Integrated Logistics Support: A Case Study of Royal Thai Navy's Acquisition

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***Abstract* - This paper aims to examine the Royal Thai Navy (RTN) defense materiel acquisition process and understand the implementation *of* Integrated Logistics Support (ILS) within the Ship building programs. The author introduces the research background clearly and gives enough details to the basic ideas and the theoretical analysis. ILS is credited as a United Stated Army tool and aims for maximum materiel availability with a minimum life cycle cost. This paper utilizes a qualitative methodological approach and uses two methods of data collection: documentary research and semi-structured interviews. The methodological approach employed the mapping of the documentation process to identify formal ILS practice in the Ship building program (including acquisition processes through published regulations and manuals that were formulated by the RTN authorities) and then was compared to the documents of other countries. The approach of accumulating a selection of 64 interviewed participants comprised of personnel from inside and outside RTN organizations. Results of this study reveal that the ILS in RTN acquisition process differs from that of ILS used in other countries. Consequently, the problems in using ILS include and led to limitations for the RTN in achieving the anticipated organizational aim and ILS objectives.**

Keywords- Integrated Logistics Support; Acquisition; Life Cycle Cost; Thai Defense; Royal Thai Navy

I. INTRODUCTION

Integrated Logistics Support (ILS) is a disciplined approach that influences the product design and develops the support solution to optimize supportability with minimum cost. The United States Amy has developed the Military Logistics of ILS from the mid 1960. The ILS guide [1] defines ILS "… as disciplined, unified, and iterative approach to the management and activities necessary to

- Integrate support considerations into system and equipment design;
- Develop support requirements that are related consistently to readiness objectives;
- Design each other;
- Acquire the required support;
- Provide the required support during the operational phase at minimum cost.

Ketsatein [2] has studied the RTN adoption of ILS since 1992 which has been incorporated into the contracts for all RTN ship building programs. Chansongserm [3] mentioned that the RTN still struggled in accomplishing the full availability of military capability and cost saving goals. He examined the direct use of ILS by the RTN and noted that ILS had not been fully implemented as a standard or in a systematic manner. He reflected on the ILS practices as a burden and questioned its value for money. Chansongserm's [3] studies illustrated unsuccessful ILS practices within the RTN, but the details of the problems and actual operations remained unclear. It could be that they were unable to present the entire range of problems regarding the use of ILS due to various restrictions worked specifically for the RTN.

Fully understanding the use of ILS could be an interest to outsiders and other military forces. Therefore, this paper (of which the author/s is/are not attached to the RTN) intends to address the Acquisition Processes of ILS practices of the RTN and to compare these with the principles of ILS as applied by other countries.

II. LITERATURE REVIEW

To date there has not been a significant attempt to directly and fully explore the process of how ILS in the RTN is carried out and what actions are taken to improve the use of ILS. However, there is documented evidence demonstrating the use of ILS in various countries, for example, Jones [4] addressed the use of ILS in the United States and the United Kingdom and stated three issues, firstly, that ILS has been used as an important tool in several military acquisition projects, secondly, the incorporation with logistic concepts, and thirdly, the calculation of costs and benefits based on tasks and elements needed throughout the life of each material and service. ILS was used differently in each organization depending on the given definitions. The paper by Pretorious [5] also reflected on a similar approach, explaining that definition was subjected to the organizational purpose.

Two questions arose out of the work of Jones [4] and Pretorious [5], as to how the RTN defined ILS and how they could formulate ILS in the same way as found in other countries. It is possible that the RTN, as discussed by Jones [4] and Pretorious [5], would not have a clear understanding of ILS, meaning that the practices are in doubt. Some of the RTN personnel might have a limited knowledge about ILS and therefore did not have any clear procedures to guide their practices.

Luengvilai [6] and Phusavat [7] suggested that many steps and procedures should be involved in the ILS process, and the analysis of Life Cycle Costs (LCC) should take part in the ILS practice. However, their recommendations might not be relevant to the vessel acquisition programs, since their studies were based on guidance devices of missile where these weapons were ready made. Therefore, cost analysis could not be used to determine or influence the initial design to reduce LCC. When conducting LCC for vessel acquisition projects, ILS is required, since it can be used to tailor the different designs according to the buyer requirements such as size, elements, parts, and materials. The freedom in changing the design at an early phase of the acquisition process leads to

more opportunity to lowering LCC than in the cases of ready-made equipment. Moreover, Phusavat [7] stressed that the analysis for LCC should be done during the designing phase in order to open an opportunity to the buyer of what materials or parts should be selected to fit the vessel functions and with an effective cost.

Since there is limited information to clarify how LCC has been done by the RTN, this needed to be considered in more details. From previous investigation, it was evident that if the LCC was fully and correctly conducted, following the standard ILS principles, the success of ILS implementation was high, with noticeable cost effectiveness.

Previous international studies and research, like the work of Erzin [8] examined the problems from using ILS and found that the limited knowledge on ILS, especially the lack of clarity concerning logistics doctrine and objectives, was the main ILS problem of the Turkish Army. Slaughter [9] and Jacobsen [10] studied different acquisition projects of the U.S. Ministry of Defense and found that Logistics Support Analysis and LCC were not needed to be used in depth as the freedom of design change was limited when purchasing from the ready-made or off-the-shelf equipment. However, the acquired equipment would have limitations meeting the user requirements. Watson [11] mentioned a source of information regarding discussion on the actual ILS practices of the U.S. Navy, indicating the cause of ILS problems were from not using the ships the way they were designed, not using inappropriate materials, not operating without manuals, and not having an inaccurate estimation of spare parts costs. The study by Chansongserm [3] provided useful information regarding the ILS problems occurred in the RTN, resulting in a lack of knowledge and standards when applying ILS. Watson [11] stressed that the problems of using ILS could be eliminated by developing ILS plan and manual, appointing an ILS manager, specifying the ILS manager's role, and formulating the evaluation procedure.

At present, the RTN has made some adjustments on ILS practices including establishing a new department responsible for ILS. However, work has yet to be done to examine the work of the new department and how the ILS practices have been changed and if these changes have any similarities or differences from the ILS practices common in other countries.

III. STUDY METHODS

The existing studies previously discussed have partially illustrated the use of ILS in acquiring defence materials and only in some aspects relate to the ILS practices of the RTN. Therefore, to gain extensive details to investigate the ILS practices of the RTN, a qualitative method was chosen by using documentary research and semi-structured interviews.

This study utilized approaches suggested by Sekaran [12], where the research involved complex data and confidential information (including works related to ILS practices involved with complicated data and various involvements from different agencies and national securities data). Therefore, the confidentiality of the collected information and the release of such information were a main concern of the RTN research at hand. Participant selection was done via a sampling method, determining the key participants through their direct involvement in the life cycle of the navy vessel as suggested in Blanchard [13]. Furthermore, the interviewed participants were chosen by using the snow ball technique. By doing this, the participants were the personnel who worked with ILS, ranging from managers to the Navy's officers, first line practitioners, and private shipbuilders. The total number of interviewees was 64. They have the involvement with ILS in each phase of the vessel life cycle and have had different experiences related to ILS, ranging from 1 year to more than 5 years.

IV. STUDY RESULTS

A. RTN Acquisition Process

The Ship building program of the RTN started with the Operation Department drafting a Staff Target (ST). Requirements from the Fleet and other operational units were then made and drafted by the ST. The requirements basically cover the operational conditions and the vessel functional specifications. At this stage the logistics were not systematically considered. The next step involved the drafting of a Staff Requirement (SR). The RTN would then set up a committee to draft SR, and sub-committees for each part was established according to Expanded Ship Work Breakdown Structure (ESWBS) with 4 digit code as found in the US Navy Standard. ILS sub-committee were set up to draft the ILS terms and conditions as an annex to the Term of Referent (TOR) for the project. The final TOR was passed to the Bidding Committee for announcement.

TOR was comprised of Commercial and Technical parts, where each part was weighted for scoring. For the last 3 projects ILS was 5 points out of 100, major equipment's brands for each system was also listed with normally 2 or more brands such as Main Engines or Gen-Sets listed for the bidder selection. The bidding participants from abroad and local submitted their design and also listed equipment that would be used, for a better score they would have to know which brand was preferred by the RTN.

The top scoring design was called to make an offer on price to RTN, and if their price was within budget, they became the successful bidder. After the contract was signed, the contractor was to start ordering the major equipment and materials detailed in the design. ILS had to be carried out by a sub contractor due to the ship builder's lack of ILS knowledge. The Logistics Support Analysis (LSA) must be performed as per the contract, and the RTN had their own format and procedure for computer software compatibility, which added to complications regarding overall compatibility.

As ILS was performed after the design was submitted, the questions needed to be asked, how could analysis affect the submitted design? The interviewed contractor mentioned the analysis was done after the vessel launched, and that there was no chance that LSA could influence or change the submitted design. The interviewed RTN Acceptance Committee Member also admitted that he was not able to check the correctness of the data provided by sub contractor on time.

B. ILS in the RTN

In respect to the RTN, many interviewed participants have known about ILS but they have not seen any documents directly related to ILS, especially manual of ILS rules, regulation or procedures. They have had only several documents about logistics supports under the topics of ship acquisitions, designs, and repairs. Those documents were published separately and had no linkage between each document. However, the logistics support documents show links with ILS.

These documents that had a direct link with ILS had been classified into two groups. Firstly, the documents which focused on the use of ILS applications (these were found under the name of Staff Requirement or SR document as the appendices of various new naval vessel acquisition projects and some were found in the documents of Logistics Department, including navy doctrines, rules, and commands). Secondly, the documents in a group indirectly related to ILS, which usually include ILS as a subtopic. These documents were found in different offices of the RTN that have specific duties, such as ship designs, which were under the Navy Dockyard, where their involvement in ILS only in some particular parts. Therefore, these documents only mentioned some areas of ILS that were relevant to very specific types of responsibilities.

The scatter and separation of the documents previously mentioned showed the ILS of the RTN contents and processes were not integrated and did not associate and integrate each phase of the vessel's life cycles, differing from the U.S. and the U.K. practices. Although RTN had no ILS documents, some of the basic ILS elements such as analysis costs were found in several projects. These are handled by staff of private companies who were the Navy's contracted partners. These companies were responsible for only writing manuals to be used with computers that related to ILS but not specifically fitting requirements, for example doing more than necessary. Therefore, it can be said that the RTN lacked important information (which was not passed on by the contracting companies) to be used in the beginning of the designing phase, and information only being received partially from contractors. In such cases, the purposes of RTN's application of ILS were different from those of the U.S. and the U.K., because ILS was not used in influencing the design but only used for the maintenance of management.

C. Logistics Doctrine

"Military Doctrines" are basic principles that guide military actions that are widely accepted and formally delivered from one generation to the next. As previously mentioned, the RTN had placed the ILS process as a part of logistics supports. Therefore, ILS principles could be found in the Logistics Doctrines, for example, as found in the document Number 4001 in the logistics doctrine, published on the Navy's website [14]. In this doctrine page, it indicated the purpose of ILS as mainly for repairing and maintenance servicing, and should be used from the beginning of the acquisition process. However, no other indications could be found regarding a clear statement of how to utilize ILS.

Moreover, the Logistics Doctrine notes ILS as a policy and recommends it to be used only as a reference principle when working on any topics that related to logistics support. With regards to ILS as a policy there are 7 recommended principles, which are:

- responding to needs,
- simplicity,
- flexibility,
- cost-saving,
- sufficiency,
- continuity,
- safety.

It is interesting to note that, no mention of priority was made. In practice, RTN officers had to make their own judgment by focusing on one principle to the exclusion of all the rest. This was problematic when attempting to respond to overall user-requirements. Therefore, cost-savings may not have been taken into account. This would have been an obstacle for the officer who had to use ILS with possibly unclear or contradictory principles in play.

This uncertainty could also be extended to the Logistics Department who from a practical point of view had the responsibility of directly creating ILS standards that had to be a formal guideline and clear to all participants. In practice, however, the department did not have an authority to command. The department used ILS in their area responsible for maintenance support and repair service instead of integrating and participating in the initial conceptual phase of design to the final stage of discharging the vessel. To formulate ILS into a more efficient practice as found in the U.S. and the U.K, it would require full authority and command, powers the department did not have, and therefore could not exert any influence. The department's experience was in contrast to that of the U.S. and the U.K, where ILS had been directed and applied under the full authority of their Minister of Defense.

D. ILS Elements and the RTN Practices

According to ILS documents issued by the U.S. Ministry of Defense [15] and the ILS documents of the U.K. Ministry of Defense [16], both countries used 10 similar elements, which are:

- maintenance planning,
- manpower and personnel,
- supply support,
- support and test equipment,
- training and training devices,
- technical documentation,
- packaging handling, storage and transportability,
- facilities,
- reliability and maintainability,
- computer resources support.

The UK had added some elements to make ILS more flexible to be adjusted to fit with the future technology and unforeseen costs, such as Disposal & Termination, Configuration Management, Obsolescence Management, and Through Life Finance (TLF). Most of the basic ILS elements of the two countries were similar, based on the four main concepts, which are: Logistics Support Analysis (LSA), Reliability Analysis, Availability Analysis, and Maintainability Analysis. These four main conceptual areas require a coordinated effort of quantitative analysis, involving many personnel from different departments, ranging from the early design phase of the vessel through to the final phase of disposal and hand-over of the vessel. This coordinated analysis process should also be carried out from the very beginning of the conceptual design phase and should be done in a flexible manner, allowing for some changes to occur at each phase. For the RTN, an ILS contractor carried out these tasks. Once the vessel design was finalized, and the acquisition agreement had been signed, the ILS contractor was then able to start gathering all information for the analysis processes. The result of the entire analysis process was then handed to the relevant departments within the RTN according to the agreed date for submission, prior to shipbuilding completion and the project conclusion.

However, regarding the procedure of the contract's conclusion, it is interesting to note that the RTN assigned an ILS contractor to cover all analysis required by the ship building contract to receive all figures relating to analysis post vessel design and selection. This occurred just prior to vessel hand over. Therefore, not all ILS elements were utilized to support the RTN officer in the decision making process during equipment and material selection for the vessel. Moreover, the ILS was not used to influence the design to assist in determining the best choices or alternatives.

The RTN's ILS practices do not seem to follow the ILS procedure, purpose and principles, differing from other countries. As a result, RTN is forced into considering an initial cost rather than looking at LCC for most of their acquisition programs.

V. DISCUSSION AND CONCLUSION

The findings of this study demonstrate that the ILS principles and objective of the RTN were similar to other countries, which was also suggested by Chansongserm [3]. However, the RTN seemed to have differing ILS processes and procedures from ILS standard and principles found in use by the U.S. and the U.K. The reasoning for this could be that the RTN did not use any information to determine the needs of the user's requirement analysis phase. Furthermore, during the Acquisition process the ST and SR did not conduct any analysis to influence design, which could have potentially helped to make appropriate choices and reduce costs. The RTN had had Logistics analysis forms which their contractors had to comply with for the ship building contract. With the analysis being done after the ship design had been selected, the results of analysis could not influence the ship's design. Kawakuchi and Rausan [17] pointed out that if there was no analysis on the LCC, it would be hard to evaluate the effectiveness of the appropriate that had different LCC values. With a lack of an LCC model and working without standard and systematic ILS, showed a weakness, and was problematic for the ILS practices.

The research by Chansongserm [3] suggested that the RTN should use different methods of analysis gathered from different information standards from the U.S. and/or the UK. In fact, the standards used by those two countries allowed the tailoring analyses of different types of projects, however, it was found in this present study that the ILS problems of the RTN more likely resulted from the unclear regulations and procedures set by the RTN. Particularly, all of the analysis had been done by ILS contractor and conducted after the design had been approved. These were the errors that did not follow the ILS principles. Watson [11], Blanchard [13], and Phsusavat [7] pointed out that an analysis should be done at the first phase of designing and before making a choice on the equipment and materials. If no analysis was done, costs would not be reduced and budget management would be a problem. Therefore, in adopting ILS, the RTN should not overlook the important rules of LCC analysis. Without LCC Model, the RTN does not have the main ILS element. As a result, the ILS cannot be used to evaluate all alternatives in the vessel acquisition projects.

The finding of this study concluded that although there were some problems in Acquisition Process and ILS practices of the RTN, these problems seem to be the errors of work process and misunderstanding about ILS principals and objectives. These could be solved by redesigning work processes, rearranging all documents and developing training programs for all involved staff to help them to clearly understand all ILS objectives. With those attempts, there should be some improvements of the Acquisition and ILS practices.

VI. SUGGESTIONS FOR FUTURE RESEARCH

This study involved confidential government information. Sources used have been approved for public release, with unofficial relations of the key participants providing the researcher to clarification of all unclear issues. Therefore, future research may use a different data collection method to achieve a more complete outcome.

The topic for future research should focus on the LCC models by looking the process of acquiring data for LCC analysis and how to use LCC for budget management. The suggested topics could be of interest to other officers involved in the monitoring of budget spending in the public sector.

REFERENCES

[1] Department of Defense. "Integrated Logistics Support Guide". first edition. Fort Belvoir, Virginia, 1986.

[2] Ketsatein, Tula. Capt. The Integration of Munition Readiness**.** Bangkok: The Naval Adjutant General Department., 2003. (in Thai).

[3] Chansongserm**,** Rattachai. Capt. The Integrated Logistics Support to response the Royal Thai Navy Readiness. Nakornpratom: Naval War College. 2007. (In Thai).

[4] Jones, James V. Integrated Logistics Support Handbook second edition. California: McGraw - Hill, 1995.

[5] Pretorious, Peteus Johannas. A Generic Approach to Integrated Logistics Support for Whole-Life Whole-System. Doctor's Thesis: University of Pretoria, 2002.

[6] Luengvilai, Capt**.** Anuwat "Study of Life-Cycle Costing Behavior" Thesis Submitted to the Department of Industrial Engineering, Kasetsart University, 2000.

[7] Phusavat, Kongkitti "Impacts from Logistic Support on Life Cycle Cost Incurred and Committed from Purchasing Decisions", Kasetsart University Publication Index. https://pindex.ku.ac.th/file_research/Paper%201.Pdf. November 14, 2010.

[8] Erzin, Sezai. An Implementation of Integrated Logistics Support for Turkish Armed forces, Master of Science in Management, Naval Postgraduate School, California. 1990.

[9] Slaughter Darrell A. A Case Study of Avenger: Integrated Logistics Support (ILS) of A Non-Developmental Item (NDI). Master's thesis: Naval Postgraduate School, 1994.

[10] Jacobsen, Scott A. Integrated Logistics Support in special operation Aviation - A case study of the MH-60 and MH-47E. Master's Thesis. California: Naval Postgraduate School. 1996.

[11] Watson, Larry James. Integrated Logistics Support in The United States Navy's Shipbuilding Program. Master's thesis: Naval Postgraduate School, 1987.

[12] Sekaran, U. Research Methods for Business: A Skill-Building Approach. 3 edition. Singapore: John Wiley & Sons, 2000.

[13] Blanchard, Benjamin S. Logistics Engineering and Management. Sixth edition. New Jersey: Pearson Prentice Hall, 2003.

[14] Royal Thai Navy, Document Reference number 4001, Logistics Doctrine, Published on the Navy's website. 2000, (last accessed January 21, 2011) http://www.navy.mi.th/oper/pr/ref/4001.pdf.

[15] Department of the Army. Army Regulation 700–127. 2009. Logistics, Integrated Logistics Support Rapid Action Revision (RAR) Issue Date: 29 April 2009: Washington DC, 2009.

[16] Ministry of Defense. Defense Standard 00-600 Issue 1 Publication Date 23 April 2010, Integrated Logistic Support. Requirements for MOD Projects, Defense Equipment and Support UK Defense Standardization, Kentigern House, 65 Brown Street, GLASGOW. 2010.

[17] Kawakuchi and Rausan. "Life Cycle Cost (LCC) analysis in oil and chemical process industries, 1999", Life Cycle Cost (LCC). www.ntnu.no. January 25, 2010.