

Professional Excellence For The Army Engineer

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Abstract:

Professional Excellence is the epitome of success for military professionals. This essay explores the attainment of professional excellence by the Army Engineer who ensures that our Army's equipment is safe, reliable, maintainable and operational. The Army Engineer is the combat force multiplier that optimises the capital investment of weapon systems to enable mission success for our Army. The essay starts by outlining the challenges of the Army Engineer, who wears the hats of a soldier and trainer as well. The essay discusses how the Army Engineer can be moulded in the four tenets of individual excellence, technical and engineering excellence, soldiering excellence and leadership excellence to enable the Army Engineer to contribute as *primus inter pares* for the 3rd Generation SAF.

Keywords: Professional Excellence; Challenges; Expectations; Roles; Discipline

"Excellence is doing ordinary things extraordinarily well."

– John W. Gardner, Former United States Secretary of Health, Education, and Welfare in the administration of President Lyndon Johnson.¹

INTRODUCTION

Professional Excellence seems a very general term but what does it really mean? Is it just about attaining success in one's profession or more? As described in the Merriam-Webster Dictionary, a professional is defined as "having a particular profession as a permanent career", and excellence is defined as "the quality of being excellent."² Therefore, for any individual, Professional Excellence would simply be excelling in your profession. But, what of an Army Engineer who wears the hats of a Soldier, a Trainer as

well as an Engineer? This essay attempts to discuss the professional excellence of the Army Engineer.

WITHIN THE ARMY ENGINEER?

Engineering is the science of certainty and precision; it is an exacting discipline, demanding a lot of rigour, intellect, analysis and confidence in our understanding of the machines we operate. In the Singapore Armed Forces (SAF), the Maintenance and Engineering Support (MES) Command is the birthplace of our Army Engineers who are bastions of the motto, 'Excellence through Professionalism' and who are considered our 'Machine Masters'. They are part of the Military Domain Expert Scheme (MDES) and their grounding is in the areas of maintenance, technical and engineering expertise. The MDES scheme develops individuals with deep specialisation to meet the complex demands of the 3rd Generation Army and

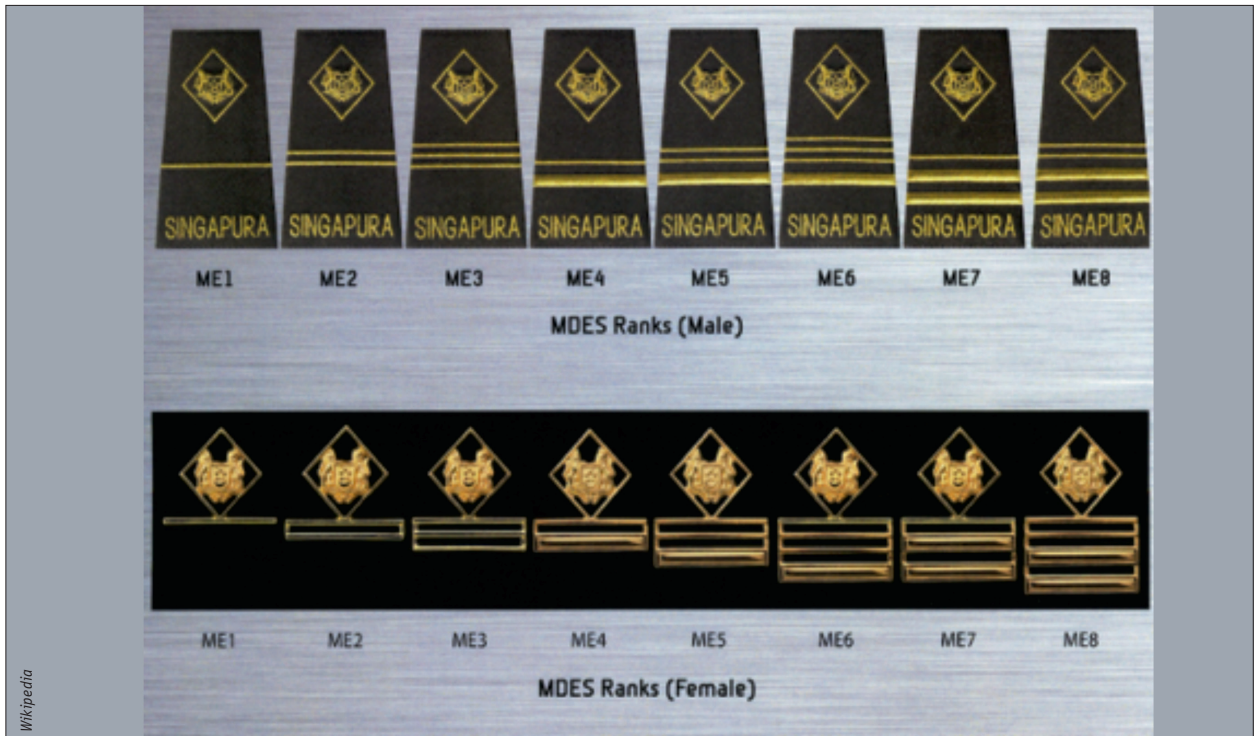


Figure 1: The MDES Rank Structure.³

bears the creed, “I take pride in my deep expertise, knowledge & professionalism.” What is synonymous so far has definitely been ‘Professionalism’.

A good mix must be found otherwise we would either end up with an engineer who would be dead in the battlefield or a soldier who cannot change his vehicle tyre to save his life.

CHALLENGES FACED

The challenges faced by the MES Command are shown as follows:

a. Increasing Engineering Demands

With the transformation of the SAF into a 3rd Generation force, we will see an increase in the number of systems. There is therefore a need to prioritise and ensure that our engineering resources are optimally employed to manage existing systems while concurrently devoting resources to new Capability Development projects. At the same time,

the Army needs to maintain operational readiness, but the challenge posed by aging equipment may not be surmountable even with the best engineering solutions.

b. Dwindling Supply of Engineers

It has been reported that our country will face a declining supply of engineers due to a general decline in interest in science and engineering among young people around the world.⁴ For the military, the engineers will perennially come from the local universities. With the decreasing trend of undergraduates taking up engineering as well as engineers switching occupations, there will be a tightening of the stream of engineer supply to the military.

c. Complexity of Modern Systems

Modern systems require both a breadth and depth of engineering expertise, which need to be nurtured and built up differently. Furthermore, the development of System-of-Systems (SoS) gives rise to even further engineering complexity and the difficulty in the rectification of faults.

d. Obsolescence Challenges

The rapid pace of high-technology electronics market has conversely led to the rapid obsolescence of electronic components in military systems. This is further compounded by the long development cycle for military systems.

e. Rising Operational Cost

The operational cost of systems rises throughout their life cycle and unless the fleet is constantly renewed, the maintenance commitment and Operations and Support (O&S) costs will continue to rise as the fleet ages.

THE 'PROFESSIONAL' ENGINEER

In the light of the aforementioned challenges, is it possible for the Army to hire professional engineers to aid them? This is what the US Army had tried by deploying professional civilian engineers to Afghanistan along with the soldiers to resolve issues that hinder mission success in theater.⁵ These civilian engineers were deployed to the US Army Research, Development and Engineering Command Field Assistance in Science and Technology-Center (RFAST-C) Prototype Integration Facility. This model however, was possible as the engineers were mainly deployed only in the RFAST-C. As they had no soldiering experience, they would represent the group

depicted in Box 4 of *Figure 2*. However, if they were to be in a hot zone, they may be a liability to the soldiers deployed alongside them. Furthermore, in our Singapore setting, these professional engineers would likely have National Service (NS) roles which they should not relinquish. A good mix must be found otherwise we would either end up with an engineer who would be dead in the battlefield or a soldier who cannot change his vehicle tyre to save his life.

EXPECTATIONS FOR THE ARMY ENGINEER

The professional soldier is essentially a combatant and therefore expected to excel in Soldier Fundamentals (SOFUN). However, there lies the stark contrast for the Army Engineer who wears the hats of Engineer, Trainer and Soldier. For the Army Engineer, did he enter the career of an Army Engineer to excel as an engineer in the Army or, is he a combatant who is also an engineer or because he could not make up his mind? Unfortunately, if these ideals do not converge, then it is possible that the Army Engineer might throw in the towel and leave. The following are the key hats required of an Army Engineer.

SOLDIER'S HAT

This is the first hat which the Army Engineer must be essentially grounded in. The United States (US)

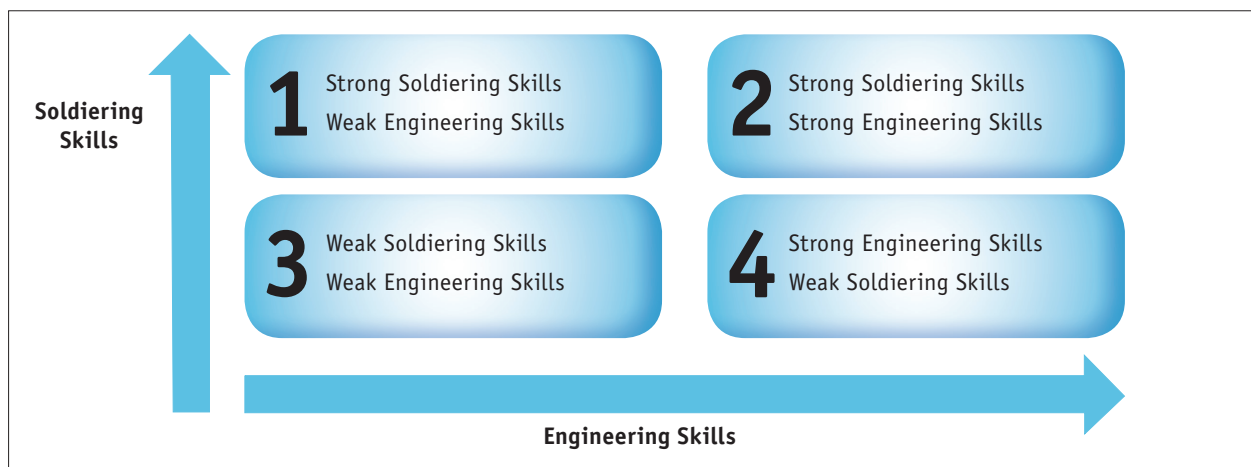


Figure 2: Soldier Vs Engineer Matrix.



Figure 3: The Army Engineer's essential weapon – The Singapore Assault Rifle (SAR) 21 with a Spanner?

Army had reviewed their foundational building blocks of soldiers' skills in 2010 as the list had expanded so much that soldiers could not list down the skills. In essence, the revised list is far smaller and slashes the number of Soldier Tasks from 32 to 15, the number of Battle Drills from 11 to 4 and the number of associated subtasks from 235 to 76.⁶ A soldier is required to 'shoot', 'move', 'communicate', 'survive and adapt'. These are the same fundamental skills that our Army Engineer must be familiar with, to ensure survivability.

Engineer's Hat

The key role of our Army Engineers as 'Machine Masters' is to ensure the sustainability of our Army equipment from cradle to grave. His key roles during the various phases are as shown below. All in all, the engineer is required to possess strong engineering, technological and analytical skills.

a. Front-End

During the front-end and acquisition phases, he

is expected to manage, develop & deliver Integrate Logistics Support (ILS) as an ILS Engineer. He would need to know how to balance the reliability, maintainability

Just as the Army is required to raise, train and sustain our Army's fighting units to ensure our operational readiness, the Army Engineer is also required to play a role to raise, train and sustain the operational capabilities of our maintenance units.

and supportability of the system. His role in this phase is typically understated. However, it is crucial that he ensures that systems have high reliability during operations as well as possess good maintainability and

supportability to reduce system downtime. Therefore reliability, maintainability and supportability are important and should be considered up-front so as to ensure that our combat systems can attain higher reliability and readiness, possess systems safety and subsequently lead to lower downstream Operations and Support (O&S) costs.

b. Operations and Support

During this phase, he is expected to ensure systems reliability & availability, balance life cycle costs and budgeting as a Systems Manager. This phase spans a long time horizon and roles for our engineers are shown below as extracted from the MINDEF Direct Communication Module (DCM) Manual. While this is the phase that the engineer would spend most of his

professional grounding in, it is a challenging phase due to the increasing complexity and range of our Army equipment.

- (1) Maintenance Management
- (2) Supply Support Management
- (3) Modification and Configuration Management
- (4) Engineering Support Management
- (5) Budget Management
- (6) Contract Management
- (7) Quality Assurance
- (8) Ammunition Surveillance
- (9) Real Estate Management
- (10) Export Control Requirement

c. System Retirement

Last but not least, he is also expected to ensure equipment serviceability and completeness during

system retirement phase. During this phase, even if the system's disposal strategy is in sales or smelting, the engineer is required to ensure that a support plan is put in place to ensure the system serviceability during its last mile in service.

Trainer's Hat

Just as the Army is required to raise, train and sustain our Army's fighting units to ensure our operational readiness, the Army Engineer is also required to play a role to raise, train and sustain the operational capabilities of our maintenance units. Besides the need to inculcate maintenance skills to soldiers who very likely do not possess any maintenance or technical background, he would also have to maintain the confidence of his subordinates who are mainly full-time National Servicemen. In this role, he is expected to be a commander, trainer and



Figure 4: Tenets of Professional Excellence.

coach and must possess strong technical and coaching competence and if required, patience.

Expectations

Throughout his career, the Army Engineer is likely to put on his engineering hat more as he matures in the organisation as well as during peacetime.

a. Times of Tension / Conflict

As shown in the earlier example, the Army Engineer would need to basically survive, before he can even perform any engineering work.

b. Period of Normalcy

In the daily environment, the Army Engineer would be required to exercise his engineering skills in a variety of Army related engineering problems as well as raise, train and sustain the technical competence

in the maintenance units. He still continues to be involved in military operations when the need arises.

BUILDING UP THE ARMY ENGINEERING PROFESSIONAL

So what does the Army Engineer need to enable him to comfortably put on all the hats required of him? He would essentially need to build up excellence in four areas which are interconnected as shown in *Figure 4*.

The four areas are individual excellence, technical and engineering excellence and finally soldiering excellence. While it may be a chicken and egg issue, let me explain as follows:

a. Individual Excellence

The first would be giving oneself the motivation

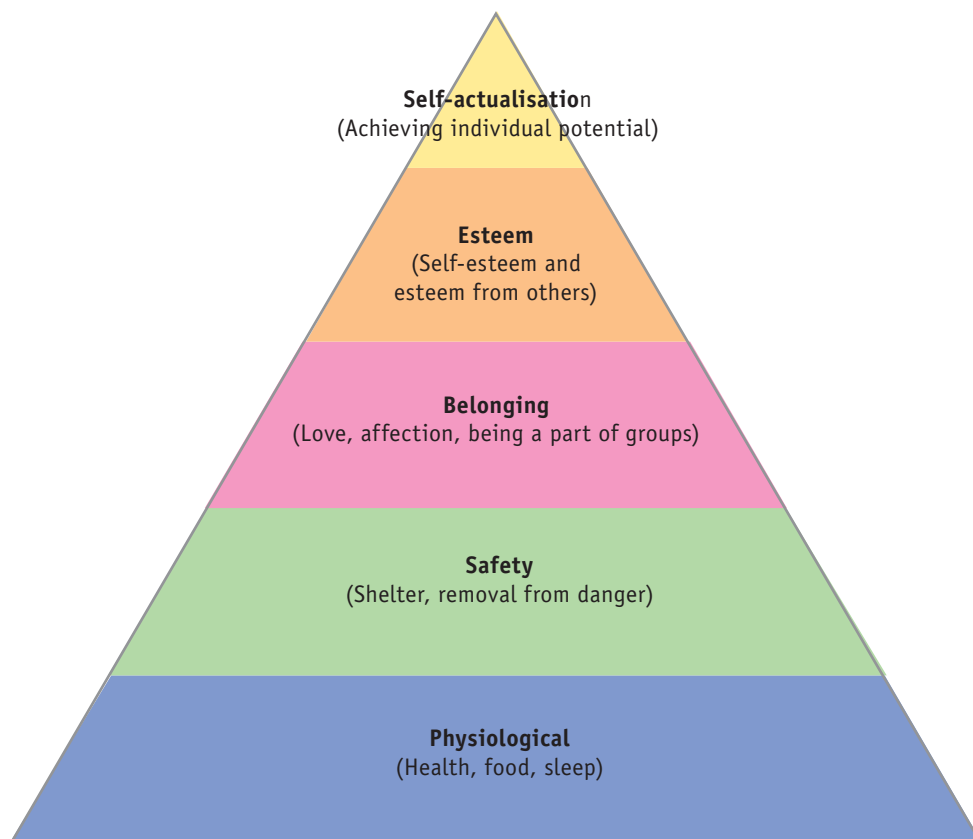


Figure 5: Maslow's Hierarchy of Needs.

to achieve one's best and strive to be the "*crème de la crème*."⁷ The concept of professional excellence to an individual is therefore the driving force to challenge oneself and yet be able to influence to give one's best.⁸ Abraham Maslow has developed the much cited '*Hierarchy of Needs*' model in which basic, low level needs such as physiological needs must be satisfied while higher level needs such as esteem and self actualisation needs are pursued.⁹ In this aspect, I believe that a stable career in the military does satisfy many of the lower needs, thus the individual motivations would essentially be higher needs.

b. Engineering & Technical Excellence

This is ultimately the Holy Grail that he must attain excellence in and be, in his day to day routine, so that he can internalise and build up his competence. While there may be some level of improvisation required in times of conflict, there is a strong likeness in all engineering areas and there are few engineering

activities in conflict which are not analogous to the activities in peace.¹⁰ An example of this would be the attainment of the Defence Technology Prize in 2011 by the Weapon Locating Radar (WLR) team during their deployment in Afghanistan. The team was able to engineer a solution to increase the lifespan and sustain the performance of the WLR for the 15 months that it was deployed in Afghanistan and achieved a 100% success rate in detecting rockets that were fired within the area of coverage. Team leader ME7 Chow Wai Yein had emphasised that, "Our training is not a last-minute kind of training. We have been preparing ourselves through our own training. For example, we conduct overseas training very regularly. During overseas training like Exercise Wallaby, our people ensure that all the equipment is serviceable. It is such training and experiences that made us thinking and learning soldiers who can perform under very stressful situations."¹¹ Indeed, it is this potent mix

S/No	Activity/Item	Challenge	Solution
1	Channeling of BV206 Exhaust Gas	Exhaust gas from the BV206 was deflected by the HESCO wall into ARTHUR's air intake and ventilation system.	Fabricate customised adapter and trunking to re-channel exhaust gas out of the deployment bay.
2.	External Generator and Cooling Units (EGCU)	BV206 engine not designed for 24/7 operations. Internal air cooling system insufficient to handle harsh summer weather.	Customised External Generator & Cooling Unit (EGCU) allowed the WLR to operate beyond its intended specifications.
3.	Improving Airflow into Rear Cabin	Difference in diameter of the hose and air inlet coupler caused drop in air pressure which resulted in insufficient cooling (Venturi Effect).	Re-routing the inlet hose through an unused ventilation fan unit removes the constriction. An adaptor box was designed & fabricated locally to connect the hose to the fan unit.
4.	Enhanced Preventive Maint	Normal Preventive Maintenance inadequate for high operating tempo.	Reviewed and improvised the frequency and scope of work.

Table 1: Technical Innovations and Engineering Solutions.



The WLR engineering team together with Dr. Ng Eng Hen, Minister for Defence, and Mr. Quek Tong Boon, Chief Defence Scientist.

of equipment knowledge, innovation and experience that help create this combat multiplier. Some of the technical innovations and engineering solutions by the team are demonstrated in *Table 1*.

c. Soldiering Excellence

An Army Engineer must continue to exercise soldiering excellence in military operations. Being a combatant is still key, as his survival in conflicts hinges on it. A stark reminder of this is the ambush on a convoy from Fort Bliss belonging to the US Army's 507th Maintenance Company on March 23rd, 2003.¹² Due to a combination of errors and a wrong turn into the Iraqi city of Nasiriyah, 11 of the 33 soldiers were killed while six were captured. The 507th Maintenance Company was subsequently dissolved and no longer exists today.

d. Soldier Fundamentals

Soldier Fundamentals (SOFUN) is therefore fundamental and should still be the cornerstone that an Army Engineer starts his professional grounding

in. This is a similar situation we see for our NSmen who are continuously refreshed on their soldiering fundamentals when they are recalled. An example of this was when soldiers from 9th Singapore Infantry Brigade (9 SIB) participated in an annual mobilisation and equipping exercises (MOBEX) in January 13th, 2013.¹³ The exercise included a segment called SOFUN activities which served to provide refresher training in various areas. They included the SAR 21 Currency Shoot for NSmen, Combat Casualty Aid Refresher training to hone key lifesaving skills and the Chemical Defence Refresher Training, which enable the NSmen to quickly don their Individual Protection Equipment suits during a chemical attack. Such training is continuously enforced to help sharpen and refresh SOFUN which is essential for all army vocationalists.

ROLE OF THE ORGANISATION

As shown earlier, the Army Engineer has his hands full in managing his many hats. While we speak of the individual, the organisation has a big part in enabling the individual to attain professional excellence through providing a stimulating yet rewarding environment.

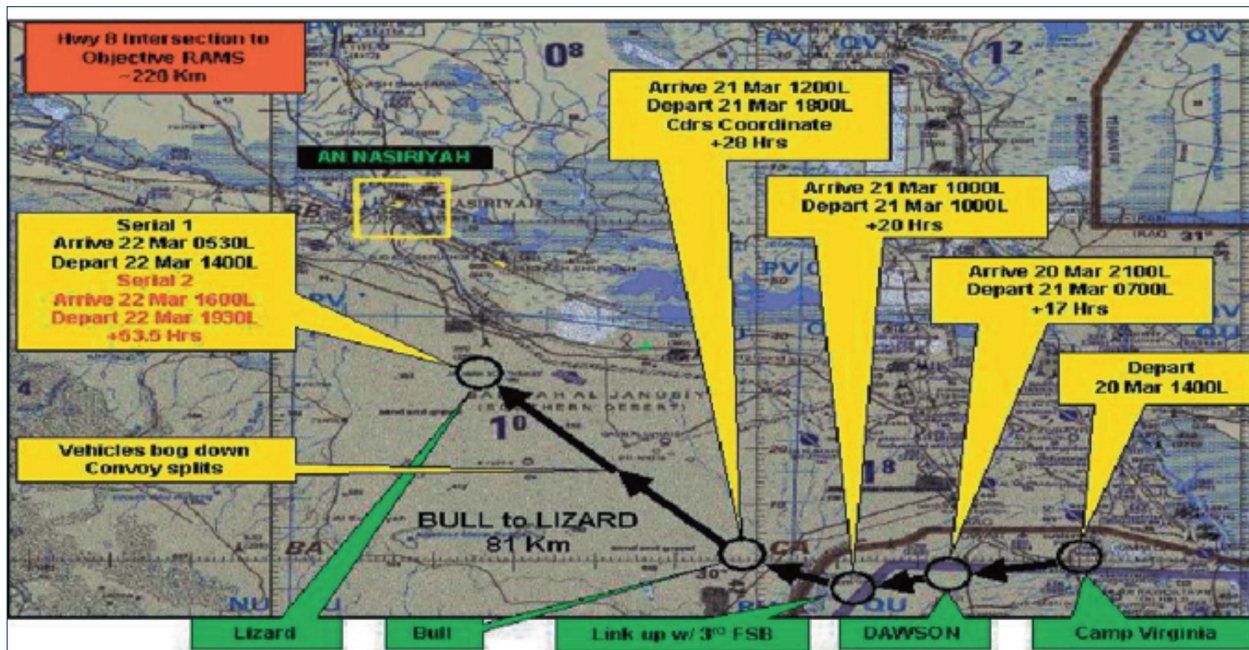


Figure 6: The 507th Maintenance Company sequence of events.¹⁴

There may be a need to find a convergence between an individual's mindset and the organisation's goals. There is inherently an intertwined relationship between a successful organisation and highly skilled staff. Areas which the organisation needs to consider are shown as follows:

a. Empowerment

Besides building personal satisfaction, empowerment is an important ingredient that can enable the engineer to exercise responsibility over his

own performance and learning. With the complexity of our Army equipment, empowerment would allow our engineers to build up professional knowledge in solving engineering issues as well as decision-making skills.

b. Doctrine and Training

The organisation's doctrine needs to be continuously refreshed amidst the changing environment based on knowledge and experience gained from operations and missions that the Army is part of. In tandem, there is a need to create a learner-centric environment that promotes career-long learning with training and education available at the point of need.¹⁵ Ultimately, the importance of professional excellence in the organisation is a reflection of the value that the firm places on technical staff development.¹⁶

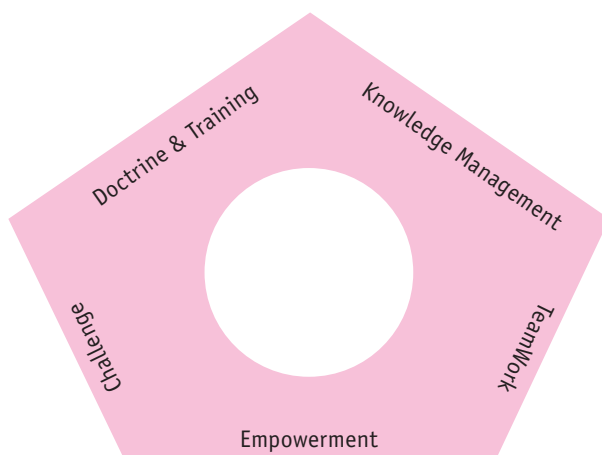


Figure 7: Organisational essentials for Professional Excellence.

With the complexity of our Army's equipment, empowerment would allow our engineers to build up professional knowledge in solving engineering issues as well as decision-making skills.

c. Challenge

It is also essential that the organisation taps the full analytical ability of every engineer. Gone are the days in which engineers perform the same daily grind day in day out. In the book, *“Professional Excellence: Beyond Technical Competence,”* the author, Alan P. Rossiter describes the need to offer a job with variety which is also stimulating.¹⁷ He carries on to explain that the effect is increased when the engineer sees that the solutions make a real difference to the people whose problem is being solved.

d. *Esprit de Corps*

Against the backdrop of economic uncertainties and declining budgets, it is essential to recognise that individuals cannot achieve success in isolation and the smallest denominator should be a pair. Most tasks would require a team of two at least to complete. Working together helps to build up professional camaraderie and subsequently develop mutual respect as well as confidence between the engineer and those he has worked with.

e. Knowledge Management

Knowledge management must exist and be accessible to allow individuals to locate information as well as be able to touch base with other individuals who may possess specific knowledge or skills. This further enhances collaboration within the organisation and also enhances an individual's solution as he is able to tap on the collection of knowledge and experiences of others. When an organisation marries technology, organisational structures and cognitive based strategies, it would be able to raise the yield of existing knowledge and produce new knowledge to meet its purpose.¹⁸

MOVING FORWARD

As the 3rd Generation SAF employs more high technology warfighting systems that are networked to fight integrated, there is a need to manage these interoperating systems even better as interoperability

multiplies our warfighting capability. Ensuring this interoperability becomes a key factor. Our Army Engineers will continue to play an increasingly important role in ensuring that the systems are serviceable and available. This is the crux even before these various interconnected systems can integrate.

CONCLUSION

The Army Engineer is an important individual in an Army and he will be required to hone varied skills in his multi-faceted roles as a Soldier, Engineer and Trainer. He needs to continuously exercise and upgrade his engineering skillsets to attain Professional Excellence and strive to be a 'Machine Master'. The organisation has a big part in his journey and can aid the process by provide a stimulating environment where he is continuously challenged and groomed. With the mentioned combination, our Army Engineers can deploy forward to contribute directly to sustaining the combat power of the 3rd Generation SAF.

“The journey toward excellence is made on a never-ending road. Because some people see no end to it, they never take the first step. Others accept the challenge and continue down the road, forever improving and looking forward to tomorrow's challenges.”

- Dr. H. J. Harrington¹⁹

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