Metamorphosing Sri Lankan Old School Military Thoughts by Incorporating Artificial Intelligence to Face the New Normalities

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Abstract - The ongoing wave of 4th Industrial Revolution (4IR) marks the dawn of a new age for every aspect of our modern society, including the military. While the 4IR is set to disrupt our society, it also provides vast opportunities for militaries to sharpen their operational edge. The second-generation military forces in Sri Lanka are highly regarded in the whole world as we were the first to win hybrid warfare. Yet Sri Lanka has not always leveraged technology as a key force multiplier. Beyond its generation transformation, the Sri Lanka Military forces must ride the wave of 4IR and exploit game changing technologies and concepts, such as Internet of Things (IoT), System of Systems (SoS), Augmented Reality (AR), Artificial Intelligence (AI) and 3D printing. To this end, the Sri Lankan Military Forces must also recognize the key challenges of adapting to this ongoing wave of 4IR. The Sri Lankan Military Forces must ensure that its organisational structure, processes, operating concepts, and workforce are best positioned to ride the wave of 4IR by keeping the Air Force at the leading edge.

Keywords: Internet of Things (IoT), System of Systems (SoS), Augmented Reality (AR), Artificial Intelligence (AI), 3D printing, 4IR

Introduction

It is indeed evident that the rapid advancements in technology have shaped the nature of military operations and weapon system capabilities, moreover, will continue to happen. Presently, developments in the realm of information and cyber technologies are unleashing the proliferation of non-conventional warfare and capabilities. Low cost non-kinetic means, such as cyberwarfare have proven to be effective alternative in achieving military objectives. Such non-traditional capabilities have low barrier-to-entry and are attractive solutions for both state and non-state organizations, particularly those with little resources. These non-conventional capabilities are effective solutions to "leveling the playing field" without requiring large investment. Such disruptive phenomenon threatens the stranglehold of established conventional militaries. Conventional militaries will have to adopt fundamentally different capability development strategies and incorporate innovative solutions to confront the evolving technological and security landscapes.

The technological breakthroughs that are being witnessed are primarily driven by the ongoing wave of 4th Industrial Revolution (4IR). The 4IR marks the dawn of a new age for the modern society, including the military. Technological advancements driven by the 4IR will increasingly blur the lines of physical, digital, and biological spheres (Klaus 2016). While the 4IR creates disruptive forces for every aspect of society, it also provides vast opportunities to be capitalized upon. Technological breakthroughs pushed forth by 4IR offer militaries the opportunities to enhance the effectiveness and efficiency of their operations, training, and support of weapon systems. The 2nd Generation Sri Lankan Military Forces are not technologically advanced but yet highly regarded military might in the world. But other developed countries and 3rd Generation or higher military forces have always regarded and utilized the State-of-the-Art Technology as its key force multiplier. To this end, the Sri Lankan Military Forces must embrace and ride upon this wave of 4IR in it's beyond its Generation transformation. The forces must adapt accordingly and adopt the technological opportunities to maintain a qualitative capability edge over its potential adversaries.

The Central Idea

The 4IR is set to disrupt all aspects of the society, including military. However, disruptive technological advances pushed forth by 4IR also provide vast opportunities for militaries to sharpen its operational edge. This reserach will first identify the key developments of 4IR, and study how the Sri Lankan Military Forces can ride the 4IR wave in its future transformation. Specifically, this research will identify the technological opportunities to enhance the Sri Lankan Military's operations, engineering, logistics, and training. The research will also discuss the key challenges, and how the Sri Lankan Military Forces can position itself to capitalize the opportunities provided by the 4IR in its future transformation. If integrated correctly this will definitely substantiate the military readiness and military might of the Sri Lankan forces and indirectly a main contributor to the National Security

Technology as a Force Multiplier

Sri Lanka is a small nation with a massive variation of unharnessed natural resources. However, we have not taken any measure in utilizing these things or utilizing the geographical advantage for whatsoever. Its limitations and immutable challenges are the lack of strategic depth and knowledgeable labor resources. Given Sri Lanka's limitations and constraints, the use of technology as a force multiplier is critical in giving the Sri Lankan Armed Forces a qualited edge. To this end, the Sri Lankan military Forces have been innovatively adopting technologies to overcome Sri Lanka's limitations and constraints by doing "more with less". Technology has been and will continue to be a critical force multiplier for small armed forces like the Sri Lanka Air Force. Moving forward, as its potential adversaries adopt new and even non-conventional capabilities, the Sri Lankan Military Forces must continue to adopt game-changing technologies and new fighting concepts.

Ensuring cost sustainability of its fighting capability is a key focus of the Government of Sri Lanka. This is of paramount importance in view of the need to ensure sustainable defence spending vis-à-vis the increasing cost of sustaining advanced weapon systems. To this end, the Sri Lankan Armed Forces must leverage technological means to do more with its resources, to ensure sustainable defence spending without compromising its military's operational qualited edge.

Methodology Followed

Researcher gathered primary data during the stay at Peoples Republic of China in 2018 to 2019 by observing the real time technology application in various military stratagems. Researcher also partook in several applications such as war gaming and big data handling. The secondary data was acquired from various readings of technology and new epochs that countries have taken in mitigating risks and solving problems, the models were observed and conceptualized before embark on this research especially the Singaporean military models, South Korean, Saudi Arabia and Chinese models. The logical framework was developed beforehand, and several attributes were tested in simulations during the collection of primary data. Deductive and post positivist approach was followed as positivists emphasizes independence between the researcher and here the researcher argues that theories, hypotheses, background knowledge and values of the researcher can influence what is observed.

4IR (Forth Industrial Revolution)

Professor Klaus Schwab first coined the 4IR. In his book entitled "The Fourth Industrial Revolution" Professor Klaus Schwab describes how the Fourth Revolution is fundamentally different from the previous three, which were characterized mainly by advances in technology (Klaus 2016). The First Industrial Revolution was characterised by mechanisation of production process, while the Second and Third Revolutions were characterised by mass production and automation respectively. In this Fourth Revolution, the world faces a range of new technologies that combine the physical, digital and biological spheres.
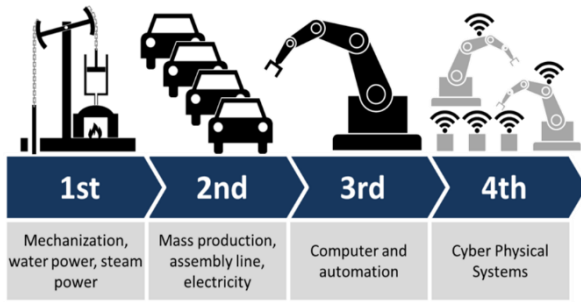
Figure1: The 4 Industrial revolution

These new technologies will challenge fundamental ideas about what it means to be human. The lines between man and machine, real world and virtual reality are no longer as clearly defined. The innovations and changes brought about by the 4IR will create waves of disruption affecting existing society structures, including military structures and reshape military concept of operations.

Among the various disruptive technological advances and new concepts driven by 4IR—Internet of Things, 3D printing, System of Systems, Augmented Reality, Artificial Intelligence possess the greatest promise to enhance, and also fundamentally change the force's concept of operations. Innovative adaption and adoption of these disruptive technologies and concepts will keep the Sri Lankan Military Forces at the leading edge in operations, training, engineering, and logistics.

4ir – Prospects

Internet of Things (IoT) – Optimizing Logistics and Maintenance.

Figure2: Biggest Security Issues IoT Devices Face (by Anastasia Stefanuk at internetofthingswiki.com)

IoT is the concept of connecting any device with an on and off switch to the Internet (and/or to each other) (Morgan 2014). This includes everything from office appliances, home appliances, personal wearable devices and almost anything else that can be connected to the internet. As mobile and broadband network technologies continue to mature and progress, IoT will correspondingly

Continue to grow and intertwine every possible aspect of our society at an exponential rate. With the proliferation of IoT, the human interaction with devices will be fundamentally altered. The interaction will shift away from a "human decide, human command, device execute" relationship. Future devices will be able to partake, influence the decisions, and command phases. Relating this to the military context, IoT will have potential to drive resource optimisation, particularly in the logistics and maintenance domains for the air force. For the Sri Lankan military, IoT can be adopted to strengthen its military power generation capability by enhancing supply chain efficiency. IoT will allow demands for spares and munitions to readily transmit to supply chain nodes, allowing logistics and supply plans to be optimized. IoT will allow technical malfunction and munition consumption details to be relayed to the supply chain nodes with the equipment is still at combat, allowing spares and munitions to be pre-positioned even before the equipment comes to the servicing or refuelling bay. This shortens the turnaround time especially for aircraft in preparing the aircraft for the next sortie.

3D Printing – Enhancing Supply Responsiveness: The emergence of 3D printing is a significant breakthrough for the engineering domain. 3D printing has provided a cost-effective means to meet supply demand expeditiously. For the Sri Lankan military, 3D printing is a viable and attractive means to manufacture non-critical equipment components on an on-demand basis. This will not only reduce demand lead-time, but also significantly enhance the equipment availability and drive down supply related costs, such as cost of maintaining stockpile.

System of Systems (SoS) – Enhance Air Force / Army/ Navy Operations: SoS is a collection of task-oriented or dedicated systems that pool their resources and capabilities together to create a new, more complex system, which offers more functionality and performance than simply the sum of the constituent systems (Dersin 2015). The promises of SoS are of great potential for military applications. An area where SoS could be

applied is the development of collaborative autonomous unmanned aerial system (UAS) operations, or swarming. In a typical swarming Operational scenario, the swarm of UAS will carry out the assigned mission in a self-reconfiguring manner, such that if one UAS is destroyed, the remaining UAS will autonomously re-configure to complete the mission. Such an operating concept utilising SoS concept, enable air operations to be conducted at a significantly lower cost. This is particularly attractive considering the increasing cost of modern air platforms. To illustrate, the cost of an F-4E was approximately US$16 million, while an F-15E costs approximately six times more at US$100 million (Bender 2014). UAS swarming concept will provide a cheaper alternative to manned platforms in fulfilling less complex surveillance and strike tasks.

Augmented Reality (AR): Overcoming Training Limitations and Constraints.

In the 4IR, multiple parallel developments are unprecedented, largely attributed and driven by the immense computing power available today. AR and Artificial Intelligence (AI) are some of the 4IR developments that will blur the lines between the physical, digital, and biological spheres. AR is the technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. In the military domain, AR is probably most useful in the training domain, delivering more realistic training for especially for military pilots and other high-risk training. AR will enable the replication of realistic conditions, allowing contingency training to be carried out in a safe and realistic environment. For the SLAF, AR can help to realise the vision of Live, Virtual, and Constructive (LVC) elements operating and fighting within the same space, overcoming the limitations and constraints of live flights. LVC will allow live assets to be replaced virtually by operator-controlled simulator systems and AI controlled constructive elements. Such an innovative approach allows the SLAF to evaluate strategies and tactics in a complex, large scale environment at a lower cost, while overcoming constraint of training space. In addition, the adoption of AR and AI technologies enable the training duration required for Sri Lankan military combat personnel, such as pilot to be shortened. For example, large force employment scenarios can be easily created using LVC technology to train operational pilots at a much lower cost.

Artificial Intelligence – Enabling Information Superiority: Beyond advances in technology, the breakthroughs brought about by 4IR could a game changer for air force operations would be AI. AI has the ability to learn from past experiences and evolve in the process to enhance the decision process while concomitantly enabling it to learn new things at a much faster rate than the human brain (Anderson 2017). In the context of air force operations, AI could be applied to enhance the processing of 'big data' for the SLAF. The adoption of automation and AI will enhance the Orient and Decide phases in the Observe, Orient, Decide, and Act (OODA) decision process. During the Orient phase, AI can be applied to process 'big data' and derive accurate conclusions, and thereafter recommend the best course of actions to maximize operational advantage to the man in the loop for execution. This shortens the OODA cycle by enabling information superiority for air operations.

Chalenges in 4IR

Cyber Threats: While the 4IR delivers technological advances and many new possibilities, it increases the reliance on computer systems and networks. This phenomenon presents and exposes the society, including military to cyberattacks. Given the increasing reliance on computer systems and networks, it is of paramount importance that the Sri Lankan Military Forces ensures that capabilities are not compromised due cyber vulnerabilities. Cyber defence and operational capabilities at the national level must be strengthened to safeguard the Sri Lankan Military's capabilities.

Re-profiling of Manpower Resources: The disruptive forces induced by the 4IR do not just affect operations, but also the profile and nature of workforce required. To fully capitalize on the opportunities provided by the 4IR, 'up-skilling' and reprofiling of workforce will be required. The World Economic Forum has forecasted that 65% of the world's children entering primary school today will ultimately end up working in completely new jobs that do not yet exist (World Economic Forum 2016). As the Sri Lankan military seek to embrace the 4IR as part of it's beyond new Generation transformation, the military forces must 'up-skill' and reprofile its

workforce accordingly. The re-profiling and training of the air force workforce is necessary to support the emerging roles and demands of new capabilities and operations.

Air Space Management: Proliferation of UAS has opened up a new dimension of challenge in the area of airspace governance to ensure aviation safety. Unregulated use of civilian UAS poses safety challenges to the SLAF given that its airbases are located near populace. To this end, the SLAF must work closely with relevant aviation authorities to enforce strict governance to regulate the use of UAS in the civil domain to safeguard against disruptions to the air force's operations and training.

Embracing a Culture of Innovation: Creativity and innovation are not often associated with military organisations, such as the Sri Lankan Military. However, presently Sri Lanka Army and Sri Lanka Navy has been focusing on imbuing work culture and instituting organisational processes to encourage bold thinking and actions from its workforce. To be able to innovatively adopt technologies and operating concepts allow the forces to achieve operational effectiveness and resource efficiency. Today, efforts in the area of strengthening the culture of innovation are aimed to support and create innovations that harness the latest technologies like data analytics, artificial intelligence, 3D printing and more. The Sri Lankan Military must embrace the culture of innovation to optimise the opportunities presented by 4IR. To this end, top down and bottom up initiatives will be required to take full advantage of the 4IR technologies. Some examples of Sri Lankan Military's bottom up initiatives include computer programmes developed by air force personnel to enhance administrative and maintenance tasks and the e-Learning (LMS-Learning Management System) at Junior Command School China bay in 2020

Strengthen Collaboration with the Defence Technology Community (DTC): Sri Lankan DTC is a critical enabler in the Sri Lanka's military transformation into an advanced 3rd Generation armed force. The DTC comprises of local defence research and development agencies, defence procurement agencies, and departments within the ministry of defence. The DTC is responsible for Sri Lanka's defence research & development, acquisition, and sustainment. Given the nature of

the technologies driven by the 4IR, extensive customizations and indigenous developments will be required to develop capabilities unique to the Sri Lankan operating requirements in its future transformation. At the leading edge, the Sri Lankan Military can no longer rely on acquiring off the shelf systems to meet its unique operational needs. The military forces must strengthen collaboration with the DTC to develop game changing technological solutions as the Sri Lankan forces seeks it is beyond 3rd Generation transformation.

Conclusion

The 4IR will bring about the fusion of the physical, digital and biological domains. 4IR will disrupt the way humankind conducts everyday life and views the world. While this new phenomenon will bring new challenges, the 4IR also create new opportunities that the modern society must capitalise. The Sri Lankan Military has always innovatively adopted technologies to sharpen its operational edge and to overcome its constraints. The Sri Lankan Forces must orient itself to this wave of 4IR and adapt to capitalise on the provided opportunities to maintain its qualitied edge. To this end, the Sri Lankan military must remain cognisant of the impact and disruptions brought by the 4IR, while seek to foster a strong culture of innovation and strengthen cooperation within the DTC community. This will ensure that the force's organisational structure, processes, operating concepts, and workforce are best positioned to ride the wave of 4IR, keeping the Sri Lankan Military at the leading edge.

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