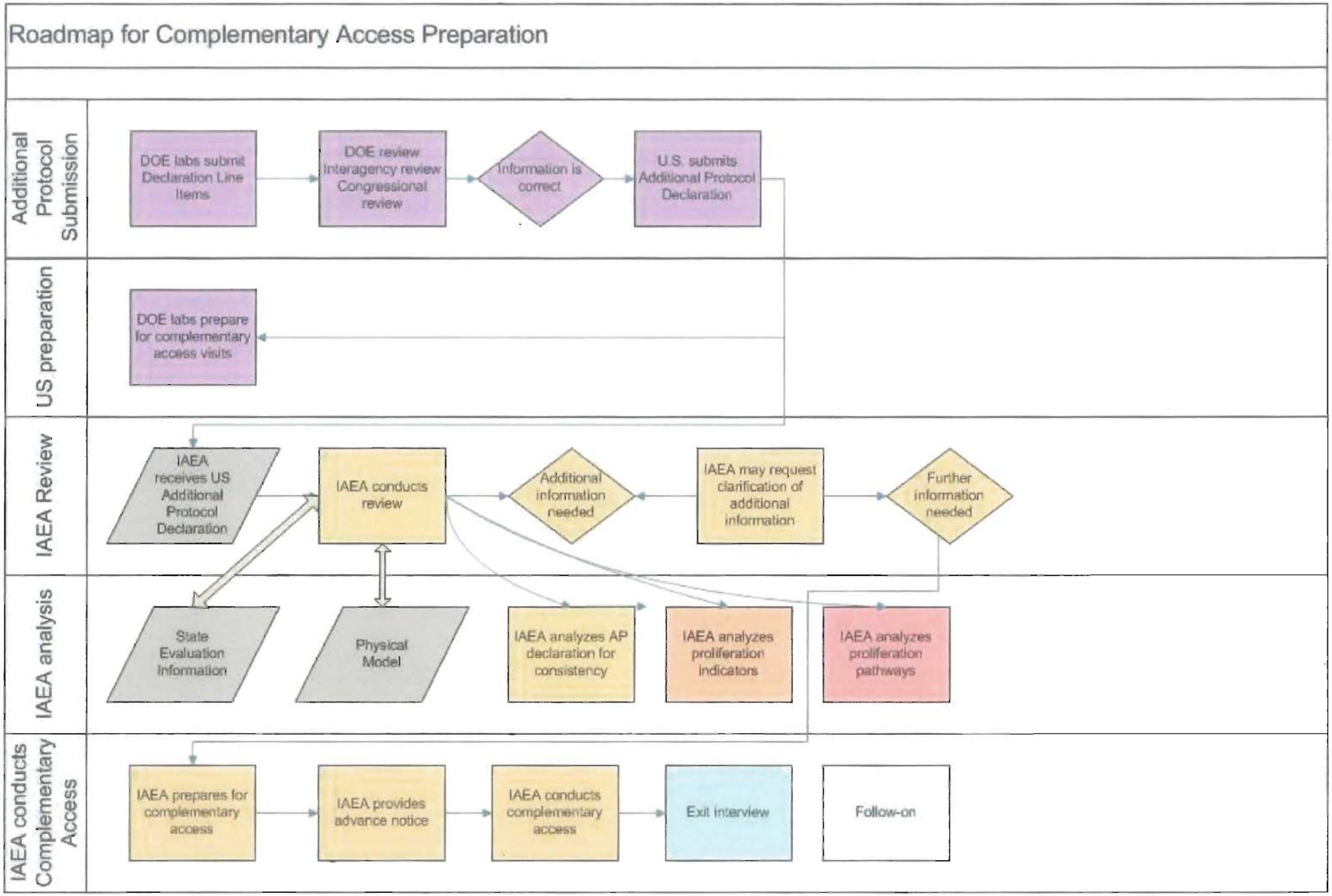

Figure 1. Complementary Access Roadmap

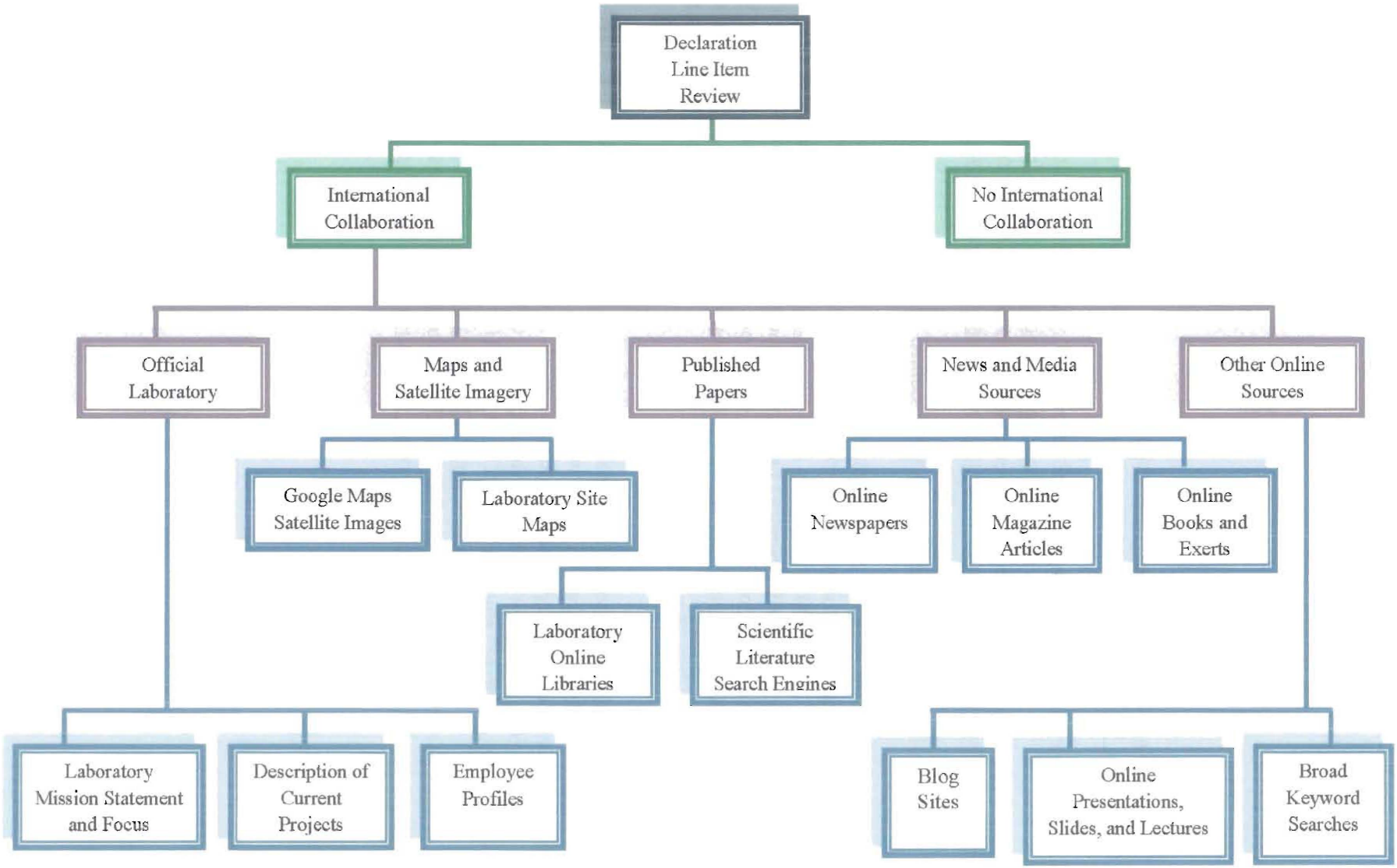

Figure 2: Open Source Information Analysis Progression

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