SRI LANKA MILITARY ACADEMY JOURNAL

Sri Lanka Military Academy Journal

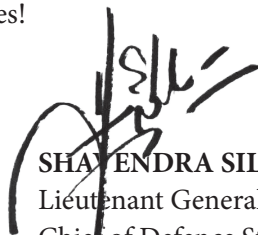# MESSAGE FROM THE CHIEF OF DEFENCE STAFF AND COMMANDER OF THE ARMY

As Chief of Defence Staff and Commander of the Army, I am pleased to pen down this message to the *SLMA Journal - 2020* which is published as the second consecutive volume. The SLMA Journal is a precious collection of research articles with high academic value to both Military Academy and the entire Sri Lanka Army. It is undoubted that this copiously complied SLMA Journal possesses a wealth of new knowledge with its coverage of diverse subject areas in military disciplines.

Research exploration on the military, military knowledge, military technology and areas having links to the military has become a timely requirement as the military spectrum needs to be broadened in the knowledge-based current world. In catering to the need, the prestigious Academy has ventured in publishing the SLMA Journal Volume II with multi-disciplinary research articles from academics serving at universities in Sri Lanka and most importantly from Officers serving at the Sri Lanka Military Academy and other military establishments.

The academics that supervised and guided the articles to their perfection with expert knowledge as reviewers have been able to ensure the quality of the research work and underscore the significant role of military in filling the research gap and sight the renaissance in the military amidst playing a stellar role in fighting the deadly pandemic at the hour of need, so that headway of motherland is ensured.

In conclusion, I convey my warmest congratulations and sincere thanks to the Commandant of the Sri Lanka Military Academy who directs and guides his professional staff to cope with contemporary educational trends. Also, I make this an opportunity to appreciate the knowledge explorers, the authors of the Journal 2020 for volunteering to submit articles, the Editorial Board for meticulously structuring the best articles and more importantly the reviewers for developing first class publish-worthy articles with rich contents in research disciplines.

I wish and hope that this Journal would make its progress over years by nourishing every field linked with military disciplines!

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Lieutenant General
Chief of Defence Staff and Commander of the Army

MESSAGE FROM THE COMMANDANT OF
SRI LANKA MILITARY ACADEMY

I as the Commandant feel extremely happy and proud of adding my message to the SLMA Journal- 2020 which sets an ideal platform for the officer instructors of the Army and other academic scholars in the pursuit of academic caliber and excellence through research. I strongly believe that this dedicated approach towards dissemination of knowledge on the subject areas such as Military Science, Social Sciences and Educational Sciences will be immensely beneficial for the Sri Lanka Army to develop the academic domain, with regards to developing military strategies for future.

Education is considered as a vital tool for social and national development. It has significant role in evaluating the human development of a country. Research is considered to be really effective in the improvement of education and upgrading the education system with the current pace of advancement in other spheres. In this background, educational research plays a key role in improving the quality of education with the various methods and help institutes and nation to improve the efficiency of academic staff. It is a well known fact that there is no organization in the world without any obstacle or challenge, but educational institute can use educational research to overcome those obstacles and perform better in time to come.

As the Commandant, I trust that research is an essential tool in the present education system and it brings immense academic benefits; they help scholars in their personal growth as well as in the development of skills and expose themselves from "unknown to known". Also, researchers learn how to identify a problem and reach either at a possible solution or develop an opinion on a specific field of study. Also, they can develop their analytical skills by analyzing data, learning how to put up questions, focusing complete attention on key issues, creating advanced research papers by organizing their ideas, more importantly to learn at a workable solution that always wanted by military decision making, perceiving different points of view and finally arming them with a wider mindset.

On behalf of the Sri Lanka Military Academy, I extend my heartfelt compliments and sincere thanks to the Editorial Board for their untiring effort to launch the Annual Journal-2020 of the Sri Lanka Military Academy. In conclusion, I extent my warm congratulations and sincere acknowledgment to all the researchers and reviewers of the Journal for their valued accomplishment in sharing the wisdom through SLMA Journal-2020.

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INCLUSION

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EFFECTIVENESS OF THE LAST-MILE DISTRIBUTION OF HUMANITARIAN LOGISTICS DURING FLOOD DISASTERS IN SRI LANKA

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ABSTRACT

This study analyses the effectiveness of the last-mile distribution (LMD) of humanitarian logistics during flood disasters in Sri Lanka. It was found that beneficiaries and humanitarian relief organizations suffer at the last-mile distribution.

The objectives of this study is to analyse the problems of the present practice of last- mile distribution system of humanitarian logistics during flood disasters in Sri Lanka and propose ways to overcome them by recommending an effective model to respond to flood disasters. The study focuses on four flood-prone districts, Batticaloa, Colombo, Kilinochchi, and Rathnapura and the sample comprises of 200 beneficiaries, 100 workforce and interviews of 25 relevant officials. This is a mixed-method study in which primary data collection was done by using two sets of questionnaires given to beneficiaries and workforce and in-depth interviews were conducted with officials. The data was analysed descriptively with the use of SPSS 26. By incorporating the findings to disaster management cycle practiced in Sri Lanka foundation to decisions and steps in last-mile distribution is formed.

The overall finding of the study is that the knowhow on last-mile distribution is ignored in the Sri Lankan context. The researcher recommends that the concept of last-mile distribution should be introduced to the mechanism whilst grouping all the activities under one umbrella so that all stakeholders can deliver their service effectively with proper understanding. With the support of findings and the recommendations the researcher could develop a framework for flood situations in Sri Lanka. Establishment of such a framework would encourage all stakeholders engaged in logistics coordination which affects the effectiveness of Humanitarian Logistics. Further, the researcher suggests to discuss LMD matters arising due to a combination of disasters such as floods with earth slips, disasters in pandemic situations and female contribution in disasters as future research areas.

KEYWORDS: *Disaster Management, Floods, Humanitarian Logistics, Last-Mile Distribution (LMD)*

INTRODUCTION

Most of the disasters are unpredictable and unexpected where they do not provide sufficient time for mitigation (Safeer et al.,2014). Disasters can be divided into various categories and Nick (2008) identifies common characteristics for all types of disasters. A rapid increase in number of disasters is observed throughout the world (Cozzolino, 2012) and in 2018 alone, the whole world suffered US$131.7 billion in economic loss due to 315 natural disaster events with 11,804 deaths, and over 68 million people affected (CRED, 2019). By studying the previous disaster frequency, Thomas and Kopezak (2005) estimated natural disasters together with man-made disasters are supposed to rise fivefold over the next 50 years. The number of disasters and the effects of those in 2018 were not distributed evenly where Asia experienced the highest impact and encompassed 45% of disaster events, 76% of affected people and 80% of deaths (CRED, 2019). As such, Sri Lanka is not an exception. Sri Lankan disaster profile was dominated by terrorism however, in the present-day context by floods, droughts, fire, technological catastrophes, diseases, epidemics and rarely Tsunami etc. In 2016, Sri Lanka was among first 10 countries under the category of top 10 natural disasters in terms of disaster mortality (per 100,000 people) (Debarati et al, 2016). Recorded history of Sri Lanka reveals that it has been affected by a range of disasters and it shows disasters are not new to the world or Sri Lanka (Guruge,2005).

In the recent past, Sri Lanka has been experiencing an increase in natural disasters (DMC 2016). To name a few, annual flood in North and East of the country (Jayawardane,2006), the tsunami in 2004,(Goff at el, 2006) Meeriayabedda earth slip in 2014 (Liyanage, 2015) flood in Colombo and suburb in 2016,(Dias at el, 2018) blast in Kosgma ammunition dump in 2016, collapsing

of Meethotamulla garbage dump in April 2017 (Chathumani at el, 2019) flood in Southern, Sabaragamuwa and Western provinces in year 2017 (Kumarasiri, 2018), and recent drought in North Central province. As Sri Lanka falls under an equatorial climatic region modified by monsoons (Dittus, 1985) most of the time floods mainly impact physical and economic infrastructure, productive activities and social sectors (DMC, 2016). The flood occured in Sri Lanka in 2016 was the eleventh most costliest flood in the region, costing US$ 1.2 billion (Guha-Sapir. et al,2016). Sri Lanka as a developing country faces a huge challenge in coping with these human and financial losses. The hazardous situations become totally disastrous when the capacity to handle them is inadequate. Disaster management reduction of vulnerability could be achieved by upgrading the level of coping skills along with appropriate logistics management of any stakeholder . Dissanayaka and Rupasinghe (2014) argued that the people experienced many natural disasters worldwide and these disasters raised the demand for Humanitarian logistics management in order to reduce sufferings of the victims of a particular disaster. They regarded Last Mile as the most decisive place in humanitarian logistics management since the distribution of relief items to the sufferers took place at that moment. Last mile relief distribution is the final stage of the humanitarian supply chain. It refers to supply of the relief items from the local distribution centres to the victims (Balcik et al, 2008). Actually, what makes humanitarian logistics quite different from its commercial counterpart is 'the last mile' (Fenton, 2012). Beresford and Pettit (2012) conclude organisational and infrastructural shortcomings make weak supply chain which demands a proper last mile distribution management.

The specialty of the floods is that considerably a huge number of individuals get affected and the difficulty in providing

humanitarian assistance (Espindola, Albores and Brewster, 2018). When the Sri Lankan experiences are considered, the LMD in a disaster situation is often problematic. Since there is no any proper LMD mechanism, many parties including the public sector, the private sector, the media, individuals, etc., are involved in the distribution of relief items without any control. This phase is not properly managed, there by createing a significant gap between the demand of victims and the supply of various parties. Therefore, it is a tragedy that victims suffer from the consequences of the inappropriate LMD system in Sri Lanka during flood disasters. Hence, it is vital to identify the present practice of LMD cum problems of it with the solutions to overcome such issues.

LITERATURE REVIEW

Although Tschoegl et al (2006) identifies absence of conventional definition for disaster, United Nation International Strategy for Disaster Reduction (UNISDR) defines it as "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses, which exceeds the ability of the affected community or society to cope by using its own resources." (ICRC enhanced with characteristics of suddenness and calamitous of event to the above definition). In that, flood is defined by the Disaster Information Management System in Sri Lanka as "Water that overflows rivers or streams and runs slowly or quickly on small or large areas" (www.desinventar.lk). Whilst Nick (2008) identifies managing these disasters is an applied science United Nations defined it as "the organization, planning and application of measures preparing for, responding to and recovering from disasters", which is not to stop or eliminate the threats completely.

Humanitarian Logistics as mainly a supply chain discipline (Tabaklar. et al,2015), Thomas (2004) identifies it as "the process of

planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people", where Thomas and Izushima (2005) the 'vulnerable people' with 'beneficiaries'. As such both victims and beneficiaries are used for vulnerable people throughout this research alternatively. Last Mile Distribution (LMD) is the ultimate stage of the humanitarian logistics chain; it describes the delivery of relief aid from local distribution centres (LDCs) to the beneficiaries affected due to disasters (Balcik et al. 2008). Roy, Albores, and Brewster,(2012) have developed a working definition for the LMD and they conclude as "LMD is the ultimate stage of disaster relief operation, which is associated with delivery of relief supplies from field warehouse to the disaster affected people through the integration of facility location, inventory management, transportation management and distribution decisions, while taking into account the key factors affecting it." Lim et al (2015) defines Last mile logistics as the final stretch of a business to consumer (B2C) parcel, as a working definition.

Disaster Management Cycle is a process which aims to minimize/or avoid the possible losses from hazards or respond to them with proper assistance to fatalities of disaster; ultimately to achieve speedy and effective recovery (Warfield, 2008). Though it encompasses different phases, the key factor in any of the framework is interlinked activities which do not characterised with a series of events which start and stop with each disaster incident (Nick, 2008). Though, there are many differences and the amplification to the cycle, the most common and the Ministry of Disaster Management of Sri Lanka accepted version is the 4-phase disaster cycle that includes preparedness, response, recovery and mitigation (DMC, 2016).

However, Siriwardanaa, Jayasiri and Hettiarachchi (2017) conclude that existing framework in Sri Lanka on disaster management has failed to manage previous disaster occurrences to the expected standard. They further highlight only few alignments were observed with global standards and multi-stakeholder approach of Sri Lanka National Disaster Management Policy (SLNDMP) conform the global standards. Presently Sendai framework of United Nations' initiative on Disaster Management (UNISDR, 2015) is the intended standard which built on Hyogo Framework for Action (HFA) 2005-2015. Asian Development Bank (ADB) has developed two Disaster Management Cycles; a basic format and an alternative one as the basic cycle is superimposed with activities taken place in the field to develop the alternative cycle. However, in support of handling disasters, separate entity called National Disaster Relief Service Centre (NDRSC) to handle the logistics matters was brought under the Ministry of Disaster Management from 30 April 2010 with the gazette notification No 1651/20.

Different frameworks were developed by different scholars in relation to humanitarian logistics (Kovacs and Spens, 2009; Jahre et al., 2009; Ertem et al., 2010; Overstreet et al., 2011). Caunhye et al (2012) note that, emergency operations in logistics include facility locations, relief distribution, casualty transportation, stock pre-positioning and riddance among many others. Generally, governments, civil society, military, and humanitarian organizations are in charge for carrying out such emergency relief operations. (Safeer et al., 2014). Kunz and Reiner (2012) in their framework discuss how the Government, Socio-economic, infrastructure and environmental situational factors, affect humanitarian logistics. With the introduction of LMD, different academics have come out with different theories and models for LMD. It is described the LMD of emergency logistics is the most exigent of the relief supply

network rudiments, and to overcome the impact of destroyed communications network and physical infrastructure (roads and bridges, for example) it is really required the capable bold decision makers.(Tatham et al., 2017;Nayak et al., 2018; Challa et al., 2018; Lieu et al., 2019).

Roy, Albores, and Brewster (2012) have developed a Last mile relief distribution logistics framework which comprises decisions on facility location, inventory, transportation and distribution are the core for success of LMD. Apart from these logistical decisions, decisions on funding, coordination, assessment on needs, information and communication, cultural food habits, cultural dresses etc., also recognized as factors for effective last mile relief distribution.

LMD planning during a disaster relief operation is an intrinsically multi-criteria problem (Ferrer et al., 2018). Maghfiroh and Hanaoka (2018) recognise system description; demand characterization: demand location; vehicles; route network availability; information and decision support; planning horizon goals as the factors of LMD. According to Prado et al (2015) despite the effectiveness of systems implemented at the headquarters, the delivery of supplies and services at the BoP (Base of the Pyramid) would not be completed without human resources. Hence, Human resource becomes a major component of LMD. Apart from this, Economist Intelligence Unit (2005) came out with few fundamentals in LMD; getting the right type of donations, gaining access, distributing supplies and collecting people, and private-sector involvement / what logistics providers can do. Balcik et al (2008) emphasise four main problems in LMD as; supplies have to be carried out speedily in an atmosphere with destabilized infrastructure; restrictions related to transportation resources and urgent supplies; lack of synchronization among relief actors; insufficient information about demand and need for help. Murray (2005)

notes that lack of co-ordination regularly leads to confusion at the last mile.

Globally in commercial sector, last mile logistics has been distinguished as the most time taking and costly stage of the delivery procedure (Bopage, Nanayakkara and Vidanagamachchi, 2019). They further illustrate that performing LMD is the most crucial factor of the retailer customer relationship, as the reordering decisions of the customer depends on it. Gevaers et al (2014) in their investigations present three sorts of LMD structures as push driven, pull centric and hybrid where they implied separately stock 'sent' to customer homes by somebody other than the client; stock 'brought' from the manufacture or the producer by the client; stock 'sent' to some middle of the road site from which the product is 'fetched' by the client.

In Sri Lankan context, the expectation of stakeholders, as Siriwardana et al., (2017) comment the DMC and the disaster management structure was under extreme criticism from people. Hence, a researchable area is recognized. Although the scholars from every corner of the world have done researches on humanitarian logistics related issues, most of the researches on LMD are based on different cases and conclude with case specific solutions. Further, the LMD which these scholars have touched upon is more technical and more internationalised. Therefore, it is important to study the LMD practices in Sri Lanka based on areas that are highly prone to floods; Batticaloa Colombo, Kilinochchi and Ratnapura. As such this research will be able to identify areas to be improved in LMD practices in Sri Lanka. This research gap has been identified by Dissanayaka and Rupasinghe (2014) too who emphasised the requirement of conducting studies on flood related LMD as future research area by stating "there is a raising demand for conducting researches in order to address last mile humanitarian logistics management process especially considering the natural flood situations."

METHODOLOGY

This research is predominantly based on different group of informants; data collection and analysis has been adapted by using the mixed method; both quantitative and qualitative data. As the researcher pursued the research without targeting a practical outcome the categorisation of this research can be developed as mission oriented basic research which can be an applied research in the future (Abesekara, 2019). Further, primary sources such as interviews took the features of qualitative approach whilst the survey on beneficiary requirements and workforce experiences gave the appearance of inferential approach, which is a sub section of quantitative approach to the research.

Flooding situations in four different districts in the country were used to collect data. Structured Interviews were carried out with the focus group of individuals and questionnaires were given to beneficiaries and to the workforce to gain primary data. The sample size of this investigation as portrayed has been limited to 50 affected families from each district and number of 25 workforce from each district, altogether 200 families and 100 workforce to distribute the questionnaire. Interviews covered the 100 percent sample population and as they are the key figures in the whole process, they were provided with open ended questions covering components of last mile distribution. Since they represent four flood prone districts in different geographical locations of the country the data was gathered through interviews with the decision-making body of the system. Therefore, the results can be considered as unbiased and generalized.

As LMD refers to delivery of relief supplies from local distribution centres (LDCs) to beneficiaries affected by disasters, it can be taken as a relationship of supply and demand which connects through. For accurate discussion the following model has been developed based on the mind mapping and it attempts to cover the areas to be discussed der the resrarch questions of the study.
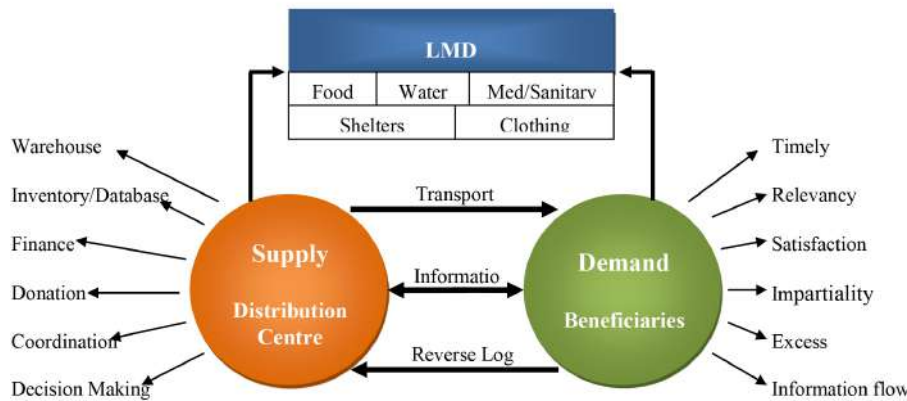
Figure 1 - Conceptual Framework
(Source: Constructed by Researcher)

RESULTS AND DISCUSSION

The methods of descriptive and correlation analysis along with inferential analysis (Kothari, 1990) were used to analyse the data. SPSS 26 software was used to compute and analyse the data. Intentionally the profile of the sample; both beneficiaries and workforce, is analysed and subsequently the responses are scrutinized with the outcome of interviews. Similarities as well as the contradictions with secondary data have also been discussed then and there. Flow of the analysis is organised to identify the problematic areas in LMD by studying deep into nitty-gritty of neutral and negative response whilst appreciating the positive responses. With five point scales, the intervals for breaking the range in measuring each item are calculated as $(5 – 1)/5 = 0.8$ where, they fall into strongly agreed (4.2-5), agreed (3.4-4.19), neither agreed nor disagreed (2.6-3.30), disagreed (1.8-2.59) and strongly disagreed (1-1.79).

Table 1: Satisfaction District wise – Beneficiaries and Workforce

		Beneficiaries			Workforce			
		Batticaloa	Colombo	Kilinochchi	Ratnapura	Batticaloa	Colombo	Kilinochchi	Ratnapura
N	Valid	50	50	50	50	25	25	25	25
	Missing	0	0	0	0	0	0	0	0
Mean		3.6522	3.5356	3.4573	2.3751	2.6802	2.4688	2.5409	2.7446
Median		3.7236	3.4139	3.5528	2.1528	2.6917	2.4333	2.5139	2.7111
Std. Deviation		.68083	.77889	.75730	.87637	.16567	.25927	.15039	.18300
Skewness		-.221	.286	-.210	.506	-.252	.430	-.114	.574
Std. Error of Skewness		.337	.337	.337	.337	.464	.464	.464	.464
Minimum		2.22	1.82	2.22	1.00	2.36	2.07	2.19	2.46
Maximum		4.80	5.00	5.00	4.36	3.03	3.06	2.78	3.16

As the skewness is negative (-0.221) and the mean is more than 3.39 (3.6522) the results in Batticaloa district beneficiaries shows a satisfaction in supply for their demand where distribution of the survey is more towards the right. However, the satisfaction over the supply by the workforce as shown in the table (2.6802 > 2.6) gives a neutral. In Colombo district, as the mean is more than 3.39 (3.5356) the results of beneficiaries show a satisfaction in supply for their demand, yet workforce satisfaction remains in the range of disagreed states where the mean is 2.4688 (< 2.6). In Kilinochchi district whilst the work force view on supply remains disagree (2.54 < 2.6) as in other districts, beneficiaries show satisfaction in supply for their demand as skewness is negative (-.210) and the mean is more than 3.39 (3.4573). As far as Ratnapura district is concerned, as the mean is less than 2.6 (2.3751) it indicates a disagree status on supply for their demand. The positive skewness signifies a leftward distribution. The view of the workforce population also falls in between the neutral range (2.59 < 2.7446 >3.4)

Table 2: Beneficiary Satisfaction District wise; Dimensions

Dimensions	Mean values			
	Batticaloa	Colombo	Kilinochchi	Ratnapura
Timely Distribution	3.6750	3.3950	4.12500	2.1550
Relevance to the Requirement	3.6600	3.7667	2.9667	2.3667
Beneficiary Satisfaction	3.6440	3.5160	3.3360	2.5400
Impartiality in relief distribution	3.6360	3.7160	3.5880	2.3640
Excess of Donations	3.4750	3.6300	2.4650	2.3650
Information flow	3.6633	3.1900	4.2633	2.4600

Beneficiary satisfaction of Batticaloa District indicates satisfaction over all dimensions where the mean is recorded above 3.39 and DMC district coordinator emphasised the affected community was mainly the Tamils and Muslims who are very poor and flood is not a new phenomenon to them. The poverty itself drives them to accept and satisfy with the relief supply they were provided with. However, it was revealed that they used to show their displeasure on the system in front of the media and politicians in power. In Colombo district information flow alone falls on to the range of neutral (2.6 < 3.19 < 3.39). Statistics in Kilinochchi districts demonstrate slightly different results from other districts. The mean of dimension 'Excess of donation' falls below 2.6 (> 2.465) with 'Relevancy of the relief items to the requirement' with the mean of 2.9667 and 'beneficiary satisfaction' with the mean of 3.3360 positioned in the range of neutral states. All the dimensions in Ratnapura district show disagreement, with uneven data distribution.

Interview results justify the statistic results above and as affected community was with very poor and flood is not a new phenomenon to them. The poverty itself drives them to accept and satisfy with the relief supply they are provided with. However, it was revealed that they used to show their displeasure on the system in front of the media and politicians. Attitudes of the beneficiaries highlighted by one of the interviewees in Kilinochchi. Where predominantly Tamils line as a practice, during flood disasters they collect whatever item they receive, which is an outcome of environmental situational factors of Kunz and Reiner's (2012) framework on Humanitarian logistics. It reveals that lack of human and material resources to handle the logistics process in Ratnapura district makes the different results. It was observed that military involvement in Ratnapura district was not as so heavy as in Batticaloa, Colombo and Kilinochchi which led to lesser Human and Material resources.

Table 3 - Summary of Satisfaction District wise; Dimensions - Workforce

Summary of Satisfaction District wise; Dimensions – Workforce				
	Batticaloa	Colombo	Kilinochchi	Ratnapura
Warehousing	Disagree	Disagree	Strongly Disagree	Disagree
Inventory/Database	Strongly disagree	Strongly disagree	Strongly disagree	Strongly disagree
Financing	Neutral	Disagree	Neutral	Neutral
Donation	Neutral	Neutral	Agree	Agree
Coordination	Agree	Neutral	Agree	Agree
Decision Making	Disagree	Disagree	Neutral	Neutral

As summarized in the above Table based on collected data, the response on warehousing and the inventory/database is not satisfactory in all four districts. Financing and the decision making give mixed response again in the range of neutral and disagree. Response on donations and the coordination fall within the range of neutral and agree. As this is the response of the workforce who activate the Humanitarian logistic mechanism, within that LMD, each dimension is grilled separately.

According to disagreement on warehousing it is found that establishment, functioning, issuing and reception of goods, suitability, timings of issuing and the availability of skilled store-men were not in the expected standard. Results of the interviews expose that except the NGOs like ICRC, DMC rarely maintains a warehouse or they lack required stores and those were established on the requirement or depend on co-operative shops/ private donors.

Disagreement on inventory and database related matter is strong. These responses show lapses in databases and inventory. Furthermore, it indicates dissatisfaction on maintenance of database, effectiveness of it, tracking facility of vehicles, and identifying the obsolete items. Again, it was found that ICRC maintains a proper inventory during the interviews, but not the other stakeholders. Military maintains their own warehouses, however those are small stores with their own inventory systems and those are not aimed at disasters.

View on financing and decision making is floating between disagree and neutral positions. Deputy Director and Media spokesman of DMC during the interview, quoting an incident occurred in Batticaloa where the request from the officials on ground highly exceeding the actual requirement. Finally, it was revealed that they have done it because the allocation was not sufficient to provide relief items for the beneficiaries.

The respondents have disagreed with the ongoing decision-making mechanism. It highlights the absence of separate desk for logistics decisions; trained logisticians; effectiveness, timeliness and ground information on decision making in LMD; and selection of distribution centres. Interview results show that absence of provisions to enforce local emergency situation has created unfavourable effects on whole humanitarian logistic process due to delay in decision making as well as financial allocations. It highlighted the requirement of legal backing to enhance the effectiveness of humanitarian logistics in disasters. Working definition on LMD includes decision on distribution as a vital component in LMD without which the whole process is jeopardised.

Although, the majority of the respondents numerically have given positive answers on which they are satisfied on components such as condition, quality, receiving timing, distribution time and the duplication of items. The interviews with officials reveal certain donations are not relevant and not suitable for local usage. Quoting a donation from a foreign country an official from Colombo discloses the received donations are of no use where they don't suit to the area and those will only create another environmental issues in the future.

It is apparent that the majority of the respondents have a positive response regarding the coordination. There, the components such as coordination among stakeholders, information sharing, coordinated reverse logistics, caring of relief teams, and coordination mechanism are appreciated. Transportation issues were not highlighted as the beneficiaries were taken to safety centres which are normally located on communication lines except in Ratnapura.

FINDINGS AND RECOMMENDATIONS

a. **Facility Location**. In the Sri Lankan context the facility locations can be divided into two; warehouse facility and safety centres. Safety centre is for the beneficiaries and the warehouse facility for the officials to handle all the donations/stores. Non availability of proper warehouse facilities disclosed. Going by the existing system, two facilities as facility centre for officials/warehousing and safety centre for beneficiaries are recommended. Apart from that the local authority/corporative shop/private supplier need to be identified in between. Safety centre can be facilitated with DMC warehouse with skilled logistician or if not local supplier can be entrusted with warehousing also as an outsourcing option.

b. **Safety Centres and Collecting Victims**. Although, most of the people report to pre-designated safety centres small percentage needs some rescue effort which is normally carried out by the military as they are one of the first respondents. Stakeholder capabilities and knowhow need to be improved for effective rescue or in other words "collecting" component of LMD. Sanitary facilities such as toilets, and other facilities must be looked into and the government expenditure must be used to gain maximum output. Safety centres need to be staffed with skilled logisticians as the present staff is not so competent on logistics matters.

c. **Information Flow and Decision Making**. As information and decision making are a major components in LMD, it is found that decision on logistics require sequencing and a professional approach. Further, they should be on real time ground information. Decision making bodies are not empowered to make decision; and information sharing among the stakeholders need improvement in certain areas. All available sources must be used for proper information gathering and sharing to enhance the coordination as well as to make

correct decision. Decision making bodies need to be located in the facility/safety centres/ local facilities and subject areas of transportation/ information / training.

d. **Warehousing and Inventory Management**. Since there no proper warehouses are functioned it is observed that they don't practice a proper inventory system and transparency is unsatisfactory. Especially they are not handled by experts on the subject, sometimes by raw laymen. Hence, a proper inventory management system is required with experts on the subject. Especially with the donations/ government funding maintain transparency is a must. Outsourcing option is available for warehousing and the inventory management.

e. **Coordination**. Coordination among stakeholders found satisfactory in Kilinochchi and Baticaloa whilst Ratnapura and Colombo need to be improved. Collective training and the recognition of stakeholders' capabilities are not properly assessed. To maintain amicable corporation and collaboration among the officials from ground level to top most in order to familiarize themselves with all types of stakeholders in their communities. Examine the possibility of use of unaffected closest administrative entity to handle the logistics at the last mile as well as up to a certain stage at the recovery stage would be another solution as practiced in China. New standard operating procedures (SOP) are to be developed and joint training with all disaster related stakeholders and civil administration should be organized.

f. **Transportation**. According to interview results, transportation seems to be satisfactory, however, they don't practice proper scheduling, route planning, tracking and the DMC do not possess vehicle fleet as they depend on stakeholders' resources. Most of the transportations are carried out by the stakeholders like military. However, it would

be perfect to have a designed network of roads covering the required nodes for transportation of relief items, distribution and casualty evacuation in order to reduce the disaster risk which will come in handy. This can be organized in district level. As such transportation requires a well-defined mechanism.

g. **Training**. There is no proper knowledge on LMD despite the experience which the workforce and the officials have in the field; and there is no weight given to it in Sri Lankan context. As a whole, most of them are volunteers, who are working in other fields. As such, findings discussed under each activity link to lack of awareness on LMD. Hence, national level mechanism, based on knowledge should be implemented in order to enhance capacity of logistic partners involving in flood disasters to support humanitarian backup. It must contain recruiting, training, accreditation and continues development of programmes along with a close monitoring process by integrating all operators including the community representatives. This will enhance the leadership in different levels thereby it will facilitate decision making process.

h. **Donation**. Although the Donation makes a positive remark as per the decision makers, there is room to improve. Especially factors like getting the right type of donations, to the right place in right quantity are vital. When involvement of the private donors, especially the media channels who possess the organising capacity to collect donations are identified a tendency of eluding from the responsibility of logistics supply by the DMC. As such, DMC need to take the full control over the donations and need to be coordinated them with proper understanding whilst accommodating the donors' ambition as well.

i. **Distribution of Supply**. Beneficiary satisfaction indicates the distribution is intact, where it is purely the effort of the stakeholders, volunteers and the transportation with proper prioritising of components of LMD such as demand locations whilst identifying the demand characteristics. Therefore, based on previous records, a scale of commodities to handle flood disaster for a period must be recognized and predicted with the modern techniques of demand and forecasting. If possible, these commodities could be prepositioned or suppliers can be pre-identified in order to reduce the lead time, or is to forecast the financial requirement and without spending money on warehousing and inventory management resort for outsourcing to acquire commodities from the local government cooperative shops/private suppliers etc.

j. **Procurement**. Providing financial assistance through government agents and divisional secretaries to Garama Niladari is a positive approach provided the money is used effectively without corruptions. Government financial assistance is not sufficient to procure the basic requirement for the beneficiaries. It is recommended that any disaster situation must be handled with centralized control of the incident whilst the local authorities are to be nominated by the head of the national council without any delay for them to make decisions at their respective fields. Legal provisions to be developed to empower the government agents and appropriate authority to make decisions and must make necessary changes to financial regulations.

CONCLUSION

Humanitarian logistics during the stages of disaster and post disaster, is a vital component as the communities affected by disaster are at a high risk at these stages. Whilst the poorest are frequently and most noticeably influenced and endure the most hardships,

analysis of the LMD in flood disasters in Sri Lanka provide clues and directions to improve the humanitarian logistics of disaster management mechanism that increases the effectiveness.

Based on the outcome of the quantitative analysis, supported with qualitative data, the subject area was examined in depth to identify the areas to be developed/ changed and recommendations were made to rectify/ improve such areas.

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DERIVATION OF A MILITARY MODEL FOR EDUCATION THROUGH THE PRINCIPLES OF WAR; WITH SPECIAL REFERENCE TO UK ARMY DOCTRINE

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ABSTRACT

Most of military organizations worldwide pursue a set of guiding principles or ideas known as the Principles of War in successful conduct of war and study of wars. In the field of education, learning theories provide essential guidelines to promote education and to achieve success in learning. The study focuses on investigating how the principles of war can be incorporated and correlated with varied educational theories/concepts even if they are expensively used to address two different fields. Hence, the study aimed to derive a new educational theory to education domain in military perspectives, thereby creating new knowledge, meaning and the ability to practically apply this military model. This pure research is defined as an exploratory conceptual study. The findings of the study revealed that military tenets such as Selection and Pursue of Aim, Offensive Action, Surprise, Cooperation, Morale, Flexibility and Concentration of Force are strongly interconnected with Selection and Pursue of Educational Aim, Teacher's Initiative, Surprise, Collaborative Learning, Motivation, Freedom of Action, Flexibility and School Administration. Meanwhile, the other principles such as Economy of Effort, Sustainment and Concentration of Force individually have considerable impacts on the concept of School Administration, whereas they all together cause a great impact on School Administration. Thus, a new educational model is proposed to the field of education as "Military Model for Education". This model as analysed in military perspectives becomes so significant to educational domain as its practical application in educational endeavours would produce results at goals attainment.

KEYWORDS: *Educational Domain, Educational Theories, Military Domain, Principle Of War*

INTRODUCTION

For centuries, many military organizations adhere to a set of guiding principles or ideas in the conduct and study of war. These guiding principles were later introduced as the Principles of War. Though there has never been universal agreement on one common list of principles, most nations have their

own list of principles, based on their military culture, experience and heritage (Mallick, 2009) The principles of war when applied appropriately, would lead to success in military campaigns. These principles are not obtuse ideas, but simple and logical tenets that should guide the conduct of all military campaigns. History provides numerous examples of failed campaigns which, when analysed, indicate that the failure stemmed from non-adherence to the basic principles of war (Kainikara, 2011). Even though accelerating technological change will introduce new methods of application at a rapid rate, the principles of war–remaining focused on the desired effects–should not vary in a significant degree. They can, thereby, continue to act as guideposts for strategists (The Principles Of War In The 21st Century, 1995). The Principles of War provide comprehensive considerations at all levels for planning and executing campaigns and operations. They are not absolute or prescriptive, but provide a foundation for adversary-focused military activity and doctrine (British Army Doctrine Publication, 2017).

Learning is a basic biological capacity which is far more developed within humans than within any other living being (Illeris, 2018). When over-viewing Learning Theory, Halpern and Donaghey (2020) explain that learning is a basic psychological process, and investigations of the principles and mechanisms of learning have been the subject of research and debate. Learning theories are an organized set of principles which explain how individuals acquire, retain, and recall knowledge. By studying and knowing the different learning theories we better understand how learning occurs. Also, the principles of the theories act as guidelines to help select instructional tools, techniques and strategies that promote learning and education (Kelly, 2012). Goel' (2017) article on "Why We Need Learning Theories" further this idea; Theories provide a basis to understand how people learn and they explain, describe,

analyze and predict learning. Therefore, a theory helps in making more informed decisions around the design, development and delivery of learning. Different learning theories such as behaviourism (positive and negative reinforcements are effective tools of learning and behavior modification), cognitivism (a child develops cognitive pathways in understanding and physical response to experiences) , constructivism (people are responsible in creating their own understanding of the world based on previous experiences), connectivism (it is based upon the idea that people process information by forming connections.), Humanism (learning is a natural process that helps a person reach self-actualization) etc (Education Degree, 2020) give deep insights and critical thinking to learning and education.

In military domain, armed forces of the world have introduced a set of guiding principles or ideas in the conduct and study of war in terms of the principles of war. When they are applied appropriately, it leads to success in military campaigns. So the study has incorporated master principles of war used by UK army in particular and the war principles used by US and Indian Armies. In education domain, varied learning theories function as guidelines to formulate instructional tools, techniques and strategies to promote learning and education, thereby achieving educational success. The study centers the educational theories such as teaching methods and strategies, Innovative learning and teaching, school resource management and administration, motivation, classroom management theories, collaborative learning etc. However, it was found that there have not been adequate research studies done in application of the principles of the two domains together to build up any educational theory and to discuss the potential of military principles to widespread its theoretical limit while broadening the spectrum of education in military perspectives. In this context, the study aimed at identifying the correlation

between the principles of war and educational theories/concepts, analyzing the intensity of the relationship in order to propose a military model to the field of Education.

LITERATURE REVIEW

The Principles of War are highly applied at all levels for planning and executing military campaigns and operations (Army Doctrine Publication, 2017). They are Selection and maintenance of the aim, Off¬ensive action, Surprise, Economy of e¬ffort, Cooperation, Maintenance of morale, Security, Concentration of force, Flexibility and Sustainability (UK Defence Doctrine, 2014). As per the US military doctrine, nine military principles are introduced; Objective, Initiative, Unity of Effort, Focus, Economy of Effort, Orchestration, Clarity, Surprise and Security. Meanwhile, the Indian Armed Force relies on twelve war principles (Joint Doctrine of the Indian Armed Force, 2007). Selection and Maintenance of Aim, Maintenance of Morale, Offensive Action, Surprise, Concentration of Force, Economy of Effort, Security, Flexibility, Cooperation, Simplicity, Administration and Intelligence.

The study also focuses on a wide range of literature related to educational concepts; learning theories such as Behaviorism, Cognitivism, Experiential Learning; Humanism; Pedagogy, Andragogy, Pragmatism, Sensory Theory etc, Classroom Management Theories, Innovative teaching and learning methods, Collaborative Learning, Adult Learning Theory (Andragogy) , intrinsic and extrinsic motivation , Roger's Humanistic Approach, Maslow's Hierarchy of Needs Theory, Kohn's Student Centered and Facilitative Learning Model, flexibility in teaching, School Administration, Coordination and synchronization of educational processes and so on.

When reviewing the past empirical studies related to use of Principles of war in varied fields, it was revealed that there have been a considerable number of studies launched in the field of business, human resource management. However, the application of those principles in the field of education has not been taken into consideration. Albright & Kleiner's (1993) study on 'The Principles of War Applied too Business' discussed how these prolonged military principles applied in warfare aid business executives to adapt them in today's competitive business world. Bhatia's (n.d) article on '7 Military Principles You Should Apply to Your Business Strategy' explains how seven master principles in war such as Objective, Offensive, Mass, Maneuver, Surprise, Security, Simplicity can be applied in field of business. Further, Ahmed (2011) researched on application of nine war in business world through his study titled 'Principles of Business War'. Selection and maintenance of aim, Maintenance of morale, Offensive action, Concentration of force, Economy of effort, Security, Surprise, Flexibility, Cooperation are major principles on which the study thoroughly focuses. Kearney, and Marks (2017) through their study on Leadership and the Principles of War Applied to Business: Two Sides of the same Coin highlighted how the Nine Principles of war; Objective, Offensive, Mass, Economy of Force, Maneuver, Unity of Command, Security, Surprise and Simplicity can be applied to build business leadership influencing a team by providing purpose, direction and motivation. In this context, a research gap is created to research on the application of principles of war in education. Significantly, a crosswalk of each principle of war to education is likely to produce a very successful and effective educational model in a military outlook in widen the scope of military as well as education.

METHODOLOGY

This study can be categorized as a pure research as it centers creating scientific knowledge to the field of education. The study tries to explore a new education model with the application of the principles of war widely used by many military forces in the world in association with the existing educational theories, thus the study is defined as an exploratory conceptual investigation.

The study is mainly based on the secondary data sources. On one hand, it has mainly incorporated military doctrines of UK, US and India armies in search of key military principles. However, the principles of war practiced by the UK army have formed the main stem to the study. On the other hand, education theories and concepts such as behaviourism, cognitivism, constructivism, connectivism, humanism, the existing teaching and learning strategies, classroom management approaches, school resource management, administration, etc have been thoroughly reviewed in search of literature.

The data of the study has been analyzed using Qualitative Content Analysis. First, the study identified and interpreted the definitions of the principles of war with a special reference to UK army doctrine. Then the study viewed the effectiveness and the relationship between the military principles and the existing educational theories/ concepts in relation to the. used by compared and interpreted the definitions of the principles of war used by UK, US and Indian armies Hence, the study finally set its pathway ahead to derive a military model to Education.

RESULTS AND DISCUSSION

Selection and Pursue of the Aim (Selection and Pursue of the Educational Aim: Selection and maintenance of the aim is regarded as one of the master principles of war.

It implies that the key to any successful military operations is need of a single, unambiguous aim and to maintain it throughout the operation (UK Defence Doctrine, 2014). The aim must be clear, achievable within available resources and also it should be articulated unambiguously among all components of the force. So, they are aware of the aim and then all their efforts can be directed towards its achievement (Kainikara,2011). Further, success of any operation is dependent on the focus on pursue of the clearly defined aim with the national interest(s) (Johnsen, Johnson, Kievit, Lovelace & Metz, 1995).

The aim of education implies a conscious attempt. Education cannot be conceived without any purpose. Instead, it has to be a purposeful activity which has definite aims and objectives to modify the behaviour of an individual with a specific end in view. They provide general direction to the educational process. It is only by fixing the aims of education curriculum, methods and devices are devised and harness them for attainment of desired goals (Education, Society and Curriculum, n.d.). School Administration Guide (2019/20) explains that schools have to ensure that the school curriculum is aligned with the goals. Learning demands active participation of the learner which is one of the key learning principles for effective education. The learning process is strengthened and people learn more quickly by retaining things longer when they are engaged in the process with more senses (Iedunote, 2017). Articulating goals and objectives within the students is valuable in clarifying what they are trying to accomplish and in framing the activities undertaken to achieve them. If the goals are more clear for learning students, which provides a much better framework for curricular planning and course designing (Swarthmore College, 2020). Therefore, it is clearly underlined here that the Selection and pursue of the aim introduced by military has a strong interconnect with the

aspects of clearly defined aim, articulation of the aim within the learner and pursue of its accomplishment in education.

a. **Offensive Action (Teacher's Initiative)**. In military, Offensive Action is the practical way in which the commander seeks to gain, retain and exploit his initiative (Johnsen, Johnson II, Kievit, Lovelace & Metz, 1995). In operational context, he must act to the adversity rather than reacting. For that, he analyzes the context of operations, time, place, scope and tempo (UK Defence Doctrine 2014: Kainikara, 2011). Seizing, retaining and exploiting the initiative will allow a force to impose will on the enemy, to make him react to own force actions. Initiative includes such actions as diplomatic measures at the strategic level, information operations, psychological operations or computer network attacks at the operational and tactical levels (Mallick,2009).

The principle of Offensive Action shows a direct relation with teacher's initiative in using appropriate methods and strategies because teachers as commanders have to cope with teaching. In this endeavour, there are different theories that explain how people learn and teaching must be shaped up practically; Behaviorism; learning is shaped through positive or negative reinforcement (Skinner,1974), Cognitivism ; new knowledge is built upon prior knowledge and learners need active participation in order to learn, Constructivism; the learner brings past experiences and cultural factors to a current situation and each person has a different interpretation and construction of the knowledge process, Experiential Learning; the learner experiencing things for themselves and learning from them (Kolb, 1984), Humanism; learning is seen as a personal act to fulfill potential (Rogers,1983), Pedagogy; the teacher directs all the learning and Andragogy ; the art and science of helping adults learn (Knowles, Holten III, and Swanson,2005), Pragmatism; facilitating learning through

promoting various activities rather than by using a traditional teacher-focused method, Sensory Theory; learning occurs when the senses of sight, hearing, touch, smell and taste are stimulated (Laird,1985) etc are some of the teaching methods that guide teachers to execute their responsibilities effectively at tactical level in teaching and learning process. Further, control of any unaccepted behavior of students (adversity in military) is another major consideration in teaching. Effective classroom management always results in a smooth-running classroom. With the support of classroom management approaches such as B.F. Skinner's Behaviorism, Glasser's Choice Theory, Kohn's Student-Directed Learning, Canter's Theory of Assertive Discipline etc, teachers can maintain a disciplined class (Groepl, n.d). Therefore, it is obvious that at the stage of teaching and classroom management, teachers must seize, retain and exploit their initiative. When correlated the military principle of offensive action in education domain, they show a strong and significant relationship.

b. **Surprise**. Surprise is referred to the consequence of confusion induced deliberately or incidentally (UK Defence Doctrine, 2014) on enemy. The contributory factors for surprise are speed, effective intelligence, deception and application of unexpected combat powe, security, use of terrain, operational security, variation in tactics and methods of operations, information superiority etc (Mallick, 2009). Surprise can be achieved in two means by attacking the adversary at a time and place where their security level and awareness are at their lowest, thereby creating an advantageous position for own force. Surprise can also be achieved by initiating actions that are not expected by the enemy (Kainikara, 2011).

The biggest challenge for any teacher is capturing the students' attention and impart knowledge in an impressive manner. For this to happen, more effective innovative teaching

learning methods should be implemented. Creativity and novelty of the teacher changes the style and method of teaching. All over the world, educational institutions implement new ideas, methods, technology based innovations to enhance the students' knowledge (Kalyani & Rajasekaran, 2018). Innovative teaching is necessary for the present and future of education to help students reach their full potential Ferrari, Cachia, & Punie, (2009). The teaching methods and strategies are to be adopted by diplomatically analysing the learner, the periodical changes of strategies, contexts with teachers' expertise and experiences. Kalyani & Rajasekaran's study on Innovative Teaching and Learning (2018) introduces ten innovative teaching methods; 1) Love What You Do, 2) Audio & Video Tools, 3) Brainstorm, 4) Classes outside the Classroom, 5) Role Play, 6)Welcome New Ideas, 7) Puzzles and Games, 8) Incidental Learning, 9) Refer Books on Creativity 10) Introduce Lessons like a Story and five innovative Learning Methods; 1) Crossover Learning, 2) Learning through Argumentation, 3) Incidental Learning, 4) Learning by Doing Science and 5) Embodied Learning to motivate to pay more attention and retain the information better. Strike's (n.d) article on 'How To Become the Best Teacher' elaborates ten ways to become an effective teacher by accumulating traits such as 1) A good teacher is an assertive teacher, 2)Be their friend, but don't go too far, 3) Make your lesson relevant to their lives, 4) Your time should be used wisely, 5) More explanations, 6) Teach in a variety of ways, 7) Be firm, 8) A good teacher always has objectives, 9) Be a good example for your students and 10) Believe in them. When all these contributory factors are analysed, it is apparent that they help teachers in extending surprising learning experiences to students both deliberate and incidental planning. Thereby, the study finds a strong correlation between the military principle of Surprise and teaching tactics used during the learning process too.

c. **Cooperation (Collaborative Learning)**. As per the doctrine of UK Army (2014), cooperation is referred to incorporation of teamwork and a sharing of dangers, burdens, risks and opportunities in every aspect of warfare. However, the US Army (1995) defines the same aspect in terms of unity of effort which is achieved by coordinating all activities in peruse of the objectives. When viewing the definitions of both armies, the UK Army definition gives a much vivid and closer meaning to educational domain and can be best fitted into the field of collaborative learning.

Children working in pairs/groups work collaboratively (Collaborative Learning) is a form of learning, in which the groups work together to maximize their own and each other's learning. In collaborative learning, the development of social skills is very important (Primary Professional Development Service, n.d). A part of collaborative learning, co-operative learning brings the benefits such as helping to raise the achievement of all students, building positive relationships among the students and creating a diversity - valued learning community, giving the experiences they need for healthy social, psychological and cognitive development (Johnson, Johnson and Holubec, 1994). Cooperative learning has also been described as "structuring positive interdependence" (Team Game Tournament, 2015). Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning cooperatively can capitalize on one another's resources and skills such as asking one another for information, evaluating one another's ideas, monitoring one another's work, etc (Chiu, 2008). Furthermore, the teacher's role is giving information to facilitate students' learning efforts. Everyone succeeds when the group succeeds (Bella, 2011). Ross and Smyth (1995) describe successful cooperative learning tasks involve intellectually demanding, creative,

open-ended and higher order thinking tasks. Cooperative learning has also been linked with increased levels of student satisfaction (Stuart, Babak, Paterson. O'Gorman, Jackson, 2016). Moreover, Knowles'(1984) Adult Learning Theory known as Andragogy promotes the aspect of absorbing adult's experience in the learning process. In his assumption, adults have so much experience to draw and apply in learning. Their learning should focus on adding to what they have already learned in the past (Learning Theories, 2020). As a person matures he/she accumulates a growing reservoir of experience that becomes an increasing resource for learning (Pappas, 2013). Therefore, the principle of cooperation seems to tightly center Collaborative Learning and Andragogy.

d. <u>**Maintenance of Morale (Motivation)**</u>. Maintenance of morale is a cognitive factor on which success of any military operation depends. Therefore, morale is an essential element of combat power and in any given situation military success is likely to depend as much on morale as the appropriate equipment and war-fighting systems (Kainikara, 2011). Morale of the troops are derived through inspired political and military leadership, a shared sense of purpose and values, wellbeing (UK Defence Doctrine, 2014). When analyzing the aspect of morale in military operation in association with the education process, it shows a strong relationship between the two aspects. Here, political and military leadership (the educator), military values (educational values) and welfare contribute to give troops an extrinsic motivation, whereas a shared sense of purpose (the sense of purpose) to achieve the set goal) seems to generate an intrinsic motivation within them.

In a learning process, intrinsic and extrinsic motivation is a necessity (Li, & Lynch, 2016, Ozcelik, Cagiltay, and Ozcelik, 2013 :Liu, Cheng, and Huang2011). Learning is a complicated process and motivation is the hard rock of this process (Li & Lynch, 2016), Hence, students should be highly motivated to face challenges, understand the process and apply knowledge in practical circumstances. To trigger up intrinsic motivation, the challenge, curiosity, control and fantasy appear as the key factors. In education, lots of will power and positive attitudes is very much required to sustain the motivation in long run (Ryan and Deci, 2000). Moreover, intrinsic motivation and academic achievement share significant and positive bonding (López and Contero, 2013: Lepper, Corpus, & Iyengar, 2005). In contrast, extrinsic motivation depicts external activities such as a reward compulsion and punishment (Tohidi & Jabbari, 2012). An individual is extrinsically motivated if they are receiving any reward or under any pressure or compulsion. According to Tohidi & Jabbari , the motivation can be cultivated extrinsically at the initial stage and transform it into intrinsic motivation during the learning process as it goes deeper. This kind of motivation provides a high level of will power and engagement. Therefore, it is obvious that the mental state, morale, discussed broadly in military operation, has a strong relationship with the concept of intrinsic and extrinsic motivation in education a much needed element in academic success.

e. <u>**Security (Freedom of Action)**</u>. UK Army doctrine (2014) defines 'Security' as providing and maintaining an operating environment that gives freedom of action, when and where required, to achieve objectives. Security is a vital component of military operations because it permits freedom of action to one's own forces (Kainikara, 2011). However, as per U.S. Army doctrine, Security involves minimizing of the vulnerability of strategic plans, activities, relationships, and systems from manipulation and interference by opponents. In analysing the definitions of security in both countries, seemingly, the UK definition gives a much closer and more important meaning to the field of education.

When the principle of Security is interpreted in educational perspectives, it seems to exist a direct link with the educational approaches such as Roger's Humanistic Approach, Maslow's Hierarchy of Needs Theory, Kohn's Student Centered and Facilitative Learning Model. All these theories are concerned about setting a favourable learning environment to enhance students' performance and academic excellence. With influx of various new changes and trends to education domain, the role of teacher is changing by adopting smart and active learning methodologies to achieve mainly four pillars of education; 1) learning to live, 2) learning to know, 3) learning to do and 4) learning to be. Now, a teacher is a facilitator in learning process (Rachmadtullaheza, 2019). To achieve human potential and a good personality in education it is required to focus on student center education instead of teacher –center education. Furthermore, the Humanistic Approach helps in achieving self-actualization, self-understanding and self-realization. According to Firdaus & Mariyat, (2017) Humanistic education is a process of liberation from the oppressive system and to encourage students to think critically and act according to the values of humanity. Meanwhile, Maslow's Hierarchy of Needs Theory highlights that students progress through learning when a set of sequential needs from physiological to self-actualisation is catered. As they move up through the levels, they feel more comfortable in their learning environment and have the confidence to push further. Carl Rogers (1902-1987) added that for a person to grow, he needs an environment that provides him with genuineness (openness and self-disclosure), acceptance (being seen with unconditional positive regard) and empathy (being listened to and understood) (McLeod, 2014). Both Rogers and Maslow through the concept of humanism brought forth a few important ideas; The students themselves should be in control of their learning which is gained through observations and explorations.

The teacher should be an encouraging role model, motivating, guiding and supporting them on their journey. In Facilitative Learning Model, teachers' roles shift from lecturers to facilitators. Teachers guide students on an educational journey by providing resources, monitoring progress and encouraging students to ask questions and solve problems (Stevens, 2019). Facilitative Learning allows students to make their own discoveries, which lead to better retention of concepts Educational Dividends Based on research found that students learn best when they themselves involved in their learning, developing a facilitative learning model where students ask questions, discover answers and apply their knowledge to a real world problem (Educational Dividends, 2020).

f. **Flexibility**. Flexibility is another key principle in success of any military operation. It implies the ability to change readily to meet new circumstances. Here, it mainly emphasizes four key features which own force must possess in achieving the flexibility; agility, responsiveness, resilience and adaptability (UK army doctrine, 2014). According to Mallick(2009) he defines it as the ability to react quickly to changing situations, in order to rapidly shift points of efforts to react to unforeseen opportunities or contingencies. His explanation covers the quality of responsiveness and agility. Further, Kainikara's (2011) description on flexibility; 'At the strategic level of a campaign, flexibility is the resident capacity within a force to adapt plans during the course of the campaign to cater for unforeseen circumstances'. When viewing the definition of flexibility and its key features, they seem to be particularly adjoined with Classroom Management concept.

A learning environment is dynamic as it always filled with disruptions, discussion and new ideas. Unpredictable nature of children makes the target unattainable. Though lesson plans for a teacher are an important part which ensures preparation and adequacy of

information ready for their pupils, deviation from the lesson is commonly and wildly experienced. If you avoid flexible teaching by sticking to your rigid lesson your lesson plan you will not achieve the end result (Netcom92, 2020). Christenbury (2010/11) explained that there is no definitive recipe, no immutable formula, no simple list of do's and don'ts for effective teaching. However, he identifies a number of characteristics in effective teaching. a) Effective teachers use a variety of strategies and a range of methods which are likely to change and refine over time. Effective teachers also differ from one another. Effective teaching is also contextual. It responds to individual students, school and classroom communities, and societal needs. This fact highlights the quality of 'responsiveness' in flexibility which is discussed in military operation too.

Effective teachers alter, adjust, and change their instructions depending on target learning group and their intellectual levels. They are fearless in adjusting curriculum, methods, and pacing to meet the needs of the students (Effective Learning and Teaching, n.d). This quality reminds of 'adaptability' which is discussed as one of the characteristics of flexibility in military operations.

Research study on 'Resilience and Classroom Management' by Murthy (2017) found that resilience of teachers is positively related to their classroom management. The teacher's ability to deal with stressful conditions, situation and the ability to bounce back to normalcy in case of hardships and adverse conditions in schools are the main concerns in the classroom management.

Classroom agility is a key prerequisite in classroom management which implies the ability of the educator to quickly and easily move in the classroom. This act results in quickly observing, assessing and responding to dynamics in the classroom. An agile teacher in classroom is constantly monitoring students, answering individual questions, making suggestions, utilizing proximity control gestures and re-tasking those off task. On the other hand, classroom agility can also apply to students. They should feel comfortable moving around the room, collecting resources and collaborating with peers (Lopez, 2017). Meanwhile, focusing on the same idea, Jacob Kounin's Proactive Model depicts the importance of striking a relationship between teacher's discipline and instructional methods for classroom management (Bober, Ulrich & Werner, n.d). Its key elements such as 1) Ripple effect; correcting one student's behavior while influencing others, 2) Withitness; awareness of surroundings and all students within your eyesight at all times, 3) Overlapping; completing two tasks at once 4) transitions; practice different transition times and 5) Group alertness; whole group engagement, despite one individual answering help the educator in improving the 'Agility' for a healthy classroom environment (Schield, 2016).

g. **Economy of Effort**. As per UK Army doctrine (2014) and US Army doctrine (2011) the best utilization and exploitation of resources; manpower, materiel and time has been defined in two different terms such as economy of effort and orchestration in relation to the achievement of objectives. In other words, it is employment of the correct number of forces/resources and combinations of capabilities to produce the righteous quantum of combat power essential to cope with the treat and to achieve success.

This principle seems to have a neutral relationship with the concept of effectiveness in resource management in school administration in particular. This has significant effects on attainment of educational goals. Therefore, economy of effort which is primarily applied in military operation can be considerably encompassed with the field of school administration.

The concept of School Administration is a broad topic which is connected with diverse concerns. According to NOUN (2006) school administration is defined as a social process of identifying, maintaining, stimulating, controlling and unifying, formally and informally organized human and material energies of the school system. Okendu (2012) defines school administration as an integration of all the processes through which resources are mobilized in educational institutions to accomplish the goals of education. The concept of School Administration is concerned with the aspects such as managing, administering the curriculum and teaching, pastoral care, discipline, assessment, evaluation and examination, resource allocation, costing and forward planning, staff appraisal, relationship with community, use of the practice necessary for the surviving the policies of the organization such as decision making, negotiation, bargaining, communication, conflict handling, running meeting etc (Ojo ,1999). School Administration is always a mediating force between students, teachers, parents and third parties. It centers opportunities to enrich the overall educational experience of students as well as management strategies to increase efficiency within the organization itself (Top Education, n.d). School Based Management (SBM) aims to enable schools to manage their operation and resources in an effective and accountable manner so as to raise the standards of learning and teaching and thus improve the students' learning outcomes. Hence, schools are devolved more responsibilities and provided with the necessary resources, autonomy and flexibilities, so that they can respond proactively to the needs of the students and the community in the delivery of educational services (School Administration Guide, 2018/19).

h.   **Sustainment**.   Sustainment is considered a fundamental decisive factor in determining the feasibility and practicality of embarking on an operation as well as shaping the strategy to achieve campaign objectives. Sustainability requires generating the means by which fighting power and freedom of action are maintained (UK army doctrine, 2014). Sustainment is the ability of a force to successfully complete a campaign that it has undertaken, from commencement to the achievement of strategic objectives and final draw down of forces. However, it is not merely administration and logistics management whereas it states that the administrative, logistical and personnel arrangements plus all aspects of their management needs to be put in place to efficiently support and implement the military strategies (Kainikara, 2011).

The Oxford Advanced Learner's Dictionary (2014) defines the term of sustainment as 'the ability to continue or be continued for a long time'. But its military definition gives a much broader and comprehensive explanation. The provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective (Military Dictionary of US Department of Defense, 2020).

Sustainment of learning is referred to the act of maintenance or upkeep of the training (Rentier,2020). Cresswell(2013) mentions seven tips for improving the learning experience while deriving practical and viable benefits in training programmes; 1) involving students directly in the launch of any training programme, 2) understanding the preferred learning styles and learning motivations of students, 3) providing 'hands-on' learning, 4) ensuring that the learner has the right tools, jobs and methodologies necessary to implement, accelerate, the adoption of new skills and competencies, 5) making sure that each learner has access to a broad support network internally, 6) reward the learner for adopting new skills and competencies and 7) engaging

the learners' line managers by involving them in the goal setting.

As far as sustainment in education is regarded, the aspect has not been adequately addressed or implemented in the field as it is covered under the principle of school administration. When analyzing the principle of sustainment, it stands as an integrated master principle as it shows mutual relationships among the principles of pursue of aim, administration, concentration of force (synchronization and coordination of resources) and economy of effort. This urges the need of mechanism in line with administrational, logistical and personal factors from the beginning to the end of any military engagement. In this context, sustainment can be introduced as a new master principle in education as it bears a considerable level of significance in school administration process.

i. **Concentration** **of** **Force (Synchronization).** Concentration of force is a fundamental consideration in the planning and execution of all operations. Concentration of force means decisive synchronization and application of superior fighting power; physical, intellectual and moral elements at the right place, at the right time and in a manner that assures the achievement of the desired results (UK Army Doctrine , 2014 : Kainikara, 2011). However, concentration does not mean massing the force at a given geographic area, merely bringing together large numbers or increasing the size of the force. Concentration of force, when applied in conjunction with other principles of war, can enable even a smaller and seemingly inferior force to win over larger and potentially superior forces. The same idea was envisaged in US Army Doctrine (1995) as concentration of the elements of national power at the place and time which best furthers pursuit of the primary national objective.

When the military principle of 'Concentration of Force' and its content are viewed in details and applied in education domain it means bringing students, teachers and principals (troops), facilities (weapons),parents resource personnel (support personnel), transportation (vehicles) and supplies together into a cohesive group ready to deal with the education. Universidad Loyola (n.d) emphasizes that diversity in areas of expertise, materials and subjects together with the various groups involved in teaching process demand a well-defined coordination structure to establish coherence and unity in the process of student learning and training. Coordination and synchronization is necessary to streamline all the processes to accomplish the mission and objectives. Rodorigo & Larragueta (2012 underline the idea of proper coordination and synchronization in relation to education. In this changing and versatile context, coordination management and structure has become a key requirement in promoting and improving educational processes. A smaller cohesive team when applied in conjunction with other principles can be effective, impressive and successful in meeting the end-state (Connolly, James, & Fertig, 2017). Coordination and synchronization is a fundamental consideration in the planning and execution of all educational operations. This also reflects the ability to formulate and apply cohesive team at the right place, at the right time and in a manner that assures the achievement of the desired and decisive results. However, concentration does not mean excessive use of physical, intellectual, moral resources in learning efforts but the deployment of resources in such a way to ensure that the highest possible resources have been employed /streamlined to execute the operation at the required place as and when necessary (Kainikara, 2011).

When the military principle of concentration of force is interlinked with education, it can be mutually related to the

aspect of synchronization and coordination of all operational processes. Practically, it becomes a very major consideration in school administration matrix while creating considerable effects in the entire education process.

FINDINGS

Having analyzed the principles of war highly applied in military engagements along with varied educational concepts, the study mainly discovered that military tenets such as Selection and Pursue of Aim, Offensive Action, Surprise, Cooperation, Morale, Flexibility and Concentration of Force are strongly interconnected with Setting and Pursue of Educational Aim, Teacher's Initiative of using Strategies, Surprising the learner with innovative teaching and learning, Collaborative Learning, Motivation, Freedom of Action, Flexibility in learning process and Synchronization of all educational processes.

One of the significant findings was that the other principles like economy of effort, sustainment and concentration of force individually have a considerable bonding with the concept of school administration, whereas they collectively contribute to have a great impact on the field of school administration.

Another key finding of the study was that setting and pursue of educational aim, initiative of using strategies, freedom of action and flexibility demand more teacher involvement in order to make teaching productive and professional. Surprising of the learner, collaborative learning, freedom of action and flexibility are contributory principles in nurturing both learning and teaching processes. Sustainment, economy of effort and synchronization are very significant principles that are directly associated with the concept of school administration while giving a comprehensive and deep meaning to the field.

Having juxtaposed the master principles of war in education domain, the study introduces a new educational theory, "Education Theory of Military" which consists of eight major principles and three minor principles. The eight master principles are Setting and Pursue of Educational Aim, Innovative, Surprise, Collaborative Learning, Motivation, Freedom of Action, Flexibility, School Administration. Further, the master principle of School Administration has been strengthened by three minor principles of Economy of Effort, Sustainment and Synchronization.

All these principles can be briefly defined in military perspectives with special emphasis to the field of education as follows:

The principle of *Setting and Pursue of Educational Aim* implies that the learner needs to possess a definite aim (purpose) and objectives to be actively involved in learning process. Further, the educator is expected to articulate educational goals and objectives within the learner as this act helps the learner and decision-makers in providing a much better framework to plan out the entire operation.

Use of *Innovative* is another master principle in the teaching and classroom management processes. During the learning process, the educator has to seize, retain and exploit his initiative at the stage of teaching and classroom management to accomplish the educational goal and objectives.

Induction of *Surprise* within the learner is another key principle in education which is achieved through use of innovative teaching and learning strategies by the educator. Innovative teaching learning methods need to be shaped up with new ideas, methods, technology based innovations through which the learner's attention is constantly captured, his knowledge is expanded and full potential is accumulated. Such surprising learning experiences should

be deliberately and incidentally planned by diplomatically analyzing the learner, the periodical changes and learning contexts.

Collaborative Learning is the next key principle which explains how pair and group work together support to maximize all learning efforts and nurture for healthy social, psychological and cognitive development within the learner. This is also one of the greatest means to absorb a reservoir of adult learners' experiences into the learning process.

Motivation is the key to educational success. The educator's leadership, education values and welfare contribute to give the learner an extrinsic motivation, whereas a sense of purpose generates an intrinsic motivation. Lots of will power and positive attitudes sustain the motivation in long run and to engage with the learning process throughout. Here, extrinsic motivation is cultivated within the learner at the initial stage and then transforms that into an intrinsic motivation during the learning process.

Freedom of Action states providing and maintaining of a facilitative learning environment that gives the freedom of action to the learner in pursue of learning objectives. The learner has full control over their learning gained through observations and explorations. The educator is a facilitator in learning process in which the learner is supported to achieve self-actualization. He guides the learner through the educational journey by providing resources, monitoring progress and encouraging them to ask questions and solve problems.

Flexibility can also be introduced as a master principle in education. This highlights the quality of being flexible to classroom dynamics in order to accomplish the end result. For that, the educator must claim four qualities; 1) Responsiveness ; the ability to respond to individual students, school and classroom communities and societal needs, 2) Adaptability; the ability to alter, adjust curriculum, methods and change their instructions depending on target learning group and their intellectual levels, 3) Resilience; the ability to deal with stressful conditions, situation and the ability to bounce back to normalcy and 4) Agility; the ability to quickly move, observe, assess and responding to dynamics in the classroom.

The principle of *Synchronization* and cooperation assures decisive synchronization and employment of physical, intellectual and moral elements at the right place, at the right time and in a manner that ensures the achievement of the desired results. This is a fundamental consideration in the planning and execution of all educational operations while streamlining all the processes for goal attainment.

Economy of Effort deals with the concept of effectiveness in resource management (school administration). It is a process of identifying, maintaining, stimulating, controlling and unifying, formally and informally organized human and material energies of the school system. This enables schools to manage their operation and resources in an effective and accountable manner to raise the standards of education and to improve the students' learning outcomes.

Sustainment highlights the administrative, logistical and personnel arrangements plus all aspects of their management needs to be put in place to efficiently support and implement the education plans until successful accomplishment of the mission. The required administrational, logistical and personal backings from the beginning to the end of educational process will be provided for the personnel involved in the education process.

The following diagraph shows the new educational theory which was born through correlation of both the principles of war in military and the learning theories/concept in education.
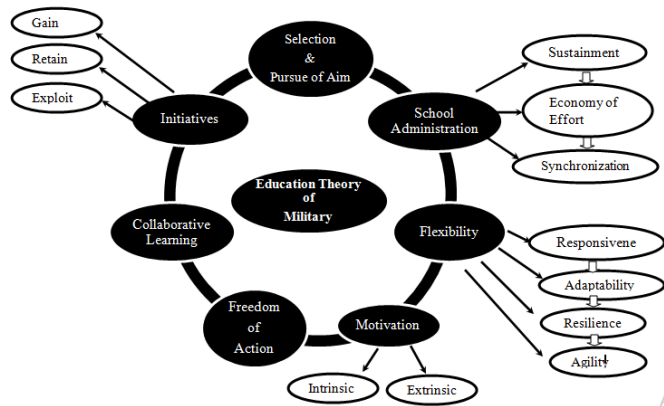
Figure 1 - Education Theory of Military

CONCLUSION

Military battles fought in human history have proven that the Principles of War provide comprehensive considerations at all levels for planning executing military campaigns and operations. Meanwhile, the learning theories in education provide guidelines to understand learning and to framework the education system in pursue of the desired goal attainment. The content based conceptual research which focused on exploring the conceptual correlation between the military and educational aspects revealed that the key components such as Selection and pursue of aim, Initiatives, Collaborative learning, Flexibility, School administration, Motivation and Freedom of action can be directly encompassed with the field of education while economy of effort, sustainment and synchronization help in reinforcing the aspect of School Administration. Resultantly, the study finally proposed Education Theory of Military as a new educational model to the education domain for educational goal attainment. When viewing the literature this study found that

Principles of War are applied not merely in planning military operations but also in the field of business, human resource management, Hence, this study was launched to introduce this military concept to the field of education as no previous studies had been launched so far to cover the gap. Also, this effort contributes to widen the parameters of both military and education by applying this militarily isolated concept in the field of education. The researcher may invite enthusiastic researchers in field of sociology, psychology, tourism, teaching etc to explore the applicability of these military principles in respective fields.

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CONTRIBUTION OF THE SRI LANKA ARMY FOR THE UN PEACEKEEPING OPERATIONS AND MEANS OF EXPLORING THE POTENTIALS

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ABSTRACT

This study attempts to identify the reasons for SLA's inability to increase the deployment of troops in UN Peacekeeping Operations (UNPKO) and explore the means to expand the Sri Lanka Army's contribution to the UN peacekeeping operations. The study was supported by qualitative response through a questionnaire and qualitative responses that have been gathered by interviews. The first part of the paper outlines an introduction to the research. The second part consists of the literature review, analyses supporting sources: researches, available military documents and involves in a critique of the existing body of literature. The discussion of different reference points do allow the research to critically evaluate the pinpointed process. The third part of the paper provides a specific methodology. The fourth part of the paper examines results that have been gathered: from questionnaries and focused group interviews. The variables considered in this study are: Monetary wellbeing of the soldiers, increase new opportunities, optimum use of SLA resources and international recognition. Results gathered proved that there is a significant difference between SLA's contribution to the UNPKO comparing to the other SAARC countries and the need of increasing the SLA contributions to UNPKO. Finally, this paper outlines a set of recommendations to enhance the SLA contribution to the UNPKO.

KEYWORDS: *Increase new opportunities, Use of SLA Maximum Resources, International Recognition and Exploration of the Potentiality, UN Peacekeeping Operations, Monetary Wellbeing*

INTRODUCTION

Over the past six decades, the United Nations Peacekeeping Operations (UNPKO) have evolved into a complex and multi-dimensional global undertaking. South Asia is the largest troop-contributing region for UNPKO. Especially, Bangladesh, India, Nepal, and Pakistan rank among the top brackets of troop contributors. Among them, Nepal and Bangladesh are the largest per capita troop contributors to UNPKO. Sri Lanka has been a member state of the United Nations since 1955 and had participated in UN peacekeeping duties as early as 1960, when the island nation

contributed to numerous military observer officers to the United Nations (UN) mission in Lebanon. However, it is presently ranked 43rd among the troop-contributing countries to UN peacekeeping missions.

The Sri Lanka Army (SLA) has demonstrated its effectiveness locally and internationally in many spheres such as combating ruthless terrorist organizations, engaging in low and high intensive battles, developing programmes for the de-radicalization and rehabilitation of ex-combatants, performing crisis management, conducting humanitarian demining, managing local and international disaster response initiatives, and nation-building. The SLA has contributed to global peace, despite fighting terrorism locally, by deploying a 750 member strong contingent and one staff officer to the United Nations Stabilization Mission in Haiti (MINUSTAH) in 2004.

After the successful eradication of internal terrorism in 2009, the SLA engaged in every aspect of the post-war reconciliation process. The SLA is amply equipped with wealth of experience, capacity and determination to encounter the various challenges which the UN peacekeeping missions have faced with.

Presently, the SLA has deployed only 410 members as contingent troops in three UN missions in Lebanon, South Sudan and Mali. Additionally, it has provided the services of twenty staff officers in eight countries and fifteen military observers in seven UN missions. Since its inception, the SLA has contributed with 18,644 troops to UN peacekeeping operations.

PROBLEM STATEMENT

6.   As per UN journal (2019) comparatively to the SAARC countries, the SLA has a higher percentage strength in comparison to the population. The comparison of SLA strength with SAARC countries are as mentioned below:

Table 1 - Comparison of Army Strength as per the Percentage of Population

Ser No	Country	Population	Army Strength	Percentage
(a)	(b)	(c)	(d)	(d)
1.	India	1,281,935,911	1,362,500	0.1
2.	Pakistan	204,924,861	637,000	0.31
3.	Bangladesh	157,826,578	160,000	0.1
4.	Nepal	29,384,297	95,000	0.32
5.	Sri Lanka	22,409,381	167,475	0.74

Tabel 2 : Comparison of Army Contribution to UNPKO

Ser No	Country	Army Strength	Troops contribution	Percentage
(a)	(b)	(c)	(d)	(d)
1.	India	1,362,500	6,719	0.49
2.	Pakistan	637,000	6,003	0.94
3.	Bangladesh	160,000	7,105	4.44
4.	Nepal	95,000	5,508	5.79
5.	Sri Lanka	167,475	410	0.24

As per the Table 1 and 2, even though the SLA is one of the largest organizations compared to the population, its contribution to the UN operations at present remains to be at a lower level. Therefore, this study attempts to examine the reasons for SLA's inability to increase the deployment of troops in UN missions compared to Nepal and Bangladesh and explore means to increase SLA troop contributions to the UNPKO with its true potential.

OBJECTIVES

The objectives of the study can be categorized into general and specific objectives:

a.   To identify the reasons for SLA's inability to increase the employment of troops in UNPKO to its potential.

b.   To find out the means to improve the potential for UN troops contribution of the SLA.

LITERATURE REVIEW

a.   <u>**Origin of The United Nations.**</u> "T h e name United Nations (UN), coined by United States President Franklin D Roosevelt, was first used in the declaration of the UN on 1 January 1942, during the Second World War, when representatives of 26 nations pledged their Governments to continue fighting together against the Axis powers" (Basic Facts about the United Nations, 2000). The forerunner of the UN was the League of Nations, an organization conceived in similar circumstances during the First World War, and established in 1919 under the Treaty of Versailles to promote international cooperation, peace, and security. The League of Nations ceased its activities after failing to prevent the Second World War. According to Basic Facts about the United Nations (2000), after failing to avert World War II, the League of Nations dissipated. Then, in 1945, dozens of countries met at a UN Conference in San Francisco to develop a new "United Nations Charter." This charter was officially signed in late June in 1945. It was subsequently ratified by the United States of America, the United Kingdom, the Union of Soviet Socialist Republics, China, France, and numerous other countries in October in that same year. One hundred and ninety-three countries hold membership within the UN today.

b.   <u>**History of the United Nations Peace Keeping Operations.**</u>   "Peace is the absence or reduction of violence of all kinds, or peace is nonviolent and creative conflict transformation" (Galtung, 1996). "Peacekeeping is a pragmatic response to threats to international peace and security. It involves the deployment of a multinational military force, with the consent of all parties to the conflict, for the purpose of promoting the conditions necessary for the lasting settlement of a dispute. As a passive and neutral third force, a peacekeeping contingent deploys with weapons sufficient only for self defence" (Ihalage, 2003). According to Emmanuel (2014), the reasons behind the sudden increase in peacekeeping operations go hand-in-hand with the growing a number of conflicts on the continent, most of them internal to countries, which affect stability and development. "The Charter of the UN lists the UN's main purpose as the maintenance of international peace and security, the taking of effective collective measures for the prevention and removal of threats to peace, the suppression of acts of aggression, and the peaceful settlement of international disputes or situations that might lead to a breach of peace" (Pitta, 1994). Peacekeeping and peacemaking operations fall within the purview of the UN's General Assembly and the Security Council. "It is the prerogative of the United Nations Security Council, acting in its capacity as the organ with primary responsibility for the maintenance of International peace and security to determine when and where a United Nations peacekeeping operation should be deployed" (Guéhenno, 2008).

The United Nations, more than any other organization in the history of the world, has proactively sought the cessation of armed conflict and the promotion of peace in all parts of the globe. According to Pitta (1994), the first peacekeeping operation in the Middle East was conducted by the UN Truce Supervision Organization (UNTSO), formed in 1948, during the Arab Israeli War. "There are more than 100,000 personnel in UN peacekeep operations: 91,132 troops, 13,563 police, and 1,811 military experts from 123 countries" (Data LEADS, 2019). As a result of these impressive figures, peacekeeping forces, under the banner of the UN, even received the Nobel Peace Prize in 1988.

c.   **Means of Exploring The Potential.** According to the literature review there are many systems which can be adopted by the TCC to increase the potentiality of increasing the UNPKO. They are:

(1)   **Application of Peacekeeping Capability Readiness System (PCRS)**. This system provides guidelines for how the United Nations will staff or field its peacekeeping operations. First, it lays out the procedures for member states to volunteer their own forces for such missions. Secondly, it defines the hierarchical structure of the system. Finally, it instructs both the member states and the Secretariat on what their duties and responsibilities lie.

(2)   **Rationale**.   "The PCRS aims to establish a predictable and dynamic process of interaction between the UNHQ and member states for ensuring readiness and timely deployment of quality peacekeeping capabilities. To ensure predictability, standardization and efficiency, these guidelines establish clearly defined criteria and a set process for registration and verification to be followed by member states and the UN Secretariat" (Guidelines for the peacekeeping capability readiness system, 2019).

According to the Guidelines for the peacekeeping capability readiness system (2019), the PCRS exists in order to legitimize recently deployed peacekeeping forces and to bridge the gap between the individual member-states and the United Nations Headquarters. Deploying police and military units must be selected by this sanctioning body.

(3)   **Increase Employment of Females in Peacekeeping and Peacemaking Operations**. "Increasing women's participation in peacemaking, peacekeeping and peacebuilding has been an important goal for UN peacekeeping since the passage in 2000 of UN Security Council Resolution (UNSCR) 1325 on women, peace and security" (Jennings, 2011). Despite the present under-representation of women in UN peacekeeping and peacemaking operations, there is an opportunity for them to play a major role. As learned in contemporary security operations around the world, women can garner access and placement within certain segments of societies that men cannot. "Women make unique and substantive contributions that improve peacekeeping operations. Female peacekeepers frequently can access populations and venues that are closed to men, thereby improving intelligence about potential security risks. They are also able to screen women during searches, helping to close a security loophole that extremists increasingly exploit. In addition, the presence of female officers improves access to community members, thereby amplifying situational awareness and helping military commanders to fulfill their mandates" (Basu, 2018).

(4)   **International Recognition and Monitory Benefits**.   Asian,   South American, and African nations supply the vast majority of security forces personnel to United Nations peacekeeping operations; according to Weisis (2019), this number might be as high as 90 per cent. According to Weisis (2019), developing countries are attracted to the prospect of providing peacekeeping forces as there are inherent financial, global recognition, and regional cooperation benefits to doing so. Bangladesh, for example, has long been one of the largest troop contributors for the UN. "The UN has even shown a willingness to financially assist economically depleted countries that are willing to support the UNPKO" Weisis, (2019). Hence, there is a need to increase the international recognition and in order to increase the opportunities and increase the foreign revenue of the member states.

(5) **Employment of Engineering Troops**. "When it comes to peacekeeping missions, engineers are often the last to deploy. They should be the first. In the rush to deploy after conflicts flare up, peacekeepers often initially lack what they need to succeed and to keep them safe: infrastructure like camps, passable bridges and drivable roads. These are the very same things that engineers plan and build and yet engineers are often the last to deploy to a conflict" (Reeze, 2017). Further, according to Reeze (2017), caps on troop deployments often preclude engineer support in favor of infantrymen. Additionally, many member-states simply don't have the engineering resources to contribute. However, if the UN were to formulate its own organic engineering capacity, this problem might be overcome.

(6) **Technology and Innovation in UN Peacekeeping**. Furthermore, "Beyond missions as a whole, individual peacekeepers, military, police, and civilian can be equipped with technology and connected to networks, as depicted in the concept of the "digital peacekeeper" from the report of the UN's Panel of Experts on Technology and Innovation in UN Peacekeeping" (Dorn, 2016).

d. **Benefits of the UN Peacekeeping Operations.** The main benefits of UN peacekeeping operations are as mentioned below:

(1) Nation-states can bolster their international reputation and garner recognition through participation. Accordingly, they are able to punch above their weight-class in the broader international relations environment.

(2) Contributing nations can develop new relationships and even alliances with the countries in which they serve.

(3) There are various financial incentives for countries to contribute to peacekeeping troops. For one, individual peacekeepers generally earn more during these operations. The UN often pays these troops directly in a foreign currency. Additionally, the UN reimburses countries for lost, damaged, and depreciated equipment.

(4) One must also not discount the professional benefits to peacekeeping troops in such operations. These soldiers and officers are exposed to different and more advanced militaries and can bring new tactics, techniques, and procedures back to their own force. Additionally, these posts are generally perceived as selective and highly developmental, and peacekeepers often reap the benefits of higher promotion rates and better assignment opportunities.

METHODOLOGY

a. **Population and the Sample.** The population for the research was considered as the officers who were deployed in UN missions as UN observers, UN staff officers, commanding officers, responsible officers who handle the UN peacekeeping operations, and Sri Lankan diplomats of the UN. They are as follows:

(1) Officers deputed as UN observers.

(2) Officers deputed as UN Staff Officers.

(3) Officers deputed as Commanding Officers.

(4) The Director of the Directorate of Overseas Training Directorate and responsible officers from the Directorate of Overseas Training.

(5) The Director of the Director General Staff.

(6) Commandant of the IPSOTSL and responsible officers.

(7) Sri Lankan representatives in UNO.

b.   Sample.   The sample for the research is as mentioned below:

Tabel 3 : Sample of the Research

Ser No	Category	Population
(a)	(b)	(c)
1.	The Director of the Directorate of Overseas Training Directorate	1
2.	Responsible officers from the Directorate of Overseas Training	3
3.	The Director of the Director General Staff	1
4.	Commanding officers from UN battalions	10
5.	Staff Officers and Observers	50
6.	Commandant of the IPSOTSL and responsible officers	3
7.	Sri Lankan representatives in UNO	3

c.   Research approach.   This study is based on the data collected from primary and secondary data. The primary data are collected using a self-administered questionnaire and through focused group interview method. Secondary data are collected through research articles, journal articles, books, and newspaper articles already published pertinent to the subject. Further, focused group discussions were carried out among the Director of the Directorate of Overseas Training Directorate, the Director of the Director General Staff, the Commandant of the IPSOTSL and responsible officers and Sri Lankan representatives in UNO.

d.   Conceptual Framework.   In order to develop the research successfully, analysis of this study and the conceptual framework show the logical and theoretical implications which reflect the interrelation among the variables and how it operates, therefore following figure 1

dispatches the process of the study constructed. Based on related literature study, the identified concepts and variables are constructed. Derived independence and dependent variables are as mentioned below:

(1)   **Monetary   Wellbeing   of   the Soldiers**.   The participation of Sri Lankan soldiers in UNPKO also contributes to the monetary wellbeing of military personnel and their families. The, wages earned during UN peacekeeping operations directly benefit Sri Lanka military personnel, their families, their local communities, and the nation itself.

(2)   **Maximising   the   Opport-unities**. There are special training opportunities associated with UN peacekeeping operations, many of which bare no financial burden on the Sri Lankan government. These opportunities assist to professionalise the force at essentially at no cost.

(3)   **Optimum use of SLA Resources.** Since the end of the Sri Lankan Civil War, there have been limited opportunities for SLA units to operationalise their equipment and capabilities. By allocating troops and resources to UN peacekeeping operations, Sri Lankan military personnel garner valuable, real-world experience that may pay dividends in future operations, that are more germane to the nation's security.

(4)   **International   Recognition**.   UN peacekeeping   operations   often   garner substantial international attention. By showing that uniformed Sri Lanka soldiers are actively engaged in world affairs, the country can increase its overall recognition and be seen as a greater military power. Moreover, these operations depict Sri Lanka as an empathetic nation which cares deeply about spurring peace initiatives around the globe.
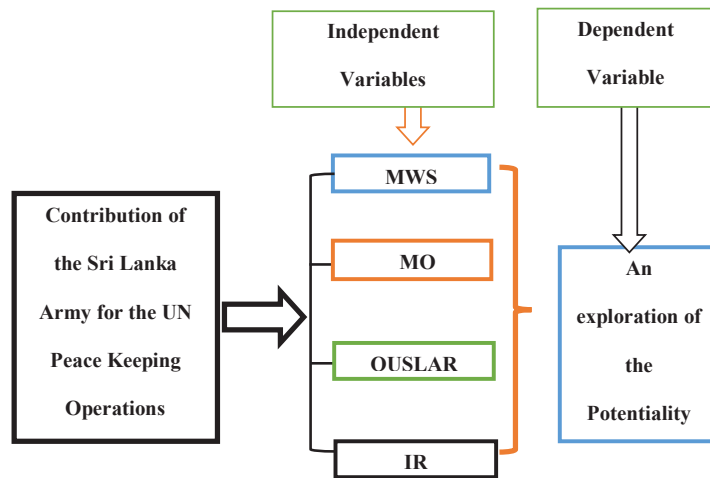
MWS: Monetary Wellbeing of the Soldiers
MO: Maximising the Opportunities
OUSLAR: Optimum Use of SLA Resources
IR: International Recognition

Figure 1 - Conceptual Framework
(Source: Constructed by Researcher)

RESULTS AND DISCUSSION

The endeavour of this research is to explore the potentiality of increasing SLA contributions to UN peacekeeping operations. Based on that, there were three research objectives derived:

    a.   Identify the reasons for SLA's inability to increase the employment of troops in UN peacekeeping operations.

    b.   Determine the means to improve the Sri Lankan Army's contribution to UNPKO.

    c.   Make recommendations in order to deploy the SLA as a potential work force.

The research findings are present in relation to the research objectives in justifying and answering the research questions. The findings of the research are as follows:

When analysing the monetary wellbeing of the soldier variable, it is found that participating in UNPKO has an impact on the monetary wellbeing of the soldiers than the soldiers who did not attend for UNPKO. There is also a positive relationship to increase the potentiality of the work force. Further, according to the respondents, the study found that the monetary wellbeing of the soldiers has a significant impact on the family economy, family living conditions, economic and social benefits, and the financial stability of soldiers. Additionally, the country could also gain monetary benefits. However, when analysing the importance of the monetary factor, the researcher found that there is a significant impact on the personnel benefits of SLA soldiers. According to the analysis, it was found that increasing the opportunity of SLA troops to effectively participate in future operations will develop the foreign revenue of the country. In conclusion, based on the research data, the monetary wellbeing of soldiers is directly correlated with the expansion of the opportunity for SLA troop in UN peacekeeping operations. The participation of Sri Lankan soldiers in UNPKO also contributes to the monetary wellbeing of military personnel and their families. Further, the UN pays soldiers approximately $1,400.00 per month, which is substantially higher than average Sri Lankan military wages. Staff officers working for the UN can even far surpass this amount; according to the UN's published pay tables, officers frequently make more than $3,000.00, and, at the higher headquarters level, can earn close to $10,000.00. This indirectly helps the nation, as much of that income is returned to the soldiers' homes. According to the Daily Mirror, since 2004, the SLA has

earned more than 161 million dollars through their participation in UNPKO (Daily Mirror, 2018). The value of these missions to the nation cannot be underestimated.

The maximising of the opportunities variable was analysed to measure its relevance to exploring the potentiality of SLA troops. The analysis reveals that the sample has responded positively on the SLA capability to engage in UN peacekeeping operations. Also, the analysis identified the requirement of specialised training for the officers and soldiers who are eligible to contribute to UNPKO with regard to the social, cultural and language knowledge of particular countries. Further, the researcher identified the priority of enhancing the peacekeeping capability readiness system declared by the UN peacekeeping department in order to fulfil the UN requirements at any given time as a TCC. It was revived that, the requirement of enhance operational readiness by SLA, as expected by the UN DPO to provide troops for UNPKO anywhere in the world. Moreover, the researcher identified the application of PCRS by Nepal and Bangladesh which has created a large impact on their economic means of GDP and foreign revenue and has helped to develop their countries. Hence, there is an urgent need of adopting a peacekeeping readiness system by Sri Lanka in order to expand SLA contribution to the UNPKO. In order to maximise the opportunities in UNPKO, the SLA needs to adopt mission-oriented special training, related to UNPKO and should maintain high standards of peacekeeping readiness system as expected by the UN to provide troops at any given time within short notice. Further, many responders suggested that diplomats have to play a critical role in exploring new UNPKO opportunities for SLA troops.

As per the responses of the sample, it was determined that there is a critical issue in the optimum use of SLA resources to the UNPKO. The researcher has identified that the SLA has not effectively employed its human resources in secondary tasks as peacekeepers. As per the statistics provided, the SLA employs only 410 personnel in UNPKO out of 167,475 total strength. Further, it was found that the ability, capability and experiences of SLA personnel have not been utilised in an effective manner. Therefore, it was revealed that the sample has responded positively on the need of employing SLA human resources in secondary tasks as peacekeepers in an effective manner. Moreover, it was pointed out that the SLA has not effectively utilised military equipment for UNPKO. As per the UN criteria it is bounded to pay allowances for the equipment provided by the TCC. As per the responders, it was revealed that even though the SLA has the capability to provide equipment for the UNPKO, it is not yet being used effectively in order to increase the optimum use of resources of the SLA. During the analysis of the effective use of medical services for UNPKO, many responses remained neutral, while few disagreed. The researcher identified that there is still room to increase the employment of medical services for the UNPKO. As per the sample, it was identified that SLA has not properly utilised its fully-fledged resources in terms of manpower, equipment, and personnel knowledge and experiences as per the UNPKO. Further, the researcher identified that the present environment is conducive for exploring new possibilities for the SLA deployment in other UN peacekeeping missions. It was analysed that the SLA still has not used its resources (manpower, equipment, knowledge and experiences) and environment effectively to explore the potentiality of the SLA contributions to the UNPKO.

When analysing the international recognition variable, it was found that it has a direct impact on the expansion of the SLA troop participation in the UNPKO. The study identified that any country and its armed forces are highly recognized internationally due to UNPSO which allows that particular country

to maximize the opportunities in the UN mission. As per the responses, the Sri Lankan Armed Forces are not highly recognised by the UN Security Council, even despite the present contribution to the peacekeeping mission at the UN. It was identified that there is a big challenge for Sri Lanka when increasing the troop participation in UNPKO which needs to be addressed immediately. Further, the researcher found that international recognition is an important tool to find new opportunities in UN peacekeeping operations for any country, whereas Sri Lanka is lagging far behind in that requirement. Moreover, it was assessed that Sri Lankan diplomats in the UN have to play a critical role to increase international recognition of Sri Lanka in order to increase opportunities for UN peacekeeping operations. Hence, it has become a barrier to increase the SLA troop contribution to the UNPKO. As a whole, it is assessed that the SLA lags significantly behind in international recognition, and also those diplomats do not play a substantial role in exploring new opportunities in prospective UN missions.

It is assessed that increasing the potentiality of the workforce can be done through the higher recognition in the world where SLA troops are lagging behind. Further, the researcher identified that the SLA should possess new military equipment and effective medical services to increase the potential workforce in the UN mission in order to match the UN standard requirements and address the challenges of other TCC. Moreover, it is highly recognized that the lack of opportunities to serve in the UN mission has affected the potential workforce of SLA due to a limited number of UNPKO opportunities.

The interviews with the most experienced and responsible officers in the SLA related to the UNPKO revealed that the human rights allegations have manifested with negative consequences with regard to increasing UNPKO opportunities. Further, it was identified that there is an issue related to the acquisition of sophisticated equipment due to overall budget restraints, and the long-term delay of a new procurement system; this must be addressed immediately. Moreover, it was highlighted that the use of well-trained and experienced engineer troops for UNPKO, and the employment of women's corp soldiers for UNPKO would substantially benefit the overall UN mission. Further, it was highlighted the need of conducting pre-inductive training and mission in training for the soldiers who take part in UNPKO.

As per the interview conducted with some diplomats who served in the UN, it is strongly recommended that the human rights allegations have to be addressed immediately and effectively. It was suggested to hold an independent investigation against human rights violators and to show the world that Sri Lanka is pursuing a policy of holding potential violators accountable for their actions. Further, it was identified that the role to be played by the Sri Lankan diplomats in the UN, should include maximising the opportunities for UNPKO. Additionally, there is a need for employing correct, suitable professionals as diplomats in the UN. Moreover, the researcher identified the requirement for the direct involvement of the government to maintain PCRS, to hasten the procurement process to acquire equipment for UNPKO, to allocate a suitable budget for the UN mission, to correctly supervise UN diplomats, and to sign a permanent agreement with the UN to provide SLA troops to UNPKO on regular basis.

CONCLUSION

The primary objective of this research was to identify the potentiality of additional SLA troop contributions to UN Peacekeeping Operations (UNPKO). However, the Sri Lankan studies on the subject were very limited. The

Sri Lanka Army has employed only a limited number of troops to UNPKO, approximately 430. The successful implementation of UNPKO requires the ability to interact and empathise with people from diverse cultures, as well as a high degree of tactical competency, for achieving operational success. Increasing the number of troops, equipment and resources for UNPKO can easily increase the potentiality of the SLA troops for UNPKO.

The literature review carried out during the research study identified five variables for the means to explore this potentiality. These include: (1) the monetary wellbeing of soldiers, (2) maximising the opportunities, (3) optimum use of SLA resources, and (4) international recognition and the potentiality of the workforce.

Moreover, the findings from this research study might be useful for both SLA and governmental decision-makers to determine the most efficient employment of SLA troops in UNPKO, and to explore the potentiality of SLA for ensuring success. The findings of this research study will assist in preparing, organising and deploying SLA peacekeeping troops for these very challenging missions.

A survey through a distributed questionnaire was the primary basis for data collection and respondent feedback was systematically collated and analysed as per the relevant research indicators. Senior, well-respected SLA officers and Sri Lankan diplomats were interviewed to draw out credible and valid recommendations. Based on analysis of this feedback, the researcher has developed a set of recommendations to explore the future potential of SLA troop contribution to UNPKO in the future.

RECOMMENDATIONS

Based on the results of the analysis and discussions so far in this paper, the following can be derived as recommendations:

First and foremost, Sri Lanka must appoint a committee comprises of various nations within Sri Lanka to investigate allegations of human rights abuses, as per long-standing international community requests. Implicit in this task is for the government to supervise the committee's performance and ensure justice is delivered in a credible and transparent way. The committee's final report must be binding and published for the international community's consumption, and those found guilty must face trial according to the law. Hence, exploring the potentiality of UNPKO requires that a proper investigation of human rights allegations is conducted.

The SLA has still not suitably utilised its troops for UNPKO. This is particularly true about female peacekeepers and trained engineer troops. Female peacekeepers are able to access populations and venues that are closed to men, thereby improving intelligence about potential security risks. Additionally, they can screen women during searches, an act which is considered a taboo for men in many cultures. Sri Lankan engineering troops possess substantial experience and a wealth of knowledge that would be vital for UNPKO. Many TCCs do not have adequate numbers of engineer troops to deploy on UNPKO. Hence, it is recommended the to contribute UNPKO, with Sri Lankan female peacekeepers and engineer troops to UNPKO to fill a much-needed gap in these missions.

Following Bangladesh's lead, the Sri Lankan government should consider establishing a National Task Force to accelerate the decision-making process regarding UNPKO. The coordinating body should be

empowered to implement national policy and revise it in a timely and accurate manner, as per requirements.

The research suggests that there is a considerable delay in the procurement of new equipment for UNPKO. Therefore, it is recommended that the government should formulate new laws and/or policies to address government procurement shortfalls.

Maintaining the Peacekeeping Readiness System (PCRS) is of vital importance for any country to provide troops to UNPKO on an ad hoc basis. Sri Lanka still has not adopted this system failing to take benefits of its advantages with regard to international recognition and monetary benefits. Hence, it is recommended that the SLA maintains the PCRS in order to fulfil UNPKO vacancies when those opportunities manifest.

To maximise the potentiality for UNPKO, Sri Lankan troops must develop their peacekeeping capacities. Therefore, special mission, pre-inductive and task-oriented training should be assigned to Sri Lankan peacekeepers, prior to deployment. This training should include ancillary subjects such as cultural/societal awareness, basic language instruction, and relevant religious knowledge. Therefore, it is recommended that the SLA should conduct a capacity building training programme for peacekeepers prior to their employment and mission in training during the process.

There are substantially more benefits in conducting a regular mission for any TCC. For example, Bangladesh has signed a perennial, regular mission agreement with the UN, which has benefited the South Asian country immensely. Similarly, Sri Lanka can contribute to a regular mission in terms of troop deployments. It should seek such an agreement to maximise the number of UNPKO opportunities that it is accorded.

Sri Lankan diplomats in the UN have to play a critical role in developing new opportunities for UNPKO, and the international recognition that is associated with such missions. Sri Lanka must appoint suitable professionals who understand the value of UNPKO and will work ardently to increase the nation's participation in those programmes. These diplomats must advocate on behalf of the SLA and demonstrate how Sri Lanka's professional military can greatly benefit UNPKO. Therefore, it is recommended to appoint suitable personnel as UN diplomats and task them to play an active role in obtaining new opportunities for SLA troops in UNPKO, thereby enhancing the nation's overall international recognition.

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EFFECTIVENESS OF COMPUTER BASED SIMULATED SMALL ARMS FIRING DEVICE ON TRAINING OF OFFICER CADETS OF THE SRI LANKA ARMY

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ABSTRACT

Sri Lanka Military Academy (SLMA) is the main military institution that facilitates Officer Cadets to improve their firing skills. Yet, the use of live-firing has been restricted due to an array of reasons. Against this backdrop, it is essential to identify the existing limitations of live-firing in induction training and to identify the viability of new technological advancements to overcome those limitations. As there is growing tendency towards the increased use of virtual technologies such as simulator firing, this research explores the feasibility of introducing a computer-based small arms firing simulator device to identify and improve the effectiveness of Officer Cadets training in the Sri Lankan Army. As a data collection method, views were collected from a sample of Officer Cadets, recently passed out Young Officers and weapon training instructors through two questionnaires. The study revealed that weather and environmental problems, logistic requirements, availability of firing ranges, safety issues, availability of limited amount of ammunition, and limited time availability due to compact training schedules have negatively affected on firing skills in induction training conducted by the Sri Lanka Army. Furthermore, the researcher found that cost effectiveness, user friendly environment, correct feedback, safety and limited space for training are advantages of small arms firing simulator. While it is identified that simulator firing is no substitute for live-firing, it is identified that exposure to simulator firing can greatly improve basic marksmanship skills of Officer Cadets. Therefore, the researcher concludes that combined practice of live-firing with simulator firing can be utilised to enhance the basic marksmanship skills among the Officer Cadets at SLMA and KDU.

KEYWORDS: *Firing, Marksmanship, Simulator*

INTRODUCTION

Accurate firing is an essential competency in any military. Every Army officer or Cadet Officer should improve their accuracy in handling weapons. The proficiency of handling weapons always depends on proper training and the application of basic marksmanship fundamentals. Induction training is generally the opportunity where trainees learn basic marksmanship skills that carry a long way in their careers. In some instances, those who could not acquire the basic skills of accurate firing during the induction training have never been able to develop this important skill even later on in their careers. Therefore, it is important to implement a proper system to deliver continuous training to the officers throughout their career. However, it should also be compatible with the available resources and time constraints.

The Sri Lanka Army provides a number of opportunities for Officer Cadets at Sri Lanka Military Academy (SLMA) and General Sir John Kotelawala Defence University (KDU) to improve basic marksman skills. However, there are limitations in the weapon handling training in Officer Cadet Courses due to an array of reasons. In this study, the researcher focuses on understanding the prevailing limitations of manual firing for Officer Cadets in the present training context at SLMA and KDU, in order to explore the possibility of introducing a small arms firing simulator towards achieving better competency in this area.

According to Kerry, J. (2013), small arms induction training is a vital component in any military. Firing is a skill that requires constant practice to develop or maintain a certain competency level. While routine weapon training practices at SLMA help improve weapon handling skills, it does not provide them an opportunity to recognise their own mistakes. Therefore, the trainees need frequent opportunities to practice firing and check their performances. Existing limitations in manual firing are hard to overcome and is nearly impossible to increase firing opportunities. On the other hand, the training curricular are overloaded, therefore, it has become difficult to allot additional time slots to accommodate firing demands. During an interview conducted on April 22, 2019, the Commanding Officer of the Officer Cadet Wing at SLMA, Colonel AP Wickramasekara stated that the Sri Lankan Army encounters serious limitations on manual firing that negatively impact on the performance of trainees. Wu and Bill (2008) argue that there are many issues that need to be addressed when organising induction training outdoor by using manual platforms. Due to weather and environmental problems, logistic requirements, availability of firing ranges, safety issues, availability of limited ammunition, and limited time availability due to compact training schedule have negatively affected on firing skills in induction training conducted by the Sri Lanka Army.

Therefore, this research attempts to identify the prevailing limitations in the present manual firing platform, that in turn would pave the way to explore probable remedial measures to overcome such issues. It also focuses on advantages of introducing computer-based small arms firing simulator devices for enhanced performance in small arms firing skills of Officer Cadets. The study aims at establishing a positive-ended bridge between current issues in the manual firing platform and introducing small arms firing simulators that the author perceives would produce a way out towards enhanced firing performance by the target audience. The author is optimistic about the virtual technologies in weapon training due to its many factors such as low risk, low cost which requires no capital expenditure, more firing opportunities, cost effectiveness, ability to identify weapon handling errors accurately, and environment friendliness.

This research is significant due to many reasons. The study attempts to identify the prevailing limitations in the present manual firing platform that in turn paves the way to explore probable remedial measures to overcome such issues. It also focuses on advantages of introducing computer based small arms firing simulator devices for enhanced performance in small arms firing skills of Officer Cadets. The study aims at establishing a positive-ended bridge between current issues in manual firing platform and introducing small arms firing simulators that the author perceives would produce a way out towards enhanced firing performance by the target group. The author is also optimistic about the safer environment with low risk, low cost other than the capital expenditure, increasing opportunities, cost effectiveness, ability to identify weapon handling errors more perfectly, and environment friendliness.

RESEARCH OBJECTIVES

The objectives of the study are as follows:

a.   Identify the exact limitations existing at present that negatively impact on manual firing.

b.   Explore the probable options available in the current context of peace and economic status of the country that can potentially impact on overcoming the existing limitations.

c.   Analyse the possibility and effectiveness of introducing small arms firing simulator device as a remedy to overcome existing limitations and improve the firing performance of the Officer Cadets.

LITERATURE REVIEW

a.   Basic Marksmanship Skills. Precision firing is an important factor in any military training around the world. Anderson (2014) revealed that it is important to improve the weapon handling capabilities of Army Officer or Cadet Officer. Marksmanship can be defined as a fundamental skill necessary for military personnel that enables an accurate fire practice to reach the desired range of weapon. Nevertheless, marksmanship is a basic component of cadet training within the Army worldwide. Generally the marksmanship training is conducted on live-firing ranges and live-firing performances indicate the training competency (Chung et al., 2011). Aiming, breath control, movement control, trigger control, follow-through are five fundamental elements in marksmanship training. All of these elements work together as one process and should be practiced together in following ways (Chung et al., 2011).

Table 1: Fundamentals of Basic Marksmanship Skills

Ser	Topic	Sub Topic
1.	Breath control	Breathing control, natural respiratory pause, and natural aiming point.
2.	Trigger control	Bucking, finger placement, flinching, firm grip and grip of firing hand, trigger control and squeeze.
3.	Aiming	Accuracy, aiming process, follow-through, eye on front sight post, sight adjustment, sight alignment.

4.	Position	Body placement, bone support, eye relief, feet placement, finger placement, firm grip, forward elbow placement, forward hand placement, leg placement, muscular relaxation, muscular tension, rifle butt placement, stable firing position, stock weld placement.
5.	Other	Consistency, distance effects, weapons safety.

Source: Chung et al., 2011

Apart from these basic fundamentals, adapting to the different environmental conditions is also an important factor in making a competent shooter in battlefield. Weather is the most considering factor that can affect shooter target. According to Scribner, Wiley and Harper, (2007) weather affects the round that leaves the barrel, especially when taking targets over 600 meters distant. Wind, light, humidity, and temperature are four types of weather conditions affecting the manual firing target. Wind can change the target drastically and the round is affected by wind from left and from right at right angles. Humidity is the amount of vapor in the air per square foot. High density resists the motion of bullet and in the group, the mean point of intact is lower than the point of aim (Scribner, Wiley and Harper, 2007). Light will affect for shooter's visibility and move the round away from the group target. In contrast, marksmanship fundamentals provide foundation to create a competent shooter. Live-firing is the commonly used method in the field for delivering marksmanship fundamentals. However, with the technological evolution simulator based training is increasingly being used for sharpening the skills of shooters.

b. **Marksmanship Training for Officer Cadets.** Sri Lanka Military Academy (SLMA) is the main institution of military training for officer cadets in the Sri Lanka Army. There are number of Officer Cadet training programmes conducted by SLMA as directed by the Army Training Command and Directorate of Training (Directorate of Training , 2019). The basic summary of the programmes are as follows:

Table 2 : Course Curriculum of SLMA

Ser	Course	Duration	Number of Periods
1.	Officer Cadets Degree Course	Two year and nine months	270 day periods and 25 night periods
2.	Volunteer Officer Cadets Course	One year and six months	188 day periods and 16 night periods
3.	Lady Officer Cadets Course	One year	104 day periods and 2 night periods
4.	Intensive Course for KDU Officer Cadets	Six months	116 day periods and 2 night periods
5.	KDU Officer Cadets Course	One year	178 day periods and 6 night periods
6.	Direct Enlist Officer Cadets Course	Four months	43 day periods and 8 night periods

Source : SLMA, 2019

A perusal of the SLMA course syllabus would reveal that sufficient time periods are not allocated for weapons training. Weapons training periods are also divided into practical, theory and site preparation. Therefore, very limited time period is allocated for small arms firing training.

Basic Marksmanship Course at MSTS is another opportunity for Officer Cadets to obtain mastery in small arms firing. This package enables Officer Cadets to go through a comprehensive firing practice to improve their firing skills, correct their firing positions and simulator training. The course conducted for a duration of 12 days consists of 111 periods dedicated to both theory and practical sessions. This is a good opportunity for officer cadets to improve their marksmanship skills and identify their mistakes due to the close supervision and feedback provided by weapon training instructors to ensure complete and thorough understanding of the training (MSTS, 2019). Moreover, Officer Cadets of KDU get the opportunity to practice live-firing during KDU degree programme period. They have two live-firing sessions annually during their cadet period at KDU and they are allocated with weapon training session periods in their provisional programmes to improve their marksmanship skills.

Apart from that, Sri Lanka Army's Young Officers are given an opportunity to train in small arms firing and live-firing sessions at the Infantry Training Centre at Minneriya and Army Training School (ATS) at Maduruoya during their Young Officers Course. Marksmanship skills and knowledge gained by officers during their cadet period can be practically exercised during these live-firing sessions.

c. **Simulator And Simulation**. Simulator is a computer system, device and programmable machine to direct training and monitor human action in a systematic way. In addition, simulation is a systematic process to control in a physical, mathematical, or otherwise logical representation of a system. According to U.S. Department of Defense (2011) there are three types of simulation methods named as virtual simulation, live simulation and constructive simulation. Among those, virtual simulation is the well-known method practice in marksmanship training.

d. **Simulation-Based Training**. Simulation technology has a long history in the field of marksmanship training. It delivers a technological substitution that resolves the resource sharing problem by creating virtual environment for satisfying the demand. Some well-known simulator types are Extended Reality (XR), Mixed Reality (MR), Augmented Reality (AR) and Virtual Reality (VR). The MSTS firing simulator can be categorised as Mixed Reality (MR). Simulation-based training uses computer-based virtual environments to expand or replace percentages of the real environment. This helps to reduce the risk and damage to the participants and environment while reducing the overall training cost (National Training and Simulation Association, 2011).

e. **Use of Simulators in Military Training**. In a review research by Orlansky et al. (1994) on aircraft simulators conclude that a combination of real equipment and simulators for training are always effective than the use of actual equipment alone. For example, one hour of aircraft simulator training was equivalent to 48 hours of actual aircraft time. In addition to that, the simulator averaged about 10% of operating costs of the actual aircraft. A review by Hays et al. (1992) and Caretta and Dunlap (1998) stated that the use of both simulator and actual aircraft for jet

aircraft training consistently results in better performance rather than the use of an aircraft alone.

Using simulators for training does not have a long history in Sri Lanka and marksmanship training is traditionally conducted on live-fire ranges. However, the cost of live ammunition, the availability and accessibility of live-fire ranges, and administrative overheads associated with planning and conducting live-fire practices make the use of simulators an attractive alternative for marksmanship training. The Sri Lankan Army has been using simulators since 2017 for marksmanship training. Similar systems are currently being employed by the Sri Lanka Navy for their marksmanship training.

f.   **Efficiency and Effectiveness of Marksmanship on Simulators**.   According to the Stephens and Temby (2014), marksmanship simulators are believed to be effective environments for trainees to become familiar with different weapon systems, as well as learning the principles of marksmanship and receiving instructions. This is because marksmanship simulators are generally more accessible than live-fire ranges, and also provides a gentle environment in which to learn, particularly for trainees with limited or no experience with live-fire weapons. However, Thomasson (2013) expresses the importance of having battle conditions in the simulator. The latter aspect is believed to lead to faster skill acquisition and hence, more efficient training during the early stages of learning. Overall, marksmanship simulation appears to be viewed as an effective supplement (but not replacement) for live-fire, when used in conjunction with marksmanship coaching.

There are few studies that provide empirical data regarding the effectiveness of marksmanship training conducted through the simulators. Several studies have shown that firing performance is generally poor in the simulator compared to live-firing (Keefe and Tikuisis, 2003). In addition, there is considerable variation in the correlation between simulator and live-fire scores, with values of the correlation coefficient (r) ranging from 0.17 (low) to 0.68 (high) (Smith, and Hagman, 2003). For the majority of these studies, correlation coefficient value was found as low to moderate values. In these cases, simulator performance was not a useful predictor of live-firing performance and it was not possible to reliably predict live-fire qualifications.

Stephens and Temby (2014) concluded that the combination of simulator and live-fire training, achieved significantly higher scores in firing. It was concluded that the blended training method allowed cadet trainees (with minimal live-fire experience) to focus on learning the basic firing techniques and gaining familiarity with the weapon system on the simulator whilst conducting simple marksmanship practices.

g.   **Comparison of Manual Firing and Simulator Firing.**

Table 3 : Comparison of Live Firing and Simulator Firing

Ser	Live-Firing	Simulator Firing
1.	Accommodate comparatively high training time and time for pre preparation.	Reduce live training time and ammunition usage (Indracompany, 2019).

2.	Safety issue arise while using first time.	Simulator can potentially be used to determine readiness for live-fire qualification (Stephens and Temby, 2014).
3.	Helps to improve army marksmanship training from different angles such as target type, shot distance, light and weather condition.	Only some parameters such as distance and light can be changed through the computational system (Indracompany, 2019).
4.	It is not easy to adjust for the desired training conditions.	Simulators can be adjusted as per the training conditions and the instructor's requirements (Stephens and Temby, 2014).
5.	Training conducted in the natural environment with natural disturbances. However, there is no proper mechanism to detect incorrect handling positions.	Aim point detection technology, realistic weapon handing technology, navigation and 3D geo-specific training environments can be seen in the simulator system (Esigma Systems GmbH, 2019).

Source : Stephens and Temby, 2014

According to Thomasson (2013), it is fairly well-established that varying levels of simulation can be effective tools in the practice and perfection of skills in the context of shooting as well as the improvement of other skills. In the firing, for instance, instructors rely on simulation as a useful training method for multiple reasons. Practice incorporating increasing levels of likeness to competitive situations has become common place at virtually all levels of shooters. Additionally, it must be noted that although it is difficult to perfectly simulate an actual scenario, training for the addition of various qualitative characteristics can still be useful during preparation.

An example of an increasingly prevalent method of simulation in practice for gunners of all levels, for instance, is the use of artificial noise during practice in order to prepare for battle field or arena. Most notably, the practice of trying to simulate external conditions, such as crowd noise, weapon noise can be found with gunners due to the significant effect that artificial noise can have on a team's level of play. Although this method of simulation only provides one qualitative parallel to actual competitive situations, it has become popular in order to allow for preparation of a salient element of shooting performance. The example of using artificial noise to simulate battle conditions is a prime representation of a way in which simulation can be presented employing only one element to ten competitive situations in a more genuine fashion. However, more than just simulating sound, visual experiences will have added importance for training (Thomasson, 2013).

METHODOLOGY

Primary data for the study was collected from a sample size of 230 respondents that included 144 Officer Cadets, 56 recently commissioned young officers and 30 weapon training instructors of the Sri Lanka Army

using a structured questionnaire. These Officer Cadets, Young Officers and weapon training instructors were selected based on the criteria of convenience of the researcher in regard to the data collection. As participants of the research questionnaire are representatives of all Officer Cadets and weapon training instructors of the Sri Lanka Army, the collected data and its results can be generalised to the entire community. The close-ended positive questions were designed with five-point Likert Scale in order to examine how strongly factors are agreed or disagreed.

CONCEPTUAL FRAMEWORK

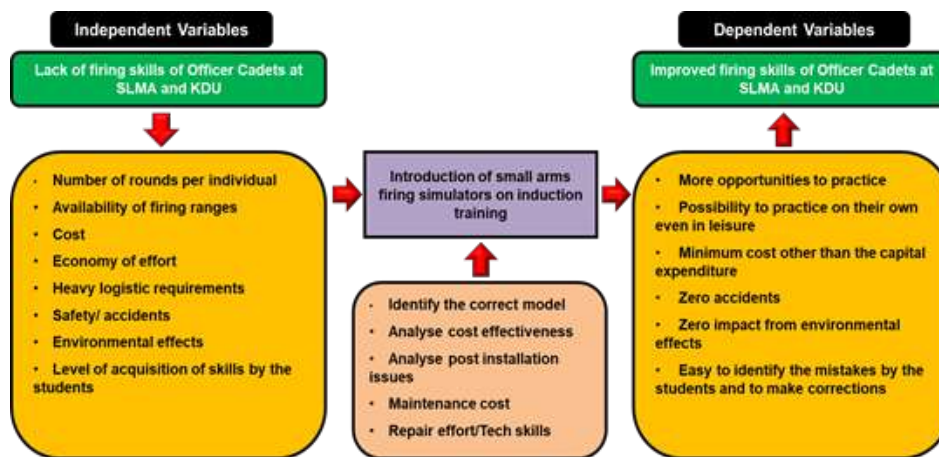The conceptual framework of this study is as follows:

Figure 1 : Conceptual Framework
Source : Developed by Author

RESULTS AND DISCUSSION

Research data collected from sample population comprising 230 respondents reveal the possible correlations among the developed variable through the conceptual framework. Relation of mediating variable; introduction of small arms firing simulators on induction training, with independent variables; number of rounds per individuals, availability of firing ranges, cost, heavy logistic requirements, safety, environmental effects, level of acquisition of skills by the students are facts to consider. Majority have disagreed that they received adequate live and training ammunition under manual firing. The conclusion is that the respondents did not receive adequate training and live ammunition due to various constraints and training design. Responding to the question on ease at which live-firing ranges for Officer Cadets at SLMA is reserved, majority disagreed with the statement and a few respondents provided neutral answers. Presently SLMA does not have a firing range on its own and all the firing ranges are under the control of the MSTS. SLMA training wing staff finds it extremely difficult to reserve firing ranges according to the SLMA training schedule as MSTS, too, conducts a number of marksmanship courses and competitions. The majority agreed that safety level in simulator firing is higher than live-firing. As safety is an essential factor at any training establishment; simulator firing can reduce risks to a greater extent. When Officer Cadets go through simulator firing sessions over a period of time they can adopt best practices that can be applied to a live-firing environment to ensure better safety. The majority agree on bad weather and environmental factors negatively affecting their groupings in firing. Therefore, it is evident that evaluation and on-site correction of individual defects is difficult during induction training. The majority of respondents tend to favour simulator firing due to its maintainability with

little repair and also due to the device's ability to detect the mistakes of the firer which helps them in making corrections in the simulator firing device. Officer Cadets are of the opinion that their individual skills can be sharpened by using simulation technology-based firing sessions. Although majority agreed with simulation-based training as more interesting than manual firing training, this result indicates the necessity of simulator training for Officer Cadets during their induction training that will greatly assist them in perfecting their firing skills.

Correlation between effectiveness of simulator training with live-firing accuracy, less time restrictions for training and user friendliness under small arms simulator shows that there was positive correlation between variables. There was negative correlation between effectiveness of simulator training with the environment and weather conditions. Therefore, the researcher has identified that environmental and weather conditions do not affect simulator training sessions as per the survey results. On the other hand, correlation output shows that there was negative correlation between simulator training and risk factor which indicates that simulator firing systems that are safer than manual firing ranges. There was a positive correlation when it comes to the deployment of small firing simulators enhanced combat efficiency and effectiveness of the Officer Cadets with achieved good marksmanship skills during induction training. It also proved that simulator firing sessions are more supportive than manual firing in achieving marksmanship skills and positively affected weather constraints, reduced ammunition costs and other operational expenses.

a.   **Existing Manual Firing Course Curriculum.**   In this study, the researcher found the effectiveness of simulator firing to improve basic marksmanship skills among Officer Cadets at SLMA and KDU. Therefore, the researcher arrived at the following conclusions through the data analysis and the data presentation. The majority responded that the Officer Cadets do not receive sufficient live and training ammunition for firing due to various constraints. Furthermore, Officer Cadets expect more weapon handling and live firing sessions to develop their basic marksmanship skills as most of the participants in the survey expressed their discontent on the unavailability of such training. On the other hand, this result suggests that the present course curriculum needs to be upgraded to allocate adequate live firing sessions. In addition, wasting of time on different non-training purposes is inevitable during manual firing sessions at firing ranges; thus, it is worthwhile to explore remedial measures to curtail the waste and utilise that time purposefully.

b.   **Weapon Handling and Firing.** The majority of the survey participants were of the opinion that accuracy in live-firing depends on individual skill level and external factors. Accuracy in live-firing depends on individual's aiming, trigger squeeze quality, steadiness, control of breathing, body relaxation, confidence, quality of the weapon, wind direction and speed, temperature and humidity whereas accuracy is least dependent on the condition of ammunition. Therefore, it is essential to identify individual weaknesses and improve individual firing skills. However, in manual firing it is difficult to identify individual weaknesses due to the impact of external factors. Therefore, to improve individual errors an environment free of external impacts should be made available during induction training.

c.   **Simulator Firing.**   In this study, the researcher identified that deployment of firing simulators at SLMA and KDU has the potential of rectifying most of the limitations that the manual firing has. According to the National Training and Simulation Association (2011),

firing simulators reduce the risk and damage to the participants and environment while reducing the overall training cost. Majority of the participants accepted that simulator firing can reduce risks to a greater extent. Furthermore, majority of the participants agreed with cost effectiveness of simulator training considering less repairs and damages. According to Stephens and Temby (2014), marksmanship simulators are generally more accessible than live-fire ranges and also provides a gentle environment to learn. As per the view of the majority of participants, simulation-based training is more interesting than manual firing training and also user-friendly devices offer a unique feedback and are easily acclimatised. However, the majority is of the opinion that they achieved marksman skills during their exposure to simulator firing. Therefore, the researcher emphasizes that simulator firing training programmes are effective in firing practices. Orlansky et al., (1994), Hays et al., (1992), and Caretta and Dunlap (1998) reviewed that a combination of real equipment and simulators for training are always effective than the use of the actual equipment alone. Although simulator firing is not at all a total replacement for live-firing, it provides greater opportunities for trainees to identify their weaker areas and seek the professional assistance of instructors. Similarly, instructors can better facilitate the trainees in a simulated environment prior to exposing them in live-firing environments.

CONCLUSION

Simulator firing in present day context is not an alien experience for young school leavers joining the Army. Certainly they have been exposed to similar commercial apparatus as youngsters. This foundation is worthwhile developing to inculcate one of the most important skills for military personnel that will remain right throughout their career.

In this study, the researcher mainly focused on the effectiveness of introducing firing simulators to enhance basic marksmanship skills among officer cadets at SLMA and KDU during their induction training. The survey results have amply proven that simulator firing practices are more effective due to prevailing constraints in live-firing. The researcher identified that simulator firing is not a total replacement for live-firing due to obvious reasons; however, Officer Cadets' exposure to simulator firing can greatly improve their basic marksmanship skills. Therefore, the researcher concluded that combined practice of live-firing with simulator firing enhance the basic marksmanship skills among the Officer Cadets at SLMA and KDU.

The research outcomes suggest that the introduction of small arms firing simulators enhance basic marksmanship skills among Officer Cadets at SLMA and KDU. Further, the use of firing simulators has the potential to overcome certain inherent limitations in live-firing, such as the scarcity of time, and the ability to reserve firing ranges. Accuracy, instant feedback to trainees and low maintenance cost provide potent justification for the need of computer-based small arms simulator for induction training.

It is recommended to introduce firing simulators during induction training at SLMA and KDU. Hence, Officer Cadets must be exposed to simulator environment prior to live-firing and provide them with the opportunity to rectify their shortcomings. Weapon training instructors should go through an orientation training capsule on simulator firing before employing them on instructor assignments. This instructor-trainee relationship in a simulator firing environment can produce quality training for officer cadets. Officer Cadets receive better opportunities in simulator firing to correct their handling errors in the simulated environment as external factors cause minimum impacts. Once

Officer Cadets are acclimatized with simulator firing to enhance weapon handling skills, they are better prepared to undertake live-firing.

The small arms firing simulator reduces the live-firing sessions. The live-firing restricts to conduct individual assessment of trainees. Therefore, Small Arms Firing Simulator can be recommended for conducting orientation and marksmanship lessons during small arms training. Sequential progress of officer cadets can be better monitored in simulator firing. Therefore, officer cadets have the liberty to maintain their own records to have an idea on their progress.

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IMPORTANCE OF DEVELOPING BATTALION LEVEL INFANTRY TACTICS IN ORDER TO FACE VIOLENT EXTREMISM IN SRI LANKA

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ABSTRACT

When states no longer have the desire to engage in the conventional wars with each other, terrorism, extremism and nonstate actors are gradually taking over the role of the original devastator of the societies. Even after the end of Humanitarian Operations in 2009, Sri Lanka had to encounter a number of experiences which the entire nation was shocked due to the insurrection of VE in the form of ethnic, religiose or social violence. However, regular infantry is the last trump of the government against the VE to re-establish law and order. Recent examples of such type of occasions suggest that, even though infantry can somehow curtail the situation, infantry could not prevent the VE reaching to a level, where it disturbed the day to day life of the society and inflict severe economic constraints in the development of the country in direct and indirect ways. Apart from that, in certain occasions infantry troops were blamed as fundamental right violators and had to face their tragedy by proceeding to many legal prosecutions. Hence, this research was conducted to find the aspect that infantry fails to address this new phenomenon and formulate guidelines to develop a new training module. Conducting a number of interviews and data surveys by questionnaires, this research emphasises the key areas under the focus of educational, tactical and technological streams, that Battalion level infantry should focus to develop its training in order to successfully control the situations in which infantry has to face VE insurrections.

KEYWORDS: *Infantry Tactics, Tactical Doctrine, Violent Extremism(VE),*

INTRODUCTION

Human civilisation has seen no shortage of wars during its prolonged history. Many of these wars had immensely contributed to create the present geopolitical shape of the world (Perlmutter & Frankel, 1991). The importance of warfare, and the necessity to master it was identified in the earlier civilisations. Even though there is an unavoidable tendency to resolve conflicts by the means of war, the present geo-political situations highly discourage interstate wars after the devastation caused by the second world war. This situation had paved the way

to the emergence of various non-state actors, specially after the termination of the Cold War (Acharya, 1995). In the modern context, the enemy of the state can be either self-emerged or cultivated by external influences within the state, and that has the capability to bring down even the biggest empires. Due to these reasons, the concept of VE has gained substantial concerns in todays' world as a significant factor which ultimately threatens national security.

Sri Lankan society is also not immune to the current world trend of VE. Specially considering the fragile peace situation that Sri Lanka passes after the humanitarian operations (Draper, 2016), it is acceptable that some incident might set off the scenario for another large-scale conflict. Considering the recent Sri Lankan experiences of VE (including the violence against the Muslim population in Kandy on March 2018 and Rathupaswala water crisis in 2013, it is evident that security forces will be called to bear the last burden due to the failure of other government authorities (Shakthi, 2019). Those situations have caused severe damages to the reputation of armed forces in one hand, and in the other hand military could not contain it from becoming a national tragedy. Infantry soldiers and junior level commanders who were launched to the situation with lack of expertise had to experience the bitter consequences of the crisis. Even though police and numerous civic organisations are present to solve these types of uprisings related to VE, the Army is the last resort of a country, and the Army will be undoubtedly tasked to shoulder the ultimate burden. Further, infantry is the arm which is commonly utilised for emergency situations because of its widespread nature all around the country, and feasibility to be employed with in short notice. Therefore, it is extremely important to ensure the proper mechanism with in the infantry battalions to mitigate this issue.

RESEARCH PROBLEM

Sri Lanka is presently passing a post conflict situation. This scenario can also be called as a fragile peace situation where the VE ideologies can be easily exploited. Further, Considering the last nine years after the humanitarian operations, there had been several occasions which showed the rising of a new extremist trend in the Sri Lankan society (Punchihewa, 2015) and (Aliff, 2015). Security Forces will be the last option of the government to control such situations in order to maintain peace and security in the country. Mainly, infantry troops were always employed for these types of situations, because internal security falls under the circumstances which infantry operates and infantry Battalions are located covering all the different areas of the country. However, infantry troops could not successfully control VE before it inflicts a considerable economic and social damage to the country. This fact is evident considering three incidents which happened during the last five years (Rathupaswala water crisis, Sinhala Muslim riots in Galle and Kandy). During each of these occasions, either infantry troops had to face for legal prosecutions after the incident or infantry troops could not control the situation before it reached up to the level of international media propaganda against the country (Guardian, 2018). Therefore, finding new tactics and successfully training infantry troops in order to handle VE is paramount important.

RESEARCH QUESTIONS

The research was based on a number of research questions and those are as follows:

a.   What is the existing training module used in infantry units to train troops in countering VE?

b.   What are the aspects that the Army has failed in using the current system to counter VE?

c.   What are the areas to be improved in order to address the deficiencies of the present system?

d.   What are the successful models used by other countries in order incorporate with the Sri Lankan system?

e.   What are the recommendations to develop Battalion level infantry tactics and training, to handle the situations of VE successfully?

OBJECTIVES

The objectives of this research are as follows:

a.   To evaluate the existing training module and tactics used in infantry to counter VE.

b.   To identify the areas that the Army has failed to address by using the existing system of countering VE.

c.   To study the improvements required, in order to mitigate the failed areas in the present system.

d.   To study the successful training modules used by foreign armies to address VE.

e.   To bring out the recommendations to develop Battalion level infantry tactics and training to handle the situations of VE successfully.

LITERATURE REVIEW

Modern concepts of strategy and warfare are growing intensively complex, and the world continues evolving into an era, where the meanings of the words will be extremely contradictory, according to the time and context. Karl von Clausewitz defined War as an act of force intended to compel the enemy to do our will (Howard & Paret, 1976). Even though this fact remains constant, the perception of enemy had spread its roots into many grey areas where finding clear definitions are no longer possible. Non-state actors, terrorists, and VE organisations also fall into this category of enemy of the state, whereas they do not possess the characteristics which Clausewitz saw in the enemy. Under these circumstances, it is essential to seek the literature in order to define this phenomena clearly and understand the gap with related to VE and infantry tactics in the Sri Lanka Army.

a.   **Violent Extremism.**   According to Rapoport (2004) famous theory of modern terrorism, the world is currently facing the religious wave which makes the essential background for the emergence of VE. United Nations was trying to give a global definition for the term VE since early 2001, but it was not feasible due to its widely alternating nature (Eddine et al., 2011). Federal Bureau of Investigation defines VE as encouraging, condoning, justifying, or supporting the commission of a violent act to achieve political, ideological, religious, social, or economic goals (FBI, 2017). According to Eddine et al (2011) Australian National Counter Terrorism Committee defines VE as the willingness to use violence in support of promoting beliefs of political, social or ideological nature. Further, the public safety of Canada defines VE as a process of taking radical views and putting them into action by using violence (UNHCR, 2017).

b.   **Theories Related To Violent Extremism.**   There is a considerable amount of literature regarding VE, and as it was stated earlier, the extremism is a relative concept according to its circumstances (Schmid, 2014). Therefore, global definition to differentiate

between violent and non VE is ambiguous, yet as it is commonly considered, when extremism is associated with a considerable use of violence it is identified as VE. According to the literature, it was observed that there are two different theories proposed regarding the dimension and types of extremism as follows:

(1) **Two Dimensional Concept of Extremism.** According to this concept, VE has two dimensions as value based and action based. Basically, this theory discusses the difference of extremism according to the ends and means. Value based extremism is focused on a set of values which are extreme and the final intended state of a process will be extremist. On the other hand, action based extremism will be using means of extremism and specific extremist actions to reach the desired end state (Eatwell & Goodwin, 2010).

(2) **Three Types of Extremism.** According to this concept three types of extremism have been identified (Wiltrobe, 2006).

(a) Extreme by the method and not by the goal.

(b) Extreme by the goal and not by the method.

(c) Extreme by the goal and the method.

Further, according to Australian Government Department of Defence (Eddine et al., 2011) the following theoretical concepts are available with related to the concept of VE:

(1) **Rational Choice Theory.** This theory attempts to explain about the interests of individuals contributing in the VE. It states that the possibility of an individual participating in VE will be decided as per the analysis of benefits against the cost. In other words, if the benefits are higher than the cost, the individual will participate in VE.

(2) **Structural or Societal Theory.** This theory explains that certain groups who possess common extremist values and ideologies such as political violence, selects VE as a course of action out of many ways and means. It explains that, because of the fact that society is a mixture of many groups, there are certain groups that select and execute VE. Therefore, VE is a result of these violent groups in society which selects it as their course of action.

(3) **Relative Deprivation Theory.** This theory explains VE as a result of people being relatively deprived in the society. According to this if an individual believes that he or she is deprived from the others in the society of economic, social or political ways, it would lead him to drive towards violent extremist movements.

Apart from those, Khalil and Zeuthen (2016) provide a timely relevance argument to understand the root causes of VE. According to them, VE mainly has three root causes in present context.

(1) **Structural Motivators**. This talks about the causes of the social structure such as injustice, unemployment and rivalries with in communities.

(2) **Individual Incentives**. This talks about generating a sense of purpose through an ideological change, sense of belonging, adventure, acceptance and such type of individual feelings as a cause of VE.

(3) **Enabling Factors**. This talks about the access of radical ideologies by online and social media as well as radical mentor being present in the society to ideologically convert people to VE.

c.   **Development of Infantry Tactics.** Organization and doctrine of the Sri Lanka Army infantry units are based on the UK doctrine which was inherited to the Sri Lanka Army at its inception. The primary role of infantry is to close with and destroy the enemy or force him to surrender (Taining Tacics, 2008). These definitions were adopted by the Sri Lanka Army from the two UK tactics publications (Army Code No:0101 and 0107) which were revised in 1995. Nonetheless, considering the development and fresh trends of land warfare during the last 23 year from 1995 onwards, it is questionable to depend entirely upon these doctrinal teachings in order to deal with present issues. Since the nature of the VE always depends on the insurgency and non-traditional threats, it is imperative to note that, development of a vital counter strategy to stop VE should be rooted from the counter insurgency doctrinal teachings.

Points to be taken from US tactics of Countering Violent Extremism. Even though the US military has proven its capability to sustain a number of counter terrorist campaigns, the US military does not comprise of a precisely perfect method of countering VE (Powers, 2017). Even though there are a number of drawbacks in the US system, there are some valuable insights which can be utilised in the Sri Lankan situation mentioned in the US Army Field Manual 3-19.15, which is dedicated to civil disturbances operations. According to United States Army (2005) above discussed operations are called Control Force Operations and any such operation would consist of three basic stages; Blocking, Dispersing and Containing. Apart from that, use of Military Working Dog (MWD) teams in the front of the crowd controlling troops to create a psychological impact and as a way of using of non-lethal force on the crowd can be a considerable option in Sri Lanka as well. Further, US troops use a Combat Cameramen in order to video and photograph every incident and conduct on location interviews to be used as witness and media purposes as situation permits(United States Army, 2005).

Points to be taken from UK tactics of Countering Violent Extremism. Since the basic model that Sri Lanka had adopted also came from UK doctrine, it is significant to evaluate the role of UK military to counter VE. According to the latest development of British doctrine (Joint Doctrine Publication 05, 2016), military forces had been given a clear task to fight VE both inside and outside the UK. In addition, UK authorities are successfully using the technique of "Kettling", which is referred to the containment of violent crowd by contracting troops into a smaller area (House of Commons, 2009). In fact, Kettling technique act as a cordon which gradually contracts into a smaller size. UK metropolitan police use this successfully during the riots against G20 summit in year 2010 (Joyce, 2010).

Indian Army Doctrine is used for Countering Violent Extremism. Similar to the situation of Sri Lanka, the Indian Army also does not have specified training to counter VE. Mostly universal counter insurgency principles are used in order to control civil unrest. According to Rana (2012), in the short term, the Indian Army intends to bring down the violence to manageable levels and in the long term to eradicate the roots of violence (Rana, 2012). This concept can be taken as a base in developing Sri Lankan tactics in order counter VE. Other than this, there are no practical adaptations for Battalion level infantry tactics from the doctrine and practice of the Indian Army.

Points to be taken from Canadian Army tactics of Countering Violent Extremism. According to (Frini et al., 2008) the Canadian Army focus on the concept of reducing lethal weapons and maximising non-lethal weapons in countering VE in the form of ethnic, religious

and social violence. This can also be taken as a viable consideration in developing infantry tactics.

d. <u>**Engagement of Sri Lanka Army Against Violent Extremism**</u>**.** According to above reviewed literature VE in Sri Lanka can be categorised as Action base VE (Eatwell & Goodwin, 2010) which is caused by Enabling Factors (Khalil & Zeuthen, 2016). Further, it can be better explained under Structural or Societal theory (Eddine et al., 2011). Followings are few occasions where VE in the form of ethnic, religious and social violence erupted in Sri Lanka during the last Six years. Even though it is possible to argue that the cause of these each crisis is not VE, the fact remains that VE had played a significant role in escalating the crisis (Aneez & Sirilal, 2013).

(1)   Water crisis of Rathupassala during November 2013.

(2)   Sinhala Muslim riots in Gintota, Galle during November 2017.

(3)   Sinhala Muslim riots in Kandy during March 2018.

It is evident that in all these situations the following circumstances were similar:

(4)   The Police could not prevent the escalation of the situation and infantry units were employed to control the situation.

(5)   Even though the conflict was stopped, it reached beyond the deadlines by making an international level discredit to the government, security forces and kept many allegations against human rights violations (Guardian, 2018 & Sanjeewa, 2017).

(6)   Even though infantry troops could stop the violence, infantry could not prevent the conflict before it reached to a level which inflicted national level economic and social damage.

Therefore, this study will focus on formulating a suitable training module in order to prepare infantry to overcome these challenges. Further, the study seeks to find out what would be the components of such a training module and what are the alterations to be done to present training module.

METHODOLOGY

This study was based on a problem statement and a number of research questions. Furthermore, there will not be testing of hypothesis and intention of the researcher is to bring out suggestions regarding essential components of a new training module.

Furthermore, this research was carried out following the post positivist approach and the epistemological approach was subjective. Hence most of the data gathered represent both qualitative and quantitative data collections, the research was primarily based on mixed method which consists of both qualitative and quantitative data samples.

a.   <u>**Data Collection Methods**</u>**.** Data required for the study was collected by both primary and secondary data sources.

(1)   **Primary Data Collection**. Primary data collection was done by the researcher using 2 data collection methods as questionnaires and structured interviews. Questionnaires were given with close-ended questions and were measured by using the Likert scale (Vagias, 2006). Further, structured interviews were conducted by the researcher and those responses were also evaluated for the analysation of data.

(2) **Secondary Data Collection**. Secondary data was collected from the existing reports and articles (local and international), with related to the outbreaks of VE and how land forces managed to mitigate the situation. Moreover, available news articles and explanations which are given on internet, was also considered regarding the occasions where VE erupted in the Sri Lankan society.

b. <u>**Sample Size And Sampling Methods**</u>. In order to collect the above mentioned primary data, both probability sampling method and non-probability sampling methods were used. Questionnaires were distributed by using stratified sampling and participants for the interviews were found by using the snowball sampling method. Detail description of the sampling size and method is as follows:

(1) **Sampling Method Used to Distribute Questionnaires**. The total population of the research is considered as, number of officers serving in 5 infantry regiments of the Sri Lanka Army. Each infantry regiment was considered as a separate stratum, and stratified random sampling method was used to distribute questionnaires. Furthermore, according to the current command system practiced in the Sri Lanka Army, the junior level decision makers who are in the ranks of Captain and Major would have to take decisions in real time when infantry is deployed for countering VE situations in the field.

(2) **Sample Selected for Interviews**. 20 middle-grade officers were selected for interviews, who are presently commanding the infantry companies. Considering the fact that they have commanded infantry companies in the current context, they might have valuable insights about the deemed development in infantry tactics. These interviewed personnel were selected with the reference from regimental headquarters. The researcher had requested from each regimental headquarter to nominate four Company Commanders who are suitable to be interviewed. Those nominated Officers were interviewed by using structured interview techniques. All these Officers were asked the same structured 4 questions, and their responses were taken into consideration.

c. <u>**Analysing Interview Data**</u>. The researcher had interviewed 20 personnel who are currently serving as Company Commanders of Infantry Battalions. The sample size of 20 was distributed equally with five infantry regiments of the Sri Lanka Army. Data gathered from interviews were analysed and coded into themes according to Axial coding based on the Straussian Grounded Theory (Bryman, 2012).

Three themes emerged which are relevant to the research questions when coding the participants' interviews. Those are as follows:

(1) The education level of soldiers.

(2) Employing Officers with experience and knowledge.

(3) Controlling of Social Media.

According to the emerged themes, further facts were analysed. Even though, "Controlling of Social Media" had strong relevancy under countering VE, it was not further taken into consideration since it falls beyond the capacity of infantry and subject area of the researcher.

According to the interviews conducted, many had emphasised about the importance of educating soldiers in order to understand the larger picture. Further, several participants had believed actual rehearsals during training courses where soldiers exposed to an almost similar situation would be helpful in mitigating this condition. Besides, some participants mentioned that selecting of soldiers for these types of tasks should have a selection criterion.

Even though it did not emerge as a theme, surveillance of the situation using remote control drone cameras is another enlightening fact that came out from 3 officers. They believe it would gather evidence to save soldiers and deter the extremist crowd as well.

Many have emphasised the importance of training conducted with troops as a separate team in order to understand the practical problems. Further, several officers were not satisfied with their knowledge about the legal aspects related to VE scenario. In addition, inexperienced young officers being sent to the field suddenly was not appreciated by almost all the officers. Many emphasised, the importance of establishing a criterion to designate only matured and experienced officers for this kind of situations.

RESULTS AND DISCUSSIONS

The percentage of the participation was 100%, and the responders have completely accepted the invitation. Distribution of questionnaires according to the military channel would have been a supportive factor for the complete participation.

Majority of the responders have expressed their dissatisfaction with the present system as it was not suitable for achieving the national purpose of employing infantry to counter violent extremist situations. In addition, presently used module of training and logistics and technological readiness of the troops was highlighted as areas which do not suit the current task. Further, it was observed that the current training module does not prepare infantry for the various complex situations where infantry could be employed in the present context.

Further, it was identified that soldiers have practically shown certain panic and aggressive behaviours as a result of lack of awareness regarding the situation. This had often led to the negligence and violations of standard Order Procedures. It is of importance of educating soldiers regarding all relevant subjects (specially about the significance of their task to national security was identified).

The Kettling tactics used by the UK para military forces also provide valuable insights about how to handle the VE situations. This method can be highly relevant when addressing the inability of containing the violence of present system. Besides, concept of maximising non lethal weapons and increasing the employed number of troops, used by the Canadian Army is also a point which can be implemented in Sri Lanka.

The basic three stages used in the US Army to execute the countering VE operations, (Blocking, Dispersing and Containing) provide a sound framework about how these operations should be designed. Apart from that, Military Working Dog and enhanced use of camera operators to photography and videography are also important.

RECOMMENDATIONS

Infantry tactics and its training development should be focused on three fundamental aspects such as Educational, Tactical and Technical aspects as described follows:

a.   **Educational Focus**.   Educational aspects of development can be listed as follows:

(1)   VE is an emerging concept of the world, and it demands a thorough study to understand it. Even though it is hard to expect that soldiers would understand this subject comprehensively, it is required to conduct lectures to sub unit commanders in the level of Senior Non Commision Officers and Non Commision Officers to give a brief understanding about the concept of VE.

(2)   Soldiers and Officers should have a clear understanding about the end state desired to achieve by employing infantry to counter VE.

(3)   The awareness of troops (Senior Non Commision Officers and Non Commision Officers) should be built, regarding media and the vital role it plays in the contemporary democracies. Soldiers should know that a single photo with an aggressive action of a soldier could shutter the entire political spectrum.

b.   **Tactical Focus**. Tactics should be more focused on mission command and sub unit commander's initiative. Guidelines to improve the present tactics and training module is as follows:

(1)   Blocking, Dispersing and Containing should be taken as the basic three stages of countering VE operations.

(2)   Main grouping of the troops should also change as Blocking Group, Dispersing Groups and Containing Group.

(3)   A separate section should be established and trained to handle MWD and use them in the VE situations.

(4)   Kettling tactics should be trained and adopted with relevant changes to Sri Lankan situation under laid down Rules of Engagement.

(5)   Use of non-lethal weapons should be maximised with the coordination of kittling tactics, therefore training should be conducted in order to familiarise the use of non-lethal weapons.

(6)   In order to achieve a deterrent psychological effect and assist the containment, quantum of troops should always be not less than the minimum level of three infantry companies.

c.   **Technological Focus**.   Establishing a technological subsection which consists of 3 to 4 soldiers will be beneficial for the entire sub unit of soldiers. Given the fact that, they have sufficient training about the technological equipment they use they can effectively perform the following tasks which benefit the entire team:

(1)   Using drone cameras to record entire event and salient occasions where those may or may not use against military forces in a court of law. Moreover, this will allow recording all the evidence, and it would create deterrence for the extremist group as well.

(2)   This team can use Jammers to hinder communication between extremists and halt false media updates which can provoke conflict situations.

(3)   Conducting interviews is also a viable option in order to use for the later media campaign and as shreds of evidence.

CONCLUSION

Infantry tactics had been continuously evolving according to the threat throughout the history. Therefore, it needs to be evolved to face VE the next major threat that the world is experiencing. Extremist religious ideologies in the East and West and the global diffusion of violence and terror give an indication to the state actors to be ready for non state threats. Analysing the present conflict situations around the world suggests that, VE plays the major role in destabilising states. Furthermore, Sri Lanka recently had the bitter taste of VE insurrection in Kandy in the form of Sinhala and Muslim rivalries and it created a number of social economic issues in the aftermath (Rasheed & Cader, 2018). Therefore, emergence of VE in the society is an unavoidable possibility and the states should be prepared to deal with it.

Many countries in the world have the same challenge, thus most of the countries are maintaining well trained and sufficient number of paramilitary units that are specifically train to deal with VE situations which are emerging as religious, ethnic and social violence. Unfortunately, Sri Lanka does not have that luxury due to the limited economic and social capabilities. Under those circumstances, infantry is the only available asset in Sri Lanka to perform this task. In this contents, infantrymen have to perform the task of normal paramilitaries and infantry is inherently vulnerable for human rights allegations and legal prosecutions due to its offensive nature.

Presently, the Infantry Regiments of Sri Lanka are using very basic tactics to deal with the above mentioned VE uprisings in the form of religious, ethnic and social violence. These methods were initially developed by the British Forces during late 1960s. However, this method does not cater for different kinds of situations and challenges presented by VE. Therefore, this research was conducted with the aim of formulating the basic guidelines of successful training module in order to prepare infantry for this uphill task.

This research was conducted on mixed approach by using both qualitative and quantitative means. Even though VE is a broader terminology, this research mainly focused on the situations where VE is emerging as religious, ethnic or social violence. The basic research questions were answered at the culmination of the research indicating certain developments in Battalion level infantry tactics and the results emphasize regarding the utmost importance of developing Battalion level infantry tactics in order to face VE in Sri Lanka. After conducting a number of interviews with the infantry Company Commanders who are in a position to be employed for the task of countering VE, and gathering survey data from the same population it was found out that

infantry training in Battalion level should be updated in three main focus areas as Tactical, Technological and Educational. Thus, the required measures should be taken to develop Battalion level infantry tactics in those areas in order to face the threat of VE. The study concluded by formulating viable guidelines regarding the deemed development of Battalion level infantry tactics, yet further research should be conducted to formulate tactics to counter VE with related to the other arms of the Sri Lanka Army.

In conclusion, no army would possibly neglect the following wise words of ancient Roman strategist Vegetius (Clark, 1993).

"If you want to live in peace, prepare for war"

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ESSENTIALITY OF HUMANITARIAN LOGISTICS FOR HUMAN-CENTERED MILITARY OPERATIONS DURING DISASTER RELIEF

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ABSTRACT

Disaster can be local- international or natural - man-made. It leads to massive damage or loss of lives, exceeding the ability of a country to cope. In the initial reaction to a crisis, military forces will play a vital role in protecting lives and delivering lifesaving support to the affected people. The efficiency of Humanitarian Logistics directly contributes for the successs of humanitarian operations. Hence, all of these humanitarian logistical tasks are main considerations in the response to disasters. Also, military offer significant, passive protection for endangered civilians by their presence as both witness and preserve influence. It is difficult to stick to humanitarian values, particularly in complicated human crises where there is a natural disaster. Comparatively the Sri Lanka military is in a high position. The picture of a peacekeeping force domestically and globally would be achieved by successful humanitarian efforts. Such morale-boosting benefits may generate unknown risks. Therefore, the aim of this research is to emphasize how military uses humanitarian logistics activities for the success of their humanitarian operations. Additionally, to get an idea about how Sri Lankan tri-forces obey humanitarian principles. Articles from different scientific publication, databases and relevant military documents were collected to recognize the theoretical aspects of humanitarian logistics. Then, relevant newspaper articles, websites were used to identify the practical implication of SL military roles during disaster relief. Further, this paper can be used as an initial study for those whoare interested in military human-centered operations.

KEYWORDS: *COVID-19, Humanitarian Logistics, Military, Disaster Management, Sri Lanka*

INTRODUCTION

In the initial reaction to a crisis, military forces will play a vital role in protecting lives and delivering lifesaving support to the affected people. The security services are historically used as a final option in the humanitarian intervention but recently they were used as one of the first respondents. The military is constantly called upon to corporate or even lead humanitarian assistance and disaster relief logistics, to address this obstacle. The phenomenon persists as the frequency and nature of disasters are rising and aid funding does not really reach demand (Pablo Yuste, 2019).

Disaster can be local, national, or international or natural or man-made disasters (Martinezb, 2010). It leads to massive damage or loss of life, exceeding the ability of a country to cope. Although all disasters have a local impact, humanitarian assistance and disaster relief operations are regional as the effects of major events are multinational in a globalized economy. Complex human situations are often the consequence when natural disasters cross into conflict zones. The urgent need for all accessible emergency services is apparent in these situations (Pablo Yuste, 2019). Although there are extended representations of the disaster management life cycle, in this research the following (Figure 01) cycle will be considered. The authors have divided the cycle into four stages: preparedness, response, rehabilitation and mitigation.
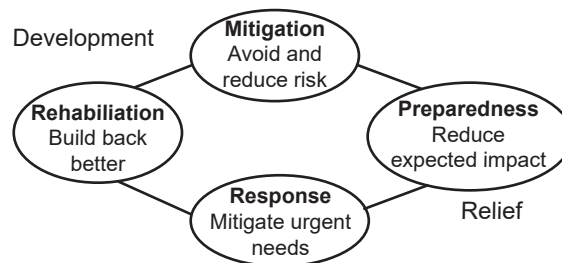

Figure 1- Disaster Management Life Cycle
Source: Martinezb, 2010

This cycle of disasters is necessary when natural disasters are increasingly frequent, serious and difficult around the world, owing to a combination of changing climate, globalized markets and rapid urbanization in flood lands and coastal areas. The potential of the humanitarian logistics network is stretched beyond its coping with disasters because of the increasing complexities and also the trans - boundary existence of disasters and complicated emergencies.

Lately, due to the COVID-19 pandemic, consideration of Humanitarian logistics operations and participation of military to mitigate such disasters have become highly essential. Within the humanitarian community, the term logistics can be explained as; "The method of preparing, executing and controlling the effective, economical flow and storage from the point of origin to the point of consumption of goods and materials, in order to meet the end beneficiary's requirements." (Barber, 2016). 'Logistics' is also defined 'supply chain management' within commerce and business. Importantly, the humanitarian approach is closely aligned with a generic military understanding of the concept when viewed as "logistics" this way. The latent and powerful capacity and capability of the logistics system was not fully integrated into the preparedness, response and recovery activities of the disaster. Primary source of data were collected by reviewing tri-forces websites and related

documents regarding the disaster mitigation processes and specially COVID-19 mitigation process. As secondary source of data, various journals, related literature, publications, newspaper articles were considered.

Even though Humanitarian Logistics is a highly critical factor for the smooth operation of disaster life cycle; many people still unaware of the gravity of this component. Thus, this paper would address how Humanitarian Logistics have helped the success of the military operations so far and suitable suggestions to make military humanitarian operations more efficient. The objective of this research is to identify the essentiality of Humanitarian Logistics for the success of military operations. First, it's necessary to have a better theoretical knowledge about Humanitarian Logistics and protection activities by the military other than war itself before considering the necessity of humanitarian logistics to military operations.

LITERATURE REVIEW

a.   **Protection Activties By The Military**. Armed forces can offer significant, passive protection for endangered civilians by their presence as both witness and preserving influence. For example, patrolling affected populations to decrease the risks of unknown incidents of violence on minorities. However, decisions on the involvement of victims of conflict in protection activities should be deferred to trained protection officers' expertise, if not obviously, lives are naturally at immediate threat. (Wright, 1995)

When considering 'military other than war'; the following are the activities should be carried out by the military during disaster relief;

(1)   Maintaining the surrounding buildings and facilities that are important to the living of the community, such as hospitals, power

and water plants, worship sites, schools kindergartens etc.

(2)   To ensure full freedom of movement of civil societies, including freedom to move to a position of protection, establish the presence in contested areas.

(3)   Maintenance of rural existence to encourage safe procedure to continue agriculture and food processing practices.

(4)   Preservation of important cultural resources in the area.

(5)   Ensure that local residents have access to medical care, including the protection of physicians in conflict zones.

b.   **Humanitarian Logistics (HL).**   HL is also one of the main considerations in response to disasters. Disasters are evident to the international community, and it's becoming a major concern. The efficiency of Humanitarian Logistics directly contributes to the success of humanitarian operations. The success of the Humanitarian Logistics process depends on people 's skills. In addition, skills are the abilities gained through training and practice that allow people to perform a role. (Rajakaruna, 2019). Humanitarian logistics is integrated into the response framework for local, national and international disasters. This refers to the broader network of supply chains, which involves procurement, purchase, storing and distribution of food, fuel, medicines, other materials, human capital and machinery. This involves the preparation, implementation and control of effective, economical movements and storage of goods and materials and relevant details from point of origin to use in order to ensure survival for beneficiaries and mitigate misery (Pablo Yuste, 2019).

Over the past few months, both local and foreign interest over humanitarian operations has increased due to the COVID-19 pandemic. An effective humanitarian operation helps to mitigate a population's emergency requirements, in the shortest period and with least resources, a sustainable reduction in their vulnerability. Preparation, response and collaboration are the fundamental components of effective humanitarian operations. Effective response ensures the rapid creation of a supply chain. Responding becomes less complicated when the response process is well prepared. Coordination can immensely help preparedness. Nevertheless, disaster response actors also have multiple goals and a fight for limited funding (Martinezb, 2010).

c.   **Humanitarian Principles.** According to UN OCHA Humanitarian activity disaster relief it is focused on four core principles (UN, 2012);

(1)   **Humanity.** People's suffering should be concerned wherever it is. The humanitarian intervention is aimed at securing life and safety and guaranteeing human dignity.

(2)   **Neutrality.** Humanitarian actors should not participate in disagreement or indulge in socially, culturally, religiously or politically controversial conflicts.

(3)   **Impartiality.** Humanitarian steps must be taken purely on the grounds of urgency, giving the most urgent cases of crisis priority and do not discriminate ethnicity, color, gender, faith, class or political views.

(4)   **Independence.** Humanitarian operations must be clear of the political, cultural, military or other objectives of all participants in the field of humanitarian intervention.

It can be difficult to stick to humanitarian values, particularly in complicated human crises where there is a natural disaster in a conflict region. The alignment between humanitarian and military with the specific prioritization between these concepts and the utilization of their respective supply chains' particular capabilities in order to reach a common purpose reflect emerging problems in disaster management.

d.   **Military Involvement In Humanitarian Logistics.**   Military participation in humanitarian aid has much potential to resolve vulnerabilities. Throughout recent decades, the process of distribution, peace-making and preservation of humanitarian assistance have been more complicated. Focusing on the complexity; military involvement in the procurement and provision of logistical assistance is needed nowadays. Humanitarian logistics varies significantly from military operations. Demand and supply are both mysterious and vibrant. Although the military has a very clear structure of command and control, it includes volunteers and dozens of other participants with various motivations and aims. Unlike the military, humanitarian logistics will follow the four core values for humanitarian aid. Hence, humanitarian logistics have to balance resources and efficiency, yet the effect is difficult to quantify (Martinezb, 2010). But Humanitarian Logistics and military operations should not be isolated.

METHODOLOGY

In this paper, the literature provides thorough knowledge about theoretical aspects of humanitarian concept, humanitarian logistics and role of military during a disaster relief which provides a foundation for preparing methodology, findings and recommendations for further analysis. This research paper has two objectives;

(a)   Identify the essentiality of Humanitarian Logistics for the success of human-centered military operations.

(b)   Improving military co-ordination with allies of humanitarian logistics.

To intrepid the theoretical knowledge and derive the above objectives, 13 articles were reviewed. The outcome of this study would help to recognize the role of logistics towards the success of military operations and sort out the mis-clarification by some local populations about close interaction between the military and humanitarian components during disaster relief. This paper has been structured in the following way:

Section I: Introduction and Literature Review; explains the theoretical aspect of humanitarian logistics and role of military during disaster relief.

Section II: The methodology for collecting and evaluating articles and publications regarding military operations during past few years.

Section III: Reviewing collected data through primary and secondary sources; the practical implication from tri-forces of Sri Lanka and how humanitarian logistics have been utilized.

Section IV: How military co-ordination with allies of humanitarian logistics, challenges and strategies followed by military for success of disaster relief operations.

Section V: Conclusion and future directions for research.

RESEARCH DESIGN

Articles from different scientific publications, databases and relevant military documents were collected to recognize the theoretical aspect of humanitarian logistics and activities of the military other than war. Then relevant newspaper articles, websites were used to identify the practical implication of SL military roles during disaster relief. Specially 3

interviews conducted by Logistics Times-2018 by Department of Management and Finance of General Sir John Kotelawala Defence University regarding the role of humanitarian logistics for military; respectively with Chief of Staff – Sri Lanka Army, Major General H Jagath S Gunawardane RSP VSV USP ndc psc, Director General Logistics – Sri Lanka Navy Rear Admiral H A U D Hettiarachchi VSV, USP and Deputy Chief of Staff of Sri Lanka Air Force Air Vice Marshal S Kotakadeniya WWV, RWP, RSP, VSV, USP set the main stream of the study.

The approach to gathering relevant literature using collection of keywords; Humanitarian Logistics, Military, Disaster Management in both local and global databases such as: Websites of tri-forces and UN, Google Scholar, Research gate, Science direct, Springer, Emerald insight and etc. For initial searching 25 research papers were gathered and out of which 13 papers were selected for further analysis of the study. The span of time; for the theoretical approach was the time in between 1995-2020 but for the practical implication of military was the time in between 2010-2020 (Post war era).

RESULTS AND DISCUSSION

a.   **Practical Implication of Tri-Forces of Sri Lanka.**   Highlighting the picture of a peacekeeping force domestically and globally would be achieved by successful humanitarian efforts. Such morale-boosting benefits may generate unknown risks. For instance, the local population may misinterpret a near partnership between the military and humanitarian components of an action (UN, 2012). The following examples are the recent activities conducted by Sri Lanka Tri-forces to mitigate various disasters.

b.   **COVID-19.**   COVID-19 is spreading worldwide, and there is no exception for Sri Lanka. As of 29th July 2020, in 215 countries and territories more than 17,039,592

positive cases were registered and almost 666,215 people died as a consequence of the pandemic (Wordometer, 2020).

The National Task for Quarantine of Returnees against COVID-19 transmission is on shoulders of Lieutenant General L H S C Silva WWV RWP RSP VSV USP ndc psc Acting Chief of Defence and Army Commander. While playing a prominent role, army troops developed 12 Quarantine Centers (QCs) across the country together with government stakeholders.
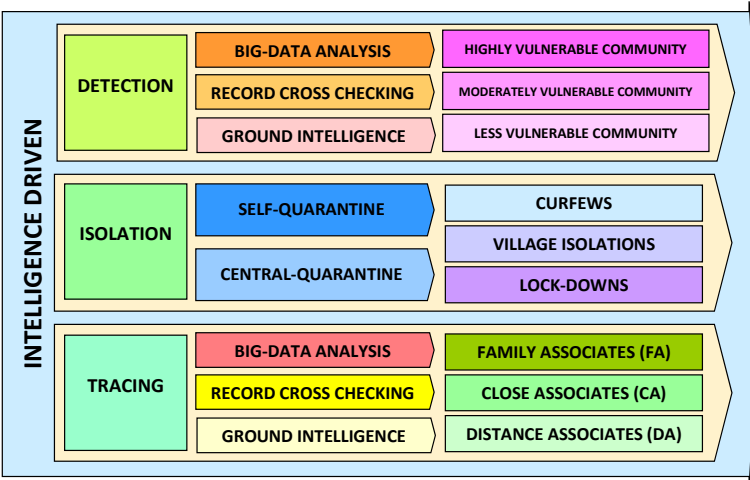

Figure 2 - DTI Model
Source: State Intelligence Service, 2020

The military forces were maintained and required to create and manage quarantine centers with the aim of preventing viruses from Sri Lanka and, if possible, suppressing them and preventing them from further spreading by different mechanisms. Detection, Isolation and Tracing are main components in this process. DIT model can be depicted in figure 02. DIT model is a proactive, competitive, forward and backward operation. It uses a variety of sources to cover land based surveillance / verification, recording checks, the analysis of boarder control data, information from telecoms companies, hotel reservations and numerous other sources. The model operates backward to determine the cause and period of the virus as or where a new case is detected or registered. In case of a positive situation in every vulnerable community, the DIT model shall apply in each case equally (State Intelligence Service, 2020).

Seeing the quick growing numbers of returnees, troops have so far improvised Quarantine Centers in Pompemadu and Rantembe to meet the needs at this crucial hour of our nation (Army, 2020). Punani, Kandakadu, Panichchankerni, 18 Sri Lanka National Guard camp at Meeyankulam, Borawewa, Galkanda, Kahagolla, Army Base Hospital Diyatalawa, Gemunu Watch camp at Diyatalawa and established two Quarantine Centers in Damminna.

The Quarantine Center has towel racks, blankets, refrigerators, books, unique cooking facilities for children and women with pregnancy and childbirth conditions, TVs, water boilers, fans, etc. Food served by Army chefs and cooks are properly processed, checked and sampled before serving the people in such centers by Public Health Inspectors (PHIs) and army nutritionists.

Figure 3 - Quarantine Centre
Source: (Army, 2020)

The military did way more than the responsibility of providing quarantine facilities. The ground task of the Sri Lankan Air Force, operating day and night to clean the entire airport, even outside the arrival lounge, must be highlighted. They carefully disinfected travelers arriving and even baggage. From day one, the Army, Navy and Air Force collaborated with the aid of Municipal Service members to clean public bus stations and key train stations until curfew was expanded. Some citizens had even stayed without transport during the curfew and were given cooked meals by the military before they were able to return home.

Figure 4 - Quarantine Center
Source: (Army, 2020)

For thousands of senior citizens, the Sri Lanka Army has done another creative operation. Pensioners were transported to the banks to receive their savings, and in both districts they dropped them comfortably at home. In the EPZ (Export Processing Zone) thousands of employees trapped in their accommodation during the lengthy curfew and they were unable to return to their homes. The army once again arranged busses-district wisely and safely took home the happiness of their parents (Mainly female employers).

Figure 5 - Humanitarian duties done by
Sri Lanka Navy
Source: (Joseph, 2020)

c.   **Flood**.   The   multiplicity   of humanitarian functions conducted in many relief centers in the post-disaster time of the catastrophic flooding in 2017 were expanded by tri-forces and different government entities.

Figure 6 - Humanitarian operations done by
the Sri Lanka Army
Source: (Army, 2017)

Army troops of the Security Force Headquarters - West (SFHQ-West), 14 Division Headquarters, 58 Division Headquarters, 141 Brigade, 142 Brigade, 581 Brigade, 582 Brigade and 583 Brigade as at present, with relief workers from Navy, Air Force and numerous

social workers, provided all possible assistance to the displaced staying at 208 temporary relief centers in temples, mosques, schools, public health centers, factories, community halls, etc in Colombo, Gampaha, Matara, Galle, Kalutara, Ratnapura and Kegalle districts. Supply of meals were done in collaboration with the Disaster Management Center, District / Divisional Secretariats and other authorities.

Meanwhile, under a 582 Brigade Headquarters and 583 Brigade in Ratnapura, troops of the Corps of Engineers Services (CES) with infantry and ground wings started clearing drinking water wells and people returned home in many flooded areas of Kalutara. (Source: (Army, 2017)

Figure 7 - Humanitarian operations done by the Sri Lanka Army
Source: (Army, 2017)

Figure 9 - Humanitarian operations done the by Sri Lanka Army
Source: (Army, 2017)

For the transportation of drinkable water, operation of mobile medical units, assistance in recording the required information of displaced persons, transportation of sick persons to hospitals, collection of abandoned items, if any, the clearing of domestic compounds and drinkable water wells, disposal of garbage in respective areas and places affected, and so on are among the key roles the Army has undertaken in each region.

In the areas affected, the Sri Lanka Navy has further intensified flood relief. The Navy has been involved in various humanitarian operations, including disaster recovery, relocation to safe areas, food and medical camping. This includes the relocation of the displaced populations.

Figure 8 - Humanitarian operations done by the Sri Lanka Army
Source: (Army, 2017)

Figure 10 Humanitarian operations done by the Sri Lanka Navy
Source: (SLN, 2017)

While the bad weather has left the country for now, the Navy is further improving its relief operations. Three mobile Reverse-Osmosis (RO) plants have also been constructed at the Research and Development Unit of the Navy in the Ratnapura, Baduraliya and Baddegama regions.

Figure 11 - Humanitarian operations done by the Sri Lanka Navy
Source: (SLN, 2017)

This one RO plant will supply up to 5,000 liters a day, promoting healthy, clean drinking water for communities. A total of 9571 people were rescued and transferred to safe places by the Navy flood relief teams. 194,800 rations of food were further distributed among the people affected.

Figure 12 - Humanitarian operations done by the Sri Lanka Navy
Source: (SLN, 2017)

In order to save the lives of the affected area, the naval flood relief teams would also continue to perform rescue and recovery operations.

The Sri Lanka Air Force has deployed its 17 helicopters, Bell 212, Bell 412 and its Y 12 aircraft, for the fourth consecutive day in support of ongoing aid operations in the provinces of Western, South, Southwestern and Sabaragamuwa.

Figure 13 - Humanitarian operations done by the Sri Lanka Air Force
Source: (SLAF, 2017)

The Air Force carried out over 30 flight outings to the most affected areas in Kalawana, Weddagala, Kalutara, Bulathsinghala, Ayagamá, Rathnapura, Baddegama, Wathurawa, Mathara, Thawalama and Yatigampitiya delivering cooked meals, dry rations, medicine, rescue boat and other forms of assistance.

Figure 14 - Humanitarian operations done by the Sri Lanka Air Force
Source: (SLAF, 2017)

The relief work carried out today was to provide more than 19,000 cooked food packets to the people affected by the floods in these regions, 14,295Kg of dry rations, 14,000 fresh water bottles and about 8,700 loafs of bread.

Additionally, 11 patients and two pregnant mothers were evacuated to safe places by Air Force aircraft, which also resulted in safe in flight child birth.

Figure 15 - Humanitarian operations done by
the Sri Lanka Air force
Source: (SLAF, 2017)

Sri Lanka's Air Force is conducting humanitarian assistance and disaster relief operations to help the people affected by the recent drift of misery.

d. **Usage of Logistics in Human-Centered Military Operations.** The all above mentioned missions are huge logistical tasks; however, it has been achieved precisely. According to the findings, even though protection activities by the military were discussed generally in the beginning, Sri Lankan military has sub-divided their logistical roles according to each division.

When it comes to peacekeeping in the Sri Lanka Army, major of their logistics roles have been divided among 5 service regiments. During these operations other Infantry regiments help to do it efficiently:

(1) **ESR- Engineering Services Regiment.** Role/Task - Maintain all buildings and associated facilities such as electricity, water and drainage systems in all accommodations used by the Army.

Further, undertake construction of capital works and inspections, designing and planning of all Army construction, supplying electricity, water sanitary, to all Army. and routing inspections should be done.

According to their procedures to obtain services; during high critical condition Service done in 48hrs, AFK 2 copy is sent with reason why it is carried out to Head Quarters ESR.

(2) **SLASC - Sri Lanka Army Service Corps.**

Role and Task in Peace:

(a) Transport support to Army –1st line transport to Army Head Quarters -Fmn HQs
(b) Supply of ration and FOL – receipt, issue, storage, maintenance, distribution of all supplies and all petroleum products.

(c) Barracks and services – providing electricity & water and meter reading, accounting.

(d) Ancillary services - Trg of B vehs drivers, Issue of B Vehs Licenses, Trg of Clerks, Cooks for the Army, catering advice to units Bakery svc and Firefighting.

Basically, SLASC does the most of the logistical part during a critical time such as procedures involved in issuing rations (Fresh ration & Bulk Ration), Transporting those goods and all goods and vehicles should be inspected.

(3) **SLMC - Sri Lanka Army Medical Corps.** Medical Advisor of the Commander of the Army. Advise COs on Medical.

It's an offence; to conceal a disease, to malinger, to refuse treatment or neglect taking medicine/treatment.

Role and Task - To provide troops with safe drinking water, adequate water supply for bathing, washing etc. c. Proper maintenance of Cook House safe food – cooks' /food handlers undergo EFI every month, examined by MO once in 3 months, maintain sanitary conditions, utensils to be cleaned after cocking, left over foods not to be used for next meal and protective vaccines.

(4)   SLAOC - Sri Lanka Army Ordnance Corps.

Role and Tasks:

To procure and supply all items of clothing stores, ammunition, weapons and vehicles required by the Army.

According to their responsibilities; all unit to be equipped according to the laid down scale, provision, receipt, storage and issue all ord stores, Accounting for all ordnance stores, Minor rep of all Ord stores (Not tec) and replacement supply of spare parts operation of laundry unit. collection of salvage and disposal. It is made up of seven regular ordnance battalions, three Base Depots and one volunteer (reserve) ordnance battalion and many independent ordnance depots give continuous support to the army.

(5)   SLEME - Sri Lanka Electrical and Mechanical Engineers.

Role and Tasks:

To ensure the operational fitness of the electrical, mechanical electronic and optical equipment of the Army.

Further, they advise other arms and svcs., advise the Dte of Budget & Finance, lay down policy and preparation of procedure and instruction concerning repair maintain, inspection and condemnation, repair of all equipment and planning for EME tools and wksp equipment.

Also unit repairs – At time, depending on the frequency of attention required.

However, they can mitigate the negative impacts on those around them while doing it in such a manner so the next generation won't experience it. Humanitarian logistics is not just about the planning, storing or transportation of A to B, or of warehouses to people. So, this is just what the citizens on the ground require and the prompt supply of necessary items. Coordination of the above mentioned activities are highly essential for the success of the humanitarian activities done by the Sri Lanka Army when a disaster occurs. If one task failed, the outcome would not be as expected.

When considering the role of the Sri Lanka Navy; To defend the sea and defending motherland is the primary task. The secondary role of logisticians of the SL Navy is to respond as soon as possible. They would not be able perform any activity in sea or land without a proper logistics system. The main responsibility of logisticians of the SL Navy is to quickly respond to their fleet units. Due to many troops of the SL Navy mostly deploying in the land base; they are moving from the 'Dvora' concept and increasing the number of ships.

The SL Navy has a separate units called Disaster Relief Operation Unit with all necessary equipment and coordination of logistics officers. It has mainly supply, engineering and medical branches. Further, the SL Navy has a collaborated disaster relief operation unit with Gemunu Regiment (SL Army). During the flood in 2017, the SL Navy used digital media to communicate with people who were affected and boats; from the HQ to be informed about

the gravity of the disaster and take necessary actions.

Last but not least the Sri Lankan Air Force (SLAF) aims to ensure national security through effective employment of air power. Basically, the SL Air Force has two core competencies, the main competency is air defensive and air offensive. Other core competency is conducting of monitoring and identification operations in Sri Lanka during day and night.

The key role of airborne logistics is to prepare for and sustain military forces with regard to planning, production, procurement, storage, delivery, repair, evacuation and distribution of materials. In addition, to transporting people and coordinating equipment, procurement or delivery of resources, medical procedures, clinical and rehabilitation programs play a significant part. The air force has the ability to transfer the disaster relief supplies to each and every area of the island which will hit the target with very little time which is a first to be active in any kind of rescue activity with a single call. There are few stages of relief operations in any kind of a disaster. Step one is to rescue all affected people as the immediate relief and rescue operations. Fulfilling their basic requirements such as shelters, food and other essentials are the second stage. As the final stage, the SLAF rehabilitation of affected people is considered. When a disaster occurs; these three stages work as a continuous process. In these activities, SLAF begins with the acquisition of a comprehensive logistics activities. Most organizations support them in an emergency scenario by supplying the gaps with immediate needs. The SLAF implements a large logistics operation, including taking items and delivering them to individuals. Such food packets are taken over and subjected to weight, charging, loading and repackaging and to make water resistant in order to avoid spoilage.

Medical Evacuation (MEDEVAC) SLAF Air Ambulance delivers emergency care for people in the case of a disaster or may need travel to the hospital at any moment.

Coordination of all of these operations done by tri-forces is vital significant to the effectiveness of military relief initiatives when a disaster happens. The outcome would not be as planned if one task failed.

d.   Challenges Face During Disasters Relief Operations.   There are few common challenges that military face during disaster relief operations. Those are;

Military humanitarian relief operations need to respect the principles of humanitarian but difficult to stick to humanitarian values, particularly, in complicated human crises where there is a natural disaster. However, comparatively Sri Lanka is in a good position.

Coordination of logistical activities is a common challenge occur during humanitarian operations. It's hard to keep the vertical and horizontal coordination in side and the outside the cluster. If one task failed, the outcome would not be as effective as planned.

Due to the lack of proper communication network, there are issues of appeal coverage of the affected people.

As a state body, the military needs to concentrate its spending on disaster relief and stick to budgetary limits; since, humanitarian operations are non profit-oriented.

The uncertainty and risk of humanitarian supply chain is critical since it has a short and unstable existence.

Corporation between stake holders is a major challenge during humanitarian operations since they facilitate the information flow

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effectively. In order to operate the information flow smoothly modern technologies should be adopted.

Out-dated rules and regulations related to disaster management should be updated and prone to amendments to avoid outdated methods.

Public support should be recognized as a major obstacle. Since the awareness of public about the disaster management operations is critical. Considering the SLAF, the main obstacle is the limitation of airpower such as geographical settings, weather, limited payload and cost.

**e.	Strategies Followed by Military for Success of Disaster Relief Operations.**	For choosing the approach and plan, there would be several steps often arising from the proper study of threats and risks, initial intervention, protection, reserves, infrastructure and warehouses, communication network, environment, local workforce, sea-lift exposure and preparedness.

The most essential strategy is the reducing the reaction time; for that military use foresee, forecast and stock strategy.

To face uncertainty of humanitarian needs, they keep surplus stocks in different places in order to cater for the expected demand. Also, they maintain their rescue equipment available to do any kind of a humanitarian mission at any moment.

The use of disaster impact information, logistical intelligence and economic intelligence is a key factor in formulating disaster relief plans and strategies.

Early gathering knowledge of geography, climate, entry points, transportation, air fields, source of supply all essential items are the secret behind successful relief operation.

CONCUSION

Coordination of all mentioned activities are highly essential for the successfulness of the humanitarian activities done by military when a disaster occurs. If one task failed, the outcome would not be as expected. The efficiency of Humanitarian Logistics directly contributes to the success of humanitarian operations. Hence, all of these humanitarian logistical tasks are main considerations in the response to disasters, each and every activity should have connected and should not be isolated.

Even though it is difficult to stick to humanitarian values, particularly in complicated human crises where there is a natural disaster in a conflict region. Comparatively, Sri Lanka holds a high position. Considering the recent humanitarian activity (Fighting for COVID-19); the Sri Lanka tri-forces showed its merciful generosity to all Sri Lankans regardless of race or religion-from the day the one medical alert was given to the public. The Regional Security Force Commanders have developed quarantine centers in safety locations, under the leadership of the Army Commander. The battle was carried out day and night by army engineers and other divisions associated with logistics and construction work. They also show their ability in record-time to set up quarantine centers. The Sri Lanka Army built solid infrastructure with the help of the Sri Lanka Navy and Air Force to provide the privacy and basic human rights of those who came for help with utilities and sanitation. It's proud to be the only country in the world that provids Free quarantine service from international airport for the well-being of Sri Lankans and foreigners. This proves that Sri Lanka military follows all four core principles to conduct humanitarian activities in disaster relief; Humanity, Neutrality, Impartiality, Independence.

The aim of this research is to emphasize how military uses humanitarian logistics activities for the successfulness of their humanitarian operations. Additionally, outcome of this paper may help to get an idea about how Sri Lanka tri-forces obey and follow humanitarian principles; specially for interested parties and people those who criticize human-centered military activities.

This research has some limitations. Since this paper focused on military other than war; Humanitarian operations during war time was left out. The investigation of these unexplored area should be aimed at future research. The review is only limited to 13 research papers for theoretical analysis and for the practical implication of the study previous interviews, newspaper articles, blogs were considered. Thus, the results cannot be generalized on the basis of this study.

However, this paper can be used as an initial study for those who insist to refer in depth about military human-centered operations. This study may influence to come up with recommendations on future development of military related humanitarian logistics operations.

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A CHRONOLOGICAL ANALYSIS OF THE MARITIME SECURITY OF SRI LANKA

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ABSTRACT

With the emergence of soft power and smart power strategies at a global level, the geopolitical significance and maritime security of Sri Lanka is something which goes beyond military strategy. In this context, this paper examines the changing nature of maritime security initiatives and activities related to both the military and the economy in the marine area of Sri Lanka throughout the past seven decades. Further, this article reveals that being a hub in Asia, Sri Lanka will have to face some unavoidable dynamic challenges within the parameters of rivalry or competition among major powers. Moreover, these articles also highlight the fact that the maritime security of Sri Lanka is something which goes beyond traditional and non-traditional security issues. The research will draw from a wide range of primary and secondary sources. The data will be analyzed using standard research tools including the descriptive analysis method. Moreover, the research involves qualitative research methods. Finally, the author argues that the changing nature of maritime initiatives and activities in the marine area of Sri Lanka as well as its military, trade and commercial importance makes Sri Lanka vulnerable to international and regional constraints.

KEYWORDS: *Indian Ocean, Maritime Doctrine Soft-Power, Smart-Power, Maritime Security, Small Power,*

INTRODUCTION

The Indian Ocean, the third largest ocean in the world which covers a total area of 73.44 million square kilometers and accounts for about 20 percent of the total ocean area in the world (Jiacheng, 2017), is considered one of the most geo-strategically significant areas when it comes to global and regional powers achieving their national interests. Traditionally, the Indian Ocean has become an area of contention between the superpowers and regional powers in terms of maritime dominance. In addition to this, being the location of major sea routes connecting the Middle East, Africa and East Asia with Europe and the Americas, global and regional powers are more interested with its energy resources, minerals and fishing

resources as well as seaborne trade and energy which transit via the Indian Ocean.

Among 28 states in the Indian Ocean region, Sri Lanka is one of the small powers and a party to the United Nations Convention on the Law of the Sea of 1982 (Tantrigoda, 2010: 1-2). Therefore, the Government of Sri Lanka exercises its jurisdiction over the territorial sea, contiguous zone, continental shelf and the exclusive economic zone in keeping with the provisions laid down in the convention (Ministry of Environment and Natural Resources, 2003: 11).

From the "sea power" point of view, Sri Lanka occupies an exceptionally key location in the world. Its lies in a strategically important shipping route which connects the Western with the Eastern part of the world. Annually a significant number of ships pass through sea lanes just six to ten nautical miles away from the country, carrying half of all container shipments and two-thirds of the world's oil transport (Wijesinha, 2016). In addition to this, the marine area of Sri Lanka is rich with living and non-living natural resources. It is important to note, however, that being a strategically significant small power in the Indian Ocean, Sri Lanka has given little attention towards developing a maritime doctrine which is considered a major element of national power. In this context, the research problem of the present research deals with how and why the Government of Sri Lanka manages maritime security issues within its marine area focusing attention on the historical experiences on maritime security issues.

The main objective of this article is to examine the different challenges to Sri Lanka's maritime security as raised by scholars in debates of security studies. Moreover, the present study highlights the possible strategies for managing the maritime security of Sri Lanka.

The research will draw from a wide range of primary and secondary sources. The secondary sources involve various books, journals, website releases, dissertations and newspaper articles. The data will be analyzed with then use of standard research tools including descriptive and analytical methods. Moreover, the research will involve qualitative research methods.

CONCEPTUALIZATION OF LITERATURE ON MARITIME SECURITY

Maritime security is perhaps one of the most important and contested discourses in the field of security studies. Therefore, there is no shortage of theory oriented studies on maritime security in the contemporary academia. In keeping with the existing literature, the field of maritime security has widened in recent times, encompassing traditional and non-traditional security challenges including legal matters related to the United Nations Convention on the Law of the Sea in 1982. Nevertheless, traditional high-end maritime security remains acute. It involves inter-state disputes over resources and control over vital sea lanes (Roeben, 2020: 83-103). Most of the existing literature on maritime security of small powers point towards the fact that although traditional state-centric security has transferred into modern human centric approach in the post-cold war context, the small powers are always threatened by it in different forms (Baral, 2017: 1-17). In addition to this, some scholars argue that ultimately, efforts to pursue enhanced maritime security on the part of small powers will be determined by how they plan a path between emphasizing their own vulnerability and the opportunities associated with their maritime domain (Malcolm, 2017: 237-245). In the context of the Indian Ocean region, some scholars have emphasized that small powers certainly face challenges such as a lack of the capacity to enhance their maritime

domain awareness and successfully react to insecurity (Malcolm & Murday, 2017: 234-256).

Moreover, the existing theoretical and conceptual discourses help us in defining the framework essential for the present research on maritime security of small powers like Sri Lanka. Studies of Sri Lanka's maritime security emerged after 1948, with an immediate focus on the distinguishing characteristics of colonial maritime security policy and post-colonial maritime security policy. Given the above considerations, literature on maritime security of Sri Lanka can be categorized under two phases.

The first phase denotes the Cold War period in the context of a realistic paradigm. In the first phase, the academia has subordinated developments at sea to wider themes in International Relations and International Politics, such as Great-Power politics, regional power hegemony, geo-strategy or international regime-building. Moreover, most of the first phase literature on maritime security of Sri Lanka has dealt with the cold war political paradigm and traditional security issues in the Indian Ocean in general and Sri Lanka's marine security in particular (Cordner, 2018: 189-224). Most studies from the Cold War to the post-Cold War era elaborated that Japan, the United States of America and India were the main actors inducing the maritime security policy outcomes of Sri Lanka (Jayasekara, 1992). Moreover, some studies emphasized that the power struggle between the superpowers during the period of the Cold War had influenced Sri Lanka to follow a non-aligned maritime security policy while bipolarity dominated the international system (Kodikara, 1973; Qureshi, 1964).

The second phase of literature on maritime security of Sri Lanka has given more priority to non-traditional security issues such as piracy, climate change, maritime terrorism, unreported and unregulated (IUU) fishing, illegal immigration, and smuggling of arms and drugs in the marine area of Sri Lanka. As pointed out by Zarina Othman, Nur Ruhana Nasuha Abdullah Jian, and Abdul Halim Mahamud (2013), the failure of the Thai government in handling and controlling drug smuggling at the Thailand-Myanmar border, created favorable opportunities for continuous arms smuggling by the LTTE with the support of the Tamil-Thai community of 10,000 in Thailand. This reality, combined with Thailand's strategic location next to Cambodia's illicit arms markets and geographic proximity to Sri Lanka, made it an area that the LTTE could not do without. In this background, most global security actors consider the creation and maintenance of security in the Indian Ocean essential to mitigating threats of short of war, including piracy, terrorism, and weapon proliferation, drug trafficking as well as other illicit activities (Pandya, et al. 2011: 1).

In the third phase, consideration of polarity and power shifts in the studies of Sri Lankan maritime security policy remains a key feature of related research. Several studies explore the fact that hegemonic pressure from global and regional power players, like the United States of America, China, Japan and India, consistently influenced the outcomes of Sri Lankan maritime security policy in terms of land and port power. For some scholars, geopolitical proximity and economic capacity are the prominent reasons to recognize both China and India as the most predominant states that influenced the maritime security policy of Sri Lanka (Silva, 2016; Gamage, 2017). The changing nature of literature on the maritime security of Sri Lanka appears to consider it a global trend of the post-cold war paradigm and a theoretical tendency of the neo-realistic and constructivist standpoints.

Given the above considerations, it is clear that there is no shortage of studies on maritime security of Sri Lanka. But existing literature tends to analyze Sri Lanka's maritime

security issues in terms of traditional and non-traditional perspectives. Therefore, an important point like developing a proper maritime doctrine has received little attention in the contemporary Sri Lanka's maritime security discourse.

THE INDIAN OCEAN AND GEO-STRATEGIC LOCATION OF SRI LANKA

Historically, the Indian Ocean, which spreads in an area of 73.6 million sq km, gained the strategic and political attention of global and regional power players due to its strategic importance. For Alfred Mahan (1890), the Indian Ocean is the most important and strategic Ocean of the Twentieth Century. Further, Robert Kaplan has highlighted the fact that the Indian Ocean forms the center stage for the challenges of the twenty first century (Kaplan, 2010). With the contemporary geo-strategic situation, their interpretation seems to be accurate, as most of the national interests of countries are directed through the Indian Ocean. With its geo-strategic location, the Indian Ocean provides major lines of sea communications connecting Europe, the Middle East, East Africa, East Asia, South Asia, India and Australia. Moreover, the Indian Ocean is a comparatively secure area. The choke points of the Strait of Hormuz, the Suez Canal and Red Sea, the Strait of Bab-el-Mandeb and the Horn of Africa, the Malacca Strait, Lombok Strait, the Sunda Strait, the Six Degree Channel, the Nine Degree Channel and the Cape of Good Hope all provide access to the Indian Ocean (Map, 01). Therefore, it appears that the Indian Ocean can be easily controlled by monitoring these choke points. Due to its strategic location, Sri Lankan ports can be easily used to control the Indian Ocean region.
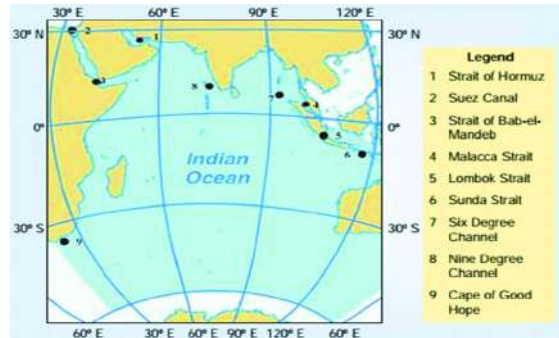
Map 1 - Major Choke Points of the Indian Ocean Region
Source: Research Gate

The Republic of Sri Lanka is a small power in the South Asia located in the Indian Ocean region, southeast of India, between 5°55' and 9°51' N latitude, and 79°41' and 81°53' E longitude. Its area is approximately 65,610 sq. km.; with a coastline of about 1,620 km (National Report of Sri Lanka, n/y: 1). The total marine area of Sri Lanka including the territorial sea, contiguous zone and Exclusive Economic Zone is supposed to be 8.7 times larger than the total land area. Sri Lanka and the southern tip of India stand on the same continental shelf and are separated by a shallow sea, the Palk Strait, which is barely 30 m deep. However, the shelf ends more abruptly in the south and east of Sri Lanka, averaging 22.5 km in width and rarely extending beyond 40 km. Within the shelf area, estimated to cover about 30,000 sq. km., the mean water depth is about 75 m, but the submarine elevations drop abruptly to 900 m within 3 km and 1,800 m within about 15 km of the shelf's edge. Beyond this there is a steep descent of over 5,500 m bringing it to the general bottom level of the Indian Ocean (Bandara, 1989).

MARITIME SIGNIFICANCE OF SRI LANKA

In the Indian Ocean context, Sri Lanka's marine area has been considered as rich and has been rated among the highly productive seas of the world. The natural resources of the coastal region of Sri Lanka include the land, minerals, mineral sand, surface and ground water, flora and fauna and other natural habitats which include coral reefs, mangroves, sea grass beds, lagoons, tidal flats (salt marshes), sand dunes, beaches and spits and the coastal waters (National Report of Sri Lanka, n/y: 8). Further, Sri Lanka's marine area consists of economically important resources such as fishes, crustaceans, mollusks and marine plants. In addition to this, Sri Lanka's marine area (sea bed) can be used for exploration and exploitation of oil, minerals and hydrocarbon resources (Premarathne et.al, 2013: 9-12).

Therefore, Sri Lanka's marine area is significant for the regional and global consumption of energy and natural resources. In addition to this, the maritime area of Sri Lanka provides important shipping routes connecting the Western to the Eastern part of the world (Map, 02). In this context, Sri Lanka's marine area is a hub in the Indian Ocean. Further, it provides key trans-shipment ports (De Silva, 2018: 13-22).

Map 2 - Shipping Lanes near Sri Lanka
Source: Sri Lanka Group

In short, the strategic location of Sri Lanka, where major sea lines of communications pass just miles away from its southernmost tip, is rapidly becoming one of the most important islands in the Indian Ocean region in terms of global maritime trade, commerce, natural resources and military purposes. Further, it is clear that the key global highways of maritime shipping run South of Sri Lanka. Around 36,000 ships including 5000 tankers pass through the sea lanes west of Colombo and south of Hambantota in Sri Lanka. Moreover, The Trincomalee port is one of the most strategically significant natural ports in the world. For regional and extra regional power players the Trincomalee port has always been a very smart location to base their naval assets. Therefore, the marine area and maritime security policies of Sri Lanka are vulnerable to the international and regional constraints in the context of global power rivalry in the Indian Ocean region (Narula, 2016).

REGIONAL AND EXTRA REGIONAL CONSIDERATIONS

Given the above considerations, global and regional power players such as the USA, China, Japan and India prefer having very close trade, commercial and military relations with Sri Lanka (Map, 03). While all four countries share an interest in securing maritime trade routes, the United States has invested relatively few economic and security resources in Sri Lanka, preferring to focus instead on the political environment (Congress of United States Senate, 2009). Therefore, despite its size, managing maritime security is a key factor to Sri Lanka. In his book, Robert D. Kaplan analyzes the importance of the Indian Ocean in general and Sri Lanka's geopolitical location in particular. In a broader viewpoint, Kaplan, has given prominence to the geopolitical location of Sri Lanka (Kaplan, 2010).

Map 3 - Maritime Hub in Indian Ocean
Source: Sri Lanka Group

By considering its strategic location in the Indian Ocean, during and after the Cold War, Sri Lanka (Ceylon) acquired importance in the global strategic considerations (Mendis, 1992). More importantly, during the period of the Second World War, the South East Asian Command (SEAC) of Axis powers deployed its navel military strength in Colombo and Trincomalee ports and air facilities were improved in Ceylon by the SEAC to make military operations against Japanese bases in northern Sumatra, Port Blair in the Andamans and to disrupt Japanese communications in Sumatra, Burma and the Gulf of Siam (Jayasekera, 1992). In the contemporary world, most global powers consider the maritime significance of Sri Lanka in context of global power rivalry.

In addition to the global powers, India, as a regional power of the South Asian subcontinent, is also concerned of the strategic location of Sri Lanka in the Indian Ocean. From the maritime security point of view of India, Sri Lanka assumes serious strategic importance in the Indian Ocean region (Muni, 1993). In the 1940s, Kavalam M. Panikkar, India's most famous maritime strategist, argued that the Indian Ocean should remain "truly Indian", advocating the creation of a "steel ring" around India through the establishment of

forward naval bases in Singapore, Mauritius, Yemen (Socotra), and Sri Lanka. The study has highlighted the strategic location of Sri Lanka as one of the sources for achieving the national interests of India (Panikkar, 1945). In this context, during the period of the Cold War, India's concern regarding the significance of Sri Lanka's marine area in the Indian Ocean has been conceptualized thus 'as long as Sri Lanka is friendly or neutral, India has nothing to worry about; but if there be any danger of this falling under the domination of power hostile to India; India cannot tolerate such a situation endangering her territorial integrity' (Poulose, 1982).

CHRONOLOGICAL CHANGES OF MARITIME SECURITY OF SRI LANKA

With the end of the Cold War, the significance of Sri Lanka's strategic location has undergone a change with the existing power rivalry in the Indian Ocean region. As a result of emerging new power player in the Indian Ocean, the traditional power player role of India has been challenged by China. Considering its strategic significance, China has given more priority to building close relations with Sri Lanka.

In this scenario, Sri Lanka looks at China as a stable Asian power which is important for achieving some national interests. Therefore, the Chinese support remains to be of special interest to Sri Lanka. But, it is important to mention here that China did not have strategic interests in Sri Lanka until recently when its maritime position became more important to China's trade and energy routes (Wheeler, 2012).

Therefore, China's maritime interests towards Sri Lanka are more strategic than political (Kelegama, 2014). Since 2009, there has been a visible increase in China's presence in the marine area of Sri Lanka. The Chinese

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are building a contradictory port at the regional and global levels in Hambantota, 230 kilometers south of Colombo, at an estimated cost of $1 billion-over 85% of the project is being funded by the Chinese. The four-phase project is scheduled to be completed in 15 years and work on the first phase began in 2007. The second phase envisages construction of an industrial port with a 1,000-meter jetty and an oil refinery (Kumara, 2020). Thus, the Colombo Port City and the Hambantota port have become a part of China's so-called string-of-pearls plan (Map, 04) for a line of ports stretching from its waters to the Persian Gulf (Jayamaha, 2017). In short, Sri Lanka's pro-dominant policy towards China has created a new power competition in the Indian Ocean region between Western and Asian power players.
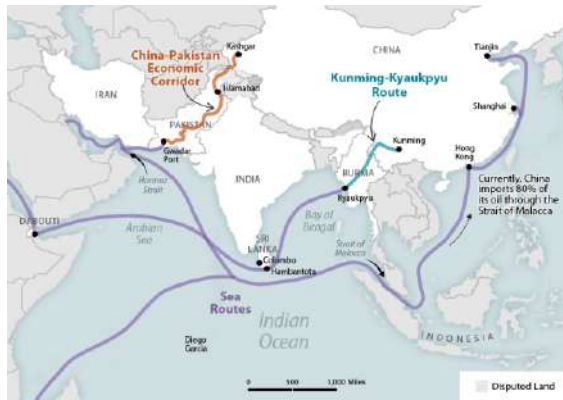
Map 4 - String-of-Pearls Plan of China
Source: CRS Report, 2018

CONCLUSION

Maritime security has become a wider conceptual discussion and core concern among major global security actors have multiplied / have evolved from the beginning of the 1990's (Bueger & Edmunds, 2017; Germond, 2015). With the changing global scenario, the concept of maritime security reflects a different perspective going beyond traditional and non-traditional perspectives. The emerging perspective of maritime security brings to the forefront issues such as marine environmental security, ocean governance, maritime border protection, military activities at sea and security regulation of the maritime transportation system (Kumara, 2020).

Sri Lanka's marine area and its location in the Indian Ocean region, historically, assume serious strategic importance for balancing power in global power rivalry. Further, the global competition for resources in and under the oceans has given a significant economic value to Sri Lanka's marine area. Access to the energy resources of Sri Lanka's marine area has become one of core the strategies for sustaining the growing industrial and economic progress of some of major powers such as the USA, Japan, India and China. In this broader context, Sri Lanka's marine area serves as a hub to most of the powerful nations in the contemporary world. As a result of the significance of Sri Lanka's marine area, a number of major regional and extra-regional powers have signaled their presence in Sri Lanka in various approaches such as ports, aviation and power plants, constructions etc. Therefore, the management of the maritime security of Sri Lanka is essential to safeguard the sustainable development of Sri Lanka. But it has been hindered by the sectorial approach of the Government of Sri Lanka.

The Government of Sri Lanka should identify realistic maritime doctrine to overcome structural maritime security challenges faced by the Sri Lankan state considering the areas of geopolitical location and geo-strategic significance of the state, the changing nature of sea power, the establishment of international security cooperation, the economic value of Sri Lanka's marine area, developing a trade and commerce hub and generating armed naval power.

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THE MILITARY PARTICIPATION FOR UPLIFTING THE STANDARDS OF LIVING OF THE CIVILIANS IN THE POST- CONFLICT SCENARIO: CASE STUDY- POONAKARY DIVISIONAL SECRETARIAT DIVISION

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ABSTRACT

Post-conflict is "conflict situation in which open warfare has come to an end. Such situations remain tense for years or decades and can easily relapse into large-scale violence". In post-conflict areas, there is an absence of war, but not essentially a real peace. Therefore, post conflict recovery is most significant factor and the military sector of any country is responsible for uplifting the standards of living of the civilians in the post- conflict scenario. Sri Lanka in the late 20th century, was to in itself apart by a brutal civil war. End of this situation, Sri Lankan Government faced a huge problematic situation of uplift the living standard of the civilians in the post- conflict season within these areas. Sri Lankan Armed forces are actively participating in this process. Therefore, the research problem of this study was to examine what kind of work that has been done by the Sri Lanka Army and its success in uplifting the living standards of the people in a selected area. Poonakary DS Division of Kilinochchi district in Northern Province has been chosen as the research study area and it consists of 7378 families. The 661 Brigade of the 66 Division of the Sri Lanka Army was largely responsible for improving social welfare of the villagers. Therefore, all the data was collected by the 66 Division of the Sri Lanka Army. Also this is a descriptive study which uses both quantitative and qualitative data. It was evident through results that the civil affairs offices of security force headquarters Kilinochchi, 66 Division and 661 Brigade, they mainly considered about four factors under the civil affairs such as community transport, cultural and religious affairs, education and women empowerment and children welfare. In conclusion, it can be emphasized that these troops have done a commodious process to uplifting the living standards of civilians through various types of strategical processes and these processes have been assisted to improve the living standards of civilians

KEYWORDS: *Civilian Living Standards, Post-Conflict, Sri Lanka Army, Uplift*

INTRODUCTION

Sri Lanka has faced a civil war from 1983 to 2009. From the beginning on 23 July 1983, there was an intermittent insurgency

against the government by the Liberation Tigers of Tamil Eelam (LTTE), which fought to create an independent Tamil state called Tamil Eelam in the north and the east of the island. After a 26-year military campaign, the Sri Lankan military defeated the Tamil Tigers on 18th May 2009, bringing the civil war to an end. For over 25 years, the war caused significant hardships for the population, environment and the economy of the country, with an initial estimated 80,000–100,000 people killed during its course. Thousands of people have lost their properties and infrastructure. (Jeyasankar and Ganhewa, 2018) After the successful conclusion of the Humanitarian Operations on 19th May 2009, the Government faced with a number of significant post-conflict challenges. The most pressing issues included the accommodation and welfare of nearly three hundred thousand civilians, demining, reconstruction of infrastructure and facilities, resettlement of the internally displaced persons, and the rehabilitation of ex-LTTE cadres and their reintegration to society. The military played an important role in meeting nearly all of these challenges.

Accommodating and ensuring the welfare of such a large number of people during the demining process was a very significant challenge. The Sri Lanka Army undertook on the responsibility of renovating more than 6,000 houses and construct nearly 7,000 new housing units in this region. In addition to resettling the people so quickly, the government has done a lot of work to assist them in reviving their livelihoods. Financial assistance has been given those involved in crop agriculture, fisheries and business activities. A great deal of assistance has been provided by the military in this regard, through donations of equipment and seeds for farmers, assisting livestock development, setting up irrigation canals, and helping small business owners set up shops. During the past conflict time period, Sri Lankan armed force took various mechanisms to uplift the living

standard of the people in those areas. Therefore, the research problem of this study was to examine what kind of works that has been done by Sri Lanka Army and its successfulness in uplifting the living standards of the people in the study area. Moreover, the objectives of this study was to identify the situation of war time and post conflict time period and to investigate the military participation for uplifting the living standard of the civilians in the post- conflict scenario in the study area.

LITERATURE REVIEW

Civil populations are often the foremost victims of contemporary conflicts. Importantly, historical and recent examples show that civilians are the object of conflict scenario. International humanitarian law defines "civilians" as those persons who are not members of military or paramilitary forces or fighters of organized armed groups of a party to a conflict. Civilians may lose protection against attacks for such time as they take direct part in hostilities (Nordas, 2009). Civil wars and other armed conflicts within states kill tens of thousands of civilians every year, destroy many more livelihoods and have forced millions of people to flee their homes. Most violent conflicts today are recurrences of previous wars. Thus, besides ending ongoing violence, preventing wars from breaking out again is one of the major challenges the world faces today. When wars end, the affected areas are often left devastated. There are large numbers of refugees, wounded and trauma victims. Therefore, Post conflict time the period is most important to war affected countries to rebuild and reconstruct physical, economic, social and mental capabilities of victims (Kaldor, 2006).

Post-Conflict Reconstruction and Development (PCRD) is a comprehensive set of measures that seek to address the needs of countries emerging from conflict, including the needs of the affected population to prevent

escalation of disputes, avoid relapse into violence, address the root causes of conflict and consolidate sustainable peace. PCRD is conceived within the African vision of renewal and sustainable development and while its activities are integrated, and many must be pursued simultaneously, they are envisaged in the emergency (short-term), transition (medium-term) and development (long-term) phases. The scope of these activities encompass six indicative elements namely security, humanitarian, emergency assistance, political governance and transition, socioeconomic reconstruction and development, human rights, justice and reconciliation and women and gender (Duffield, 2000). Moreover, international peacebuilding efforts focus mainly on four problematic areas such as providing security, re-starting socio-economic development, advancing democratic governance and promoting transitional justice (Brinkerhoff, 2007).

Reconstruction can only succeed if it is initiated by the local population. They should have a significant say in how funding is allocated. It may take years for a country to show the first signs of recovery. Effective coordination between donor countries and aid organizations is vital. There should also be a focus on the region as a whole, so that reconstruction efforts target not only the conflict zone itself but also the surrounding countries (Brinkerhoff, 2007). The armed force play a variety of roles in the complex task of peace building in the aftermath of conflict in the global age. On the one hand, armed force post-conflict roles correspond broadly with numerous and competing definitions of civil society. On the other hand, they match a wide range of tasks assumed by post-conflict peace builders (Kaldor, 2006).

METHODOLOGY

a. Study area. Poonakary DS Division of Kilinochchi district in Northern Province has been selected as the study area for this research. With regard to the relative location of this DS division, this DS division is bounded by Karachchi from east, Mannar district from south, the indian Ocean from West and Jaffna lagoon from the north. The coordinates of midpoint of the study area are 9 °30'15" N and 80 °10'42"E. It is located in dry zone of Sri Lanka and the total land area of Poonakary divisional secretariat is 439 square kilometers. The total population of the area is 25,814 and there are 7378 families. This DS division is under the command of 661 Brigade of the 66 Division of Security Force Headquarters Kilinochchi of the Sri Lanka Army.
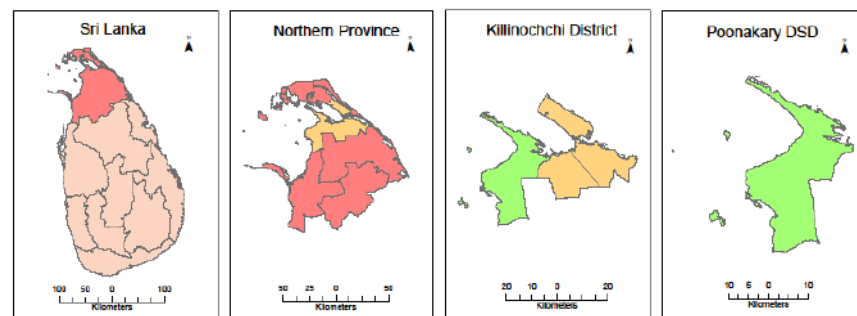

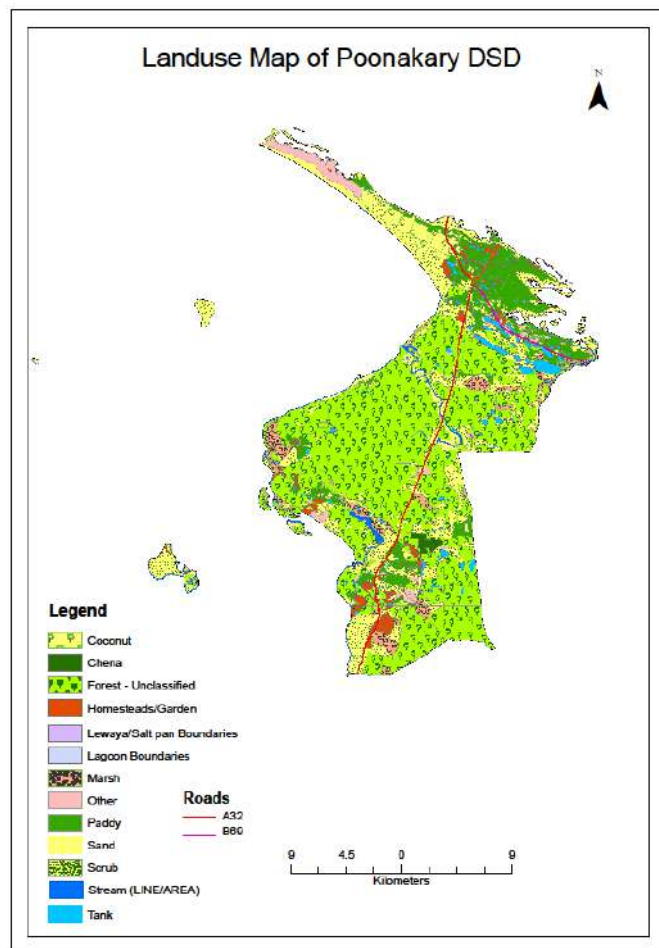
Figure 1: Location of the study area

Figure 2 - Map of the study area

RESULTS AND DISCUSSION

a. **Introduction on 66 1 Brigade of the 66 Division of the Sri Lanka Army.** The 66 Infantry Division was Inaugurated on 10 Jan 2009 and it is currently based on Pooneryn in Northern Province. This division is a part of security force headquarters Kilinochchi and has three brigades and seven battalions. These three Brigades are 661, 662 and 663. Under the 66 Division, 661 Brigade was formed on 01 March 2007 under the command of Lieutenant Colonel GV Ravipriya IG with 02 x Battalion of 4 Sri Lanka Sinha Regiment and 9 Gajaba Regiment as the first Brigade and the first mission was to launch an offensive in order to capture Pokkaravani area. Now, there are two battalions and these are 24 Vijayabahu Infantry Regiment and 5 (V) Mechanized Infantry Regiment.

b. **The Situation of the Study area During the Time of War and Post Conflict Time.** Poonakary, also known as Pooneryn, is a strategically important village in the northern province of Sri Lanka because of its geographical location. Hence, from here easy to access the Jaffna peninsula. Before the war conquered this area, Poonakary was populated and the life of the people went on as usual. All service centers such as schools, hospitals, religious places and government institutions ware located in the area and most of the people had taken up agriculture, animal husbandry, fisheries and labour as their occupations. Many traditional and isolated villages were located in this area and the majority were Tamils. With the arrival of the war in this area, the civilians had to leave their villages. The war also destroyed homes, businesses, other service centers and farmland in the area and killed some villagers. Also, people have become

b. **Samples and Data Collection.** This study has been focused on the actions taken by the Sri Lanka Army since 2008 after civil war to uplift the living standards of the civilian in the Poonakary DS Division. The 661 Brigade of the 66 Division of the Sri Lanka Army was largely responsible for improving social welfare of the villagers. Therefore, all the data was collected from the 66 Division of the Sri Lanka Army. Also this is a descriptive study which uses both quantitative and qualitative data. Primary data collection method such as semi-structured interviews and especially secondary sources like books websites and unpublished records were used for data collection. All these data have been analyzed by using qualitative method.

disabled. At the end of the war, people who had left the countryside at the end of 2009 began to return to their villages, and by the time they arrived, all their houses, resources and economic activities have been destroyed. Also they faced different kinds of difficulties such as, homeless, unemployment, no predicted annual rainfall, malnutrition, scarcity of drinking water, scarcity of water for farming activities, transportation, illegal drug trafficking, illegal timber felling and lack of facilities for schools. Therefore, it was a huge challenge to rebuild their lives physically, socially and mentally. The government, non-governmental organizations, civil societies and armed forces have made significant contribution to this.

c.   **The Military Participation to Uplift the Living Standard of Civilians.**   Civil affairs offices of security force headquarters Kilinochchi, 66 Division and 661 Brigade are accomplishing different kinds of activities to improve civil population's living standard. They mainly consider about four factors under the civil affairs such as Community transport, cultural and religious affairs, education and women improvement and children welfare. Under these main themes different sections are brought up:
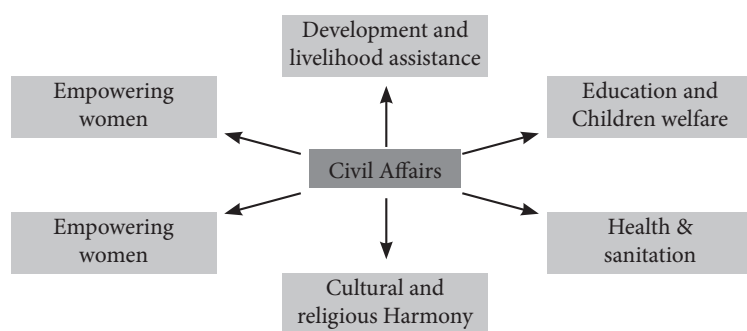

Figure 3 - Main Human related themes

d.   **Development   and   Livelihood Assistance.**   Most of the villagers still engage in primary economic activities as their livelihoods. Agriculture, livestock and fishing are the most prominent life paths in this area. When considering about agriculture, Poonakary is predominantly agriculture based and mainly depends on tanks and irrigation network. Paddy is the main crop and it is a surplus product and Maha season is the main cultivation season. Farmers use irrigation water for their cultivation and also intercrops are grown by some few farmers. The soil condition in certain parts of the area is more suitable for cultivation of vegetable and other field crops, high value cash crops and fruit crops. There are three farms located under the area of responsibility of 661 Brigade. Prominent cultivation crops are coconut, vegetables and fruits. Moreover, livestock farming is the most important traditional economic activity in this area and it is integrated with crop cultivation. Cattles, buffalos and goats are raised as livestock and five milk collection centers are located within Poonakary division. When considering about fishing activities, most of the areas have covered by the sea. Therefore, this AGA division has long coastal belt and it's suitable for fishing activities. Then, several fishing ports as well as fishing villages are located through the coastal belt. Fishing villages are unique tradition of Poonakary and these systems are controlled by fishing communities.

The   Sri   Lanka   army   is great   supporter   in   improving agricultural   activities   within   this area by using different strategies. The development policy objective is to break away from subsistence agriculture   by   promoting   high value   crops   under   intensive   and commercially   oriented   agriculture system   since   it   will   increase production, incomes and provide greater   employment   and   higher living   standard.   They   mainly consider about several factors that can be supported to agricultural productivity. They try to improve knowledge of agriculture among farmers, students in Poonakary area

while providing resources to maximize crops harvests and facilitate to have a reliable market in liaison with public and private sectors. 661 brigade that under commanding of 66 division also conducts awareness program to improve villagers' knowledge on agricultural and interest through seminars and workshops. Furthermore, they have interconnected with other private sector companies and Non-Government Organizations to donate some kind of agricultural and fishing equipment, fertilizer, seeds for low income families. For a example, with the direction of Commander 661 Brigade, 5th Mechanized Infantry Regiment organized a charity work to distribute a large stock of coconut fertilizer among low-income families on Pooneryn at 14th March 2018 under the patronage of Silver Mill Company, Mirigama.

When considering about the development related activities in Poonakary AGA division, most of the villagers have low income because some people don't have improved settlements and houses. Infrastructure is a fact that needs to be established before any civilization could establish in a society. Similarly, after the war, the suffering of the local victims of the war would need to establish them with the proper infrastructure projects which have been undertaken by the 6 Field Engineer Regiment will pay its dividends in time to come. The closer Sri Lanka Army approach to the civilians who were battered by the war would promote deeper mutual understanding of each other's values and social needs. That will in turn promote sustainable peace particularly in the area. The Sri Lanka Army has built new houses and housing project with or without donations of civil authorities and donate it to low income families. Also they donated housing materials for villagers. Furthermore, infrastructures like Roads and transportation facilities, electricity supply and water supply have been continuously provided and maintained by the respective troops.

Figure 4 - Construction of New Houses

e. **Empowering women's and children's welfare.** As a result of the terrorism prolonged in the North and East Provinces of Sri Lanka, the women and children had become the worst affected group. Most of the local population is aliened to the Armed Forces of Sri Lanka and they lived under the preconceived ideas which were propagated by the LTTE. Thus, it has become a challenge to change wrongly implanted cognition. When considering about women in study area, 13,149 women are living in Poonakary AGA division and most of them from low income families & involving house hold activities as housewives and they are suffering from poverty and unemployment.

To reach the target audience the feminine wing of the Sri Lanka Army; the Women's Corps was given the responsibility of educating women and children on several areas of feminine interests. The SLA tries to improve the knowledge of women and help to acquire self-employment for uplifting their familiy income, provide safety and better environment for children to grow up in this area. Kilinochchi troops conduct programs for women to uplift their lifestyle. They conduct seminars and awareness program to educate and empower women to improve their knowledge to begin a new employment or develop their capabilities. In this content, the Sri Lanka Army introduced and conducted different types of activities such as beauty culture, tailoring, agriculture and dairy product related activities to educate them. It helps to increase women's income.

Figure 5 and 6 - Employment training and Distribution of school items

Improvement of children's welfare is another considerable factor that contributes to uplift living standard. The Sri Lanka Army has provided security for the protection of schools within this area. Moreover, services like provision of sanitary facilities, conducting of educational seminars to improve students' knowledge and distributing of educational materials for children liveing in low income families etc in conjunction with the other government and private authorities.

f.   Health, sanitation and Natural Hazards.   Consideration of human health is more significant because better health is the key of human happiness and well-being. It also makes an important contribution to economic progress. Many factors influence the health status and a country to provide quality health services for its people. Considering about the study area, the Sri Lanka Army engages in various things to provide good health facilities and Kilinochchi troops carry out medical services with the aid of private and public sectors. They conduct free medical and dental clinics for civilians and distribute specimen like speckles, wheelchair and clutches for disable people. For example, troops of the 66 Division serving under Security Force Kilinochchi in cooperative with the 'Sri Lanka Red Cross Society', Kilinochchi launched a distribution program of spectacles among 312 needy civilians in Pooneryn area on 12 August 2018.

Flood is the prominent natural disaster in the area. During the Northeast monsoon season and intermediate monsoon season these areas are highly affected by floods. The Sri Lanka Army provides different services to prevent and reduce vulnerability of flood hazard. They actively participate rescuing and mitigation process and also in provide quake relief to the flood affected civilians.

g.   Cultural and Religious Harmony. Sri Lanka is a country of religious tolerance. Though the main religion is Buddhism, all other religions are treated at the similar respect as of Buddhism. Every citizen of the country can enjoy their freedom of faith. The long history with the mixture of religious beliefs developed a stage which no single person can particularly point out which tradition and culture, individuals belong. Accordingly, each province has its own dominant culture based on majority of the ethnicity. Kilinochchi in this regard becomes vital since the liberation from the iron fists of the ruthless terrorists and at present they enjoy cultural and religious rights of their own. The Sri Lanka Army playing a vital role in this regard always finds a foot step ahead of others in supporting the local population in all religious activities ranging from Hinduism to Buddhism including Islamic, Christianity. One major factor of many other is the between the local population and the Army.

The Sri Lanka Army tries to achieve several objectives by using different strategies. Improve knowledge of other religions among communities along with the security force personnel, improve the knowledge on different cultural affairs among the local communities, build up good friendship and understanding

between different local communities by creating the required environment to celebrate every religious and cultural festival of the local community, bridge the gap between local population and the security forces.

When considering the religiosity of population, 7512 of families live in Poonakary AGA division and they are having different religions. According to the Figure No 4 the prominent religion of this area is Hindu and 5064 families have been identified as Hindus. Moreover, 1978 of families are Christian, 469 of Islamic families and only one Buddhist family can be identified within this division.
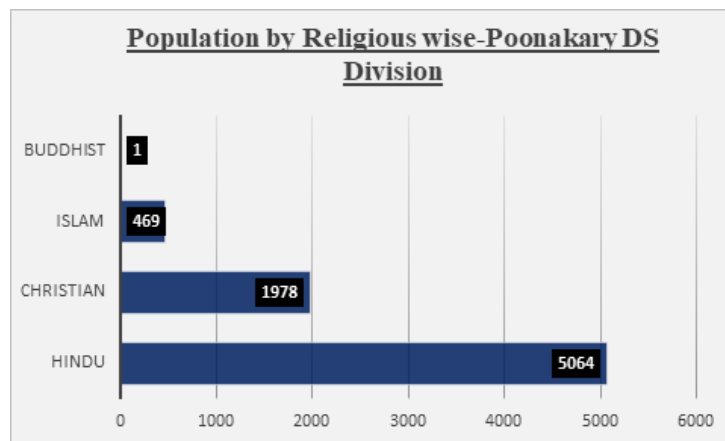

Figure 7 - Religious statistics of the Poonakary DS Division

Different cultures have various traditions and religious activities. Therefore, troops conduct religious and cultural activities to uplift the relation between people from different religious and cultural backgrounds who lived in Poonakary. Sinhala Tamil New Year, Thaipongal Day, Ramadan festival and Vesak day celebration are the most important activities.

CONCLUSION

As a result of war, the lives and livelihood of civilians in the Poonakary were completely disrupted. Therefore, after the war, the Sri Lankan government paid attention on uplifting the living standards of civilians who live in the war affected areas in northern part of the country. Military sector, especially the Sri Lanka Army has played a key role in uplifting the living standards of households within these areas. For these huge functions, the Sri Lanka Army has mainly considered four factors of civilians under the civil affairs offices in each area. These are community transport, cultural and religious affairs, education and women empowerment and children's welfare. Firstly, they have concerned about the improvement of infrastructure through the development of electricity, water, sanitation, housing and other services with interconnection of other government and non-government authorities. After that they have taken steps to uplift the employment related activities.

Empowering women and child welfare is another considerable factor and Army troop's special women's crops gives maximum support to empower women with different kinds of activities. Also, child education is another factor the army pay need by distributing knowledge, books, and other items to students with collaboration of other parties. Finally, Poonakary has been identified as different ethnicity area cultural and religious harmony helps in making good interrelationship with every ethnic groups. Therefore, the Sri Lanka Army has tried to interconnect every ethnic groups through different kinds of activities. Civil affairs offices of security force headquarters Kilinochchi, 66 Division and 66 1 Brigade have done a commodious process to uplift the living standards of civilians of the area.

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A STOCHASTIC MODEL FOR PREDICTING
COVID-19 INFECTED PATIENTS IN SRI LANKA

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ABSTRACT

Covid-19 infected patients change unpredictably in shorter period of time in Sri Lanka. Due to the randomly changing infected patients, it can be considered as a dynamical system. The data forecasting in these situations provides significant guidelines for making decisions in health sector in the country. These kinds of uncertainty and instability patterns are difficult to detect in easily. These high volatile fluctuations patterns make complicated problems in many countries around the world.

The main focus of this study is to develop a forecasting model based on Geometric Brownian motion and Ito's lemma to estimate the COVID-19 infected patients in many communities in Sri Lanka. It was more appropriate model for the predicting COVID-19 infected patients compared to the time serious analysis model. Furthermore, traditional Bias and MAPD method was used to compare the predictions. Using the error analysis methods, it has been reached to the exact value approximately. Numerical simulations were performed using the Euler-Maruyama method. Statistical validation tests were used to investigate the significance of the results. The results reveal that, the new model is more significant for task force to make decisions wisely before it becomes a crisis.

KEYWORDS: *COVID-19, Euler-Maruyama Method, Stochastic Differential Equations (SDE).*

INTRODUCTION

Better health is the greatest profit of the life. Nowadays, health has become the most vulnerable factor in our life because of the COVID – 19. The global growths of COVID – 19 infected patients are gradually increasing. It is at outstanding rate compared to the Sri Lankan rate of infected Corona virus. This situation becames worse when it is difficult for a country to provide facilities and other health equipment.

This research was conducted to predict the COVID – 19 infected cases by considering

the stochastic differential equations in a community. This project is more vital for armed forces and health officers who battle against the virus spreading, epidemic diseases analysts and others who need to draw the future pattern of their fields. As we discussed in earlier paragraph, stochastic models are made by considering major factors of the infected people changes. Those are susceptible and cured individuals affect for the change of infarcted. It is considered that only one competitor at effect to the growth of the virus. Most of experiments were conducted to predict the virus spreading and recent research was geometric Brownian Motion with Ito's Lemma Approach to Evaluate the fluctuation of number of patients.

A much accurate model requires more data. In this research, it can be obtained a considerable valuation for the forecasting the data set. Major challenges of this studies are finding a suitable data range for the particular communities. Most of the predictions are based on the assumptions that may have to consider for a better understanding of the mathematical model. By considering the infected changing time as a Δt and change in the number of patients are considered for a small-time interval. It is assumed that,

1. Large jumps in infected caused by sudden major changes in the virus spreading environment are not considered in this model.
2. These infected people are considered along with an equal health conditions.

a.   Markov Chain.   Stochastic processes whose effect of the past on the future is summarized only by the current state.

$$P(X_t = S \mid X_0, X_1, \ldots \ldots X_t) = \begin{cases} \dfrac{1}{2} & if\ S = X_{t+1}, X_{t-1} \\ \\ 0 & Otherwise \end{cases}$$

If X_i have values in S (finite set)

$$P_{ij} = P(X_{t+1} = j \mid X_t = i), i, j \in S$$

$$\sum_{j \in S} P_{ij} = 1$$

Transition probability matrix,

$$A = \begin{pmatrix} P_{11} & \cdots & P_{1n} \\ \vdots & \ddots & \vdots \\ P_{1m} & \cdots & P_{mn} \end{pmatrix}$$

Discrete time stochastic process $X_0, X_1, X_2, X_3, \ldots$ is a Markov chain if,

b.   Martingale.   Stochastic process which is for game is called Martingale process. A stochastic process $\{X_0, X_1, X_2, \ldots \ldots \}$ is a Martingale if,

$$X_t \quad = \quad [X_{t+1}/F_t]$$

For all $t \geq 0$, $F_t = \{X_0, X_1, \ldots \ldots, X_t\}$ Random walk is a Martingale.

c.   Numerical Analysis.   The Stochastic differential equation (SDE) and Euler-Maruyama method simultaneously are used to find the numerical solution to the SDE model.

$$X_{t+1} = X_t + \alpha X_{t-1} \Delta t + \sigma X_{t-1} \eta \sqrt{\Delta t}$$

$$\eta = random\ number\ generator$$

LITERATURE REVIEW

The predication of COVID-19 patients make outstanding information for the government. Many mathematical and statistical researches have been conducted to recognize the pattern of random behavior of virus spreading. Some of these methods are only applicable according to the assumptions.

Allen had held a research to identify the factors and mathematical formula that describe stochastic differential equation model for the wave of coins in circulation (Allen, 2016). He found that the stochastic differential equation model for environmental variability and mean reverting processers. The mean-reverting processes possess several important features that better characterize environmental variability in biological systems than does a linear function of white noise.

Allen investigated in developing the topic of stochastic epidemic modeling from the perspective of an Odinary Differential Equations epidemic framework. The emphasis is on continuous-time Markov chains and stochastic differential equations. In-host models can serve as powerful tools to predict and understand the dynamics of infectious diseases. These models have been used to gain new knowledge in the pathogenesis of disease in-host (including characteristics of the pathogen lifecycle), inform medicine and public health, and aid in the development of effective drug therapies and vaccines (Ciupe and Heffernan,2017). Matthews Ovens and Bruce Bukiet, (2006) found the similarities of the Cricket batting order of the ODI with SDE model. While scoring strategies and players performance in cricket has been studied, they there were very few publications on the influence of batting order.(Bukiet and Ovens, 2006)

Zika is a flavi virus transmitted to humans through either the bites of infected Aedes mosquitoes or sexual transmission. Zika has been linked to congenital anomalies such as microcephaly (Agusto, Bewick, Fagan, 2017).

METHODOLOGY

This section reviews the methodology of the study. Also it covers the hypothesis building, identifies the population of the study, selects the sample model development and data collection techniques, data analysis and interpretation. Microsoft Excel and SPSS software are used to analyse and represent the outcome.

a.   **Research Design.**   This is a statistical base research design.

b.   **Population.**   The values consisted of the statics of the population during past three months in the country.

c.   **Sample.**   The sample consisted of the static propotionate of the population from 14th march 2020 to 17th April 2020.

d.   **Sampling Techniques.**   Sample is selected according to the non-probability simple random walk sampling techniques.

e.   **Data Source.**   Data is collected through secondary data sources, published by Epidemiology Unit, Ministry of Health, Sri Lanka.

RELATED THEORIES AND CONCEPTUAL FRAME WORK

a.   **Forward Kolmogorov Equation.**

Let $t_i = i\Delta t$ for i=0, 1,……, N and let $x_j = j\delta$, for j = ….., -2, -1, 0, 1, 2, ……… Let x_0 be given. Consider the transition probability of a discrete stochastic process, where g and l are constant. If Δx is the change in the stochastic process at time t fixing $X(t) = x\_i$

NEWLY INFECTED (g)

Figure 1 - The illustration of the simple virus infected procedure. The main actions and reactions indicated as a gin and loss.

It is considered that 'g' is the per capita new infected rate and 'l' is the per capita cured rate. Also it is assumed that 'g' and 'l' are constant according to the first case.

Assume that $g\ (t,x)=g$ and $l\ (t,x)=l$ are non-negative constants.

Define the transition probabilities of a discrete stochastic process by the following,

It follows that the probability distribution in continuous time (letting $\Delta t \to 0$) satisfies the forward Kolmogorov equations. As $\Delta t \to 0$ the discrete stochastic process appropriate a continuous time process

$$\therefore \Delta t \to 0 \frac{p_k(t+\Delta t) - p_k(t)}{\Delta t} = \frac{dp_k(t)}{dt}$$

$$\frac{dP_k(t)}{dt} = P_{k+1}(t)\left[\frac{lx_{k+1}}{2} + \frac{lx_{k+1}}{2} + \frac{gx_{k+1}}{2} - \frac{gx_{k+1}}{2}\right] + P_k(t)[-gx_k - lx_k]$$

$$+ P_{k-1}(t)\left[\frac{gx_{k-1}}{2} + \frac{gx_{k-1}}{2} + \frac{lx_{k-1}}{2} - \frac{lx_{k-1}}{2}\right]$$

$$\frac{dP_k(t)}{dt} = \frac{P_{k+1}(t)lx_{k+1}}{2} + \frac{P_{k+1}(t)lx_{k+1}}{2} + \frac{P_{k+1}(t)gx_{k+1}}{2} - \frac{P_{k+1}(t)gx_{k+1}}{2}$$
$$-P_k(t)gx_k - P_k(t)lx_k$$

$$+ \frac{P_{k-1}(t)gx_{k-1}}{2} + \frac{P_{k-1}(t)gx_{k-1}}{2} + \frac{P_{k-1}(t)lx_{k-1}}{2} - \frac{P_{k-1}(t)lx_{k-1}}{2}$$

$$\frac{dP_k(t)}{dt} = -(g-l)\left[\frac{P_{k+1}(t)\ x_{k+1}}{2} - \frac{P_{k-1}(t)\ x_{k-1}}{2}\right]$$

$$+ \left(\frac{g+l}{2}\right)[P_{k+1}(t)\ x_{k+1} - 2P_{k+1}(t)\ x_{k+1} + P_{k-1}(t)\ x_{k-1}]$$

$$P_{i,k}(t) = \begin{cases} gx_i\Delta t & For\ k = i+1 \\ 1 - gx_i\Delta t - lx_i\Delta t & For\ k = i \\ lx_i\Delta t & For\ k = i-1 \end{cases}$$

If it is considered $P_{i,i+1}(t)$ where $k = i+1$

Then $P_{(i,i+1)} = g\ x_i\ \Delta t$ by substituting $P_{(0,1)} = gx_0\Delta t$, $P_{(1,2)} = gx_1\Delta t$, $P_{(2,3)} = gx_2\Delta t$

If it is considered $P_{i,i+1}(t)$ where $k = i+1$

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Then $P_{(i,i+1)} = g\ x_i\ \Delta t$ by substituting $P_{(0,1)} = gx_0\Delta t$, $P_{(1,2)} = gx_1\Delta t$, $P_{(2,3)} = gx_2\Delta t$

$$P_{i,k}(t) = \begin{bmatrix} P_{00} & P_{01} & \cdots & P_{0n} \\ P_{10} & P_{11} & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ P_{m0} & \cdots & \cdots & P_{mn} \end{bmatrix}$$

Then substitute,

$$P_{i,k}(t) = \begin{bmatrix} 1 - gx_0\Delta t - lx_0\Delta t & gx_0\Delta t & 0 & \cdots \\ lx_1\Delta t & 1 - gx_1\Delta t - lx_1\Delta t & \cdots & \vdots \\ 0 & lx_2\Delta t & \ddots & \vdots \\ 0 & 0 & \cdots & 1 - gx_m\Delta t - lx_m\Delta t \\ \vdots & \vdots & & \end{bmatrix}$$

$E(\Delta x) = (g-f)\frac{\Delta t}{\delta}$, $Var\ (\Delta x) = (g+f)\Delta t$ It is assume that the $\Delta t / \delta^2$ is small so that,

$1 - b\Delta t / \delta^2 - d\Delta t / \delta^2$ is positive.

Let $P_k(t) = P(X(t) = x_k)$ be the probability distribution at time t. Then, $P_k(t + \Delta t)$ satisfies,

$$P_k(t + \Delta t) = P_{k+1}(t)\ lx_{k+1}\Delta t + P_k(t)(1 - gx_k - lx_k)\Delta t + P_{k-1}(t)g\ x_{k-1}\Delta t$$

Then need to derive the $\frac{dP_k(t)}{dt}$,

$$\frac{P_k(t+\Delta t) - P_k(t)}{\Delta t} = P_{k+1}(t)\ l\ x_{k+1} - P_k(t)(g\ x_k + l\ x_k) + P_{k-1}(t)g\ x_{k-1}$$

Assume that δ is small, so that the stochastic process approaches a continuous valued process.

$$\text{Then } \frac{F(x+\delta)-F(x-\delta)}{2\delta} = \left[\frac{P_{k+1}(t)\ x_{k+1}\ -\ P_{k-1}(t)\ x_{k-1}}{2\delta}\right]$$

$$\frac{F(x+\delta)-2F(x)+F(x-\delta)}{\delta^2} = \frac{P_{k+1}(t)\ x_{k+1}-2P_{k+1}(t)\ x_{k+1}+P_{k-1}(t)\ x_{k-1}}{\delta^2}$$

According to the above equations it can be considered as central difference approximation for some values $\varepsilon_1, \varepsilon_2$ such that,

$$x - \delta \leq\ \varepsilon_1, \varepsilon_2\ \leq x + \delta$$

$$\frac{F(x+\delta)-F(x-\delta)}{2\delta} =\ F'(x) + \frac{\delta^2}{6}F'''(\varepsilon_1)$$

$$\frac{F(x+\delta)-2F(x)+F(x-\delta)}{\delta^2} =\ F''(x) + \frac{\delta^2}{12}F'''(\varepsilon_2)$$

Note that, fixing X(t) = x_i at time t, $E(\Delta X) = (g - l)x\Delta t$ and $Var(\Delta X) = (g + l)x\Delta t$ to order $(\Delta t)^2$. The above equations approximately satisfy the Fokker-Planck equation. Then the above system of differential equation approximates the partial differential equation,

$$\frac{\partial p(t,x)}{\partial t} = -\frac{\partial\big((g-l)xp(t,x)\big)}{\partial x} + \frac{1}{2}\frac{\partial^2\big((g+l)^2xp(t,x)\big)}{\partial x^2}$$

Consider the 'm' and 'n' functions,

Then,

Stochastic differential equation.,

$$dX(t) = m(t, X(t))dt + n(t, X(t))dW(t)$$

$$dX(t) = (g-l)X(t)dt + \sqrt{(g+l)X(t)}dW(t)$$

The probability density of the solution of the stochastic deferential equation satisfies the partial deferential equation. Therefore, there exists a close relationship between the discrete stochastic process and the continuous process. In particular, for small Δt and δ, the probability distribution of the solutions to forward Kolmogorov equation will be approximately the same as the probability distribution of solutions to the discrete stochastic process. Then, an appropriate stochastic deferential equation model is inferred from the above argument. Finally, it is useful to note in the above argument that the coefficients at time t of the Stochastic Differential Equation are related to the discrete stochastic model through the mean and variance in the change in the process ΔX over a short time interval Δt fixing X(t) = x.

Specially,

$$E(\Delta X) = a(t,X)\Delta t \quad \text{and} \quad Var(\Delta X) = b(t,X)\Delta t.$$

$$E(X) = a(t,X) = \frac{\sum_{i=0}^{N}(X_{i+1}-X_i)}{\sum_{i=0}^{N} X_i}$$

$$Var(X) = b(t,X) = \frac{\sum_{i=0}^{N}(X_{i+1}-X_i)^2}{\sum_{i=0}^{N} X_i}$$

$$X(0) = X_0$$

b. <u>**Equation Validation.**</u> The stochastic equation can be validated by using the log likelihood validation method. It is inevitable to ensure the data fittings of the curve which is drawn according to the stochastic equation. The predicted data deviate from the actual data and those changes make the validity of the derived equation.

For equation validations, main three methods are used with statistical tools, namely

(1)   Mean Absolute Percentage Deviation (MAPD)
(2)   Bias
(3)   Standard Deviation (SD)

c. <u>**Numerical Analysis.**</u> The Stochastic differential equation using Euler's method and Milstein's method simultaneously use to find the numerical solution to the Stochastic Differential Equation Virus spreading model. Let X(t) be the dependent variable for Ito's differential equation.

$$X_{t+1} = X_t + \alpha X_{t-1}\Delta t + \sigma X_{t-1}\eta\sqrt{\Delta t}$$

$$\eta = random\,number\,generator$$

RESULTS AND DISCUSSION

This section analyses the data based on the predictive model formed in the previous chapter to test the hypothesis. This chapter analyses the finding of the study gained through the MATLAB and SPSS outcomes.

Where the g and l are constant.

Calculating infected and cured rates,

$$\exists\, |gx_i\Delta t| < 1\,,|lx_i\Delta t| < 1$$

Per capita infected rate $= g$

Per capita cured rate $= l$

By considering infected values we can find the average of the infected g if,

$$(x_{i+1} - x_i) > 0$$

$$g = \frac{\sum_{i=0}^{N}(X_{i+1}-X_i)}{N} = \frac{2686}{130} = 20.66153846$$

By considering cured values, if $(x_{i+1} - x_i) < 0$

$$l = \frac{|\sum_{i=0}^{N}(X_{i+1}-X_i)|}{N} = \frac{2007}{130} = 15.4384$$

Table 1 : Values difference between two values in consecutive days and related percentages

Date	Actual	Predicted	Difference
14-Mar	17	16	1
15-Mar	27	22	5
16-Mar	43	29	14
17-Mar	50	36	14
18-Mar	59	43	16
19-Mar	72	51	21
20-Mar	76	58	18
21-Mar	81	64	17
22-Mar	96	71	25
23-Mar	101	81	20
24-Mar	101	89	12
25-Mar	105	98	7
26-Mar	105	107	-2

27-Mar	112	117	-5
28-Mar	116	125	-9
29-Mar	121	131	-10
30-Mar	142	137	5
31-Mar	145	144	1
1-Apr	150	150	0
2-Apr	158	156	2
3-Apr	165	163	2
4-Apr	175	168	7
5-Apr	177	174	3
6-Apr	184	180	4
7-Apr	188	185	3
8-Apr	189	190	-1
9-Apr	189	194	-5
10-Apr	197	199	-2
11-Apr	209	205	4
12-Apr	216	211	5
13-Apr	232	217	15
14-Apr	237	222	15
15-Apr	237	227	10
16-Apr	243	233	10
17-Apr	253	240	13

$$dX(t) = (g - l)X(t)dt + \sqrt{(g + l)X(t)}dW(t) \quad \ldots\ldots\ldots 1$$

$$dX(t) = (-0.03836619)X(t)dt + \sqrt{(2.3137058)X(t)}dW(t)$$

For Stochastic differential equation, there are individual infected and cued rates.

a. **Numerical Analysis.** The Stochastic differential equation using Euler's method and Maruyama's method simultaneously use to find the numerical solution to the SDE epidemic model.

Let $X(t)$ be the dependent variable for Ito's differential equation.

$$X_{t+1} = X_t + \alpha X_{t-1}\Delta t + \sigma X_{t-1}\eta\sqrt{\Delta t}$$

This equation is expressed in continuous time, but the simulation methods approximate the model in discrete time as:

$$X_{t+\Delta t} = X_t + F(t,X_t)\Delta t + G(t,X_t)G\Delta tZ(t,X_t)$$

η=random numbergenerator

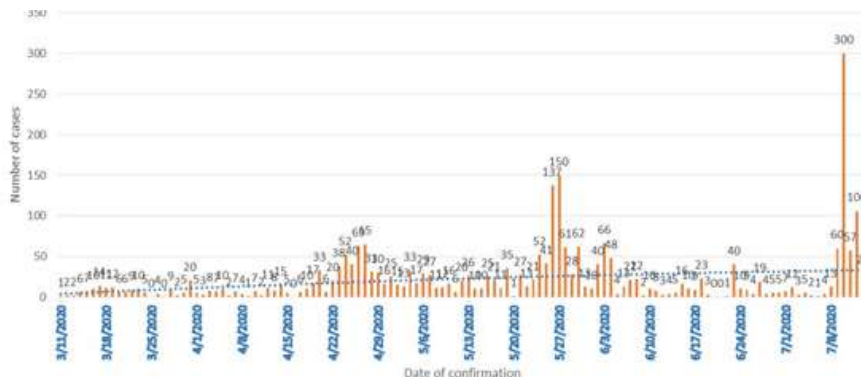Epic curve of COVID-19 patients, Sri Lanka
(as of 13/07/2020)

Figure 2 - Actual values variation of the
infected from 4th March 2020 to 8th July 2020.
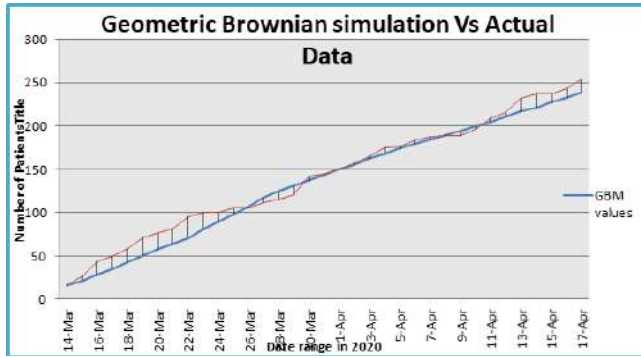(Epidemiology Unit, Ministry of Health, Sri Lanka)

Figure 3 - Solution to the virus infected changes from stochastic differential equation. The exact solution is plotted as a blue curve. The drift and diffusion parameters are set to 6.021 and 6.11, respectively. Shown in red is the actual value.

The exact solution is plotted as a blue curve and actual data graph is plotted as red curve. The Euler-Maruyama approximation with drift and diffusion parameters are set to 6.211 and 6.01 , respectively. Shown in red is the predicted value, from which and were inferred
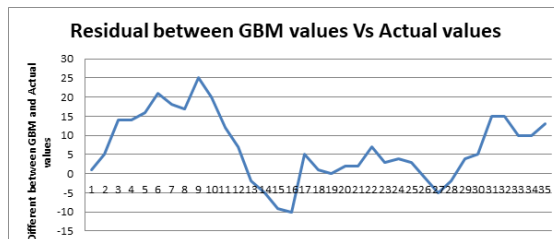

Figure 4 - The residual values between Geometric Brownian motion values Vs. Actual values

Max   :   15.59619
Min   :   -15.4542
Average: -0.50952
Variance: 48.69201
Where the Δt= 1/365

For Stochastic differential equation, there are individual infected and recovered rates.

Parameters

Initial number of patients	1
Volatility σ	6.21
Drift μ	6.01

b.   **Model Validation.**   Validation for 14th March to 17th April 2020

$$M = \frac{100}{n} \sum_{i=0}^{n} \left| \frac{A-P}{A} \right|$$

$$M = \frac{100}{1009} \sum_{i=0}^{1009} \left| \frac{A-P}{A} \right|$$

$$M = \frac{100}{35} \left| \left(\frac{235}{253} \right) \right|$$

$$M = 2.654\%$$

According to these results minimum errors are shown in between 14th March to 17th April 2020. This time range is the most suitable for the stochastic equation which we have developed above.

CONCLUSION

It is clearly seen that the stochastic differential equation that has been created in equation (1) has illustrated the simultaneous behavior with actual data plot of each year. Most of the years are shown the non-fluctuating in COVID-19 infected and it considerably coincides with the predicted model. By adjusting the variance and expectation of the formula it can be obtained the far accurate answer for the predicting model.

In error calculation, many error values are laid near the 0 line in Figure 6. Most of the values are symmetric on the center line and that illustrates the far accuracy of the mathematical

model. By using this model, it can be obtained the higher percentage of accurately predicted date for upcoming years. Furthermore, most of the data will be the emphasis on the best fitting model for the prediction and by tuning the variance and expectation, can be obtained for this equation.

According to the interpretation of actual data and predicted data the simultaneous behavior is shown. In many dynamical applications, major emphasis is placed on the probability distribution of solutions, and in particular mean and variance of the distribution. In such cases, weak solvers may suffice and have the advantage of comparatively less computational overhead, which may be crucial in the context of the Euler method.

Finally, it is concluded that the best fitting curve due to the stochastic differential equation is Figure 3. Using that model, it can be predicted the future value in the range of 92 percent of accuracy.

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