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Foreword

The theme of “Transformation” for this inaugural issue of the new POINTER is timely and apt. The security issues facing MINDEF and the SAF in the coming years will be increasingly complex and challenging. The international strategic environment has undergone a fundamental change with the emergence of transnational terrorism following the attacks of September 11, 2001 and the Bali bombing in October 2002. The war in Iraq has overturned the geo-political equation in the Middle-East and put the trans-Atlantic alliance under stress. The SARS outbreak further underlines how unexpected threats can arise, requiring a strong capacity to adapt and to respond effectively.



It is clear that MINDEF and the SAF need to transform our operational thinking and force structure. A key imperative of transformation is to build up our organisational capacity to change and adapt, so that when confronted with fundamental surprise, we will have the resilience to absorb the shock and the agility to respond. In order to maintain a strategic edge we must change the rules of the game through better operational concepts and superior application of capabilities to realise these concepts. Transformation becomes a force multiplier. Transformation means that we must change our institutions, our process, and most importantly, ourselves, before change is forced upon us.

The new POINTER has a significant role to play in MINDEF's transformation journey. The POINTER monographs and journal articles aim to keep our officers and warrant officers up-to-date on cutting edge ideas. Through these publications and the POINTER website discussion forum, readers can engage one another in professional debates on issues such as doctrine, organisational change, leadership development and defence technology. This in turn will help foster a culture of open-mindedness and free-flowing exchanges in the defence community, which are crucial in our journey of transformation.

I am pleased to note that the inauguration of the new POINTER also marks the 21st anniversary of its establishment as the professional journal of the SAF. I am pleased to note that to encourage a diversity of views and perspectives the POINTER journal will be tapping eminent local and foreign thought leaders, experts and institutions for contributions in the issues to come.

Transformation is a venture into the unknown. It takes courage and commitment to transform. Expressing their views through POINTER is one of the ways in which SAF officers and warrant officers can demonstrate their commitment to transformation. I am confident that with your continued support, POINTER will become a key node in our transformation efforts.

RADM (NS) TEO CHEE HEAN

Minister for Defence

Editorial

POINTER was first published in 1975 as an instructional journal of the School of Methods of Instruction. In 1982, it took on its present identity as the professional journal of the SAF, with the aims of educating SAF officers on professional and military issues as well as providing a forum for them to debate and discuss these issues.

Since 1982, an editorial board under the chairmanship of Commandant, Singapore Command and Staff College, has provided the guidance for the development of the journal. POINTER has improved over the years with wider subject coverage and better quality articles. In its early days, topics on discipline, leadership, management and training featured prominently in POINTER. In the later years, articles on military history, geopolitics and military technology were added to its staple. As the SAF developed into an increasingly sophisticated and complex organisation, POINTER's coverage extended to revolution in military affairs, learning organisation, peacekeeping and globalisation. In the wake of September 11th, the issue of global terrorism has recently gained prominence as a topic of dissertation for POINTER contributors.

In many ways, Sep 11th can be seen as a watershed from which a new strategic and global security paradigm began to emerge. In Singapore, the discovery of the Jemaah Islamiah regional terrorist network and the SARS crisis have shown that the defining characteristic of our new security environment is uncertainty. To stay flexible and relevant, the SAF must become an organisation that is capable of continuous transformation, adapting rapidly to changing circumstances and demands. The first step begins in the mind - the willingness to create a "boundary-less" organization that seamlessly shares knowledge and resources.

We are therefore proud to commemorate the 21st anniversary of POINTER by reinvigorating the journal as the leading node in the SAF for sharing and networking. The new POINTER will leverage on the power of vast domestic and international network of ideas spanning the military-academic-scientific-industrial nexus. It will be the forum where SAF officers can think about, discuss and debate professional and military matters with eminent thinkers in diverse fields and discover ideas that may transform military and security affairs in a fundamental manner.

Transformation is a fitting theme for the inaugural issue of the revamped journal, given the background and rationale for the new POINTER. But what exactly is or is not Transformation? How do we bring about Transformation in different fields and contexts? How does it differ in different countries? In this inaugural issue, we have brought together a rich and diverse perspective of views on the subject, which hopefully will stimulate a lively discussion for those pertinent questions on Trans-formation.

The SAF Future Systems Architect examines the serious topic of obstacles to Transformation in the SAF from a light-hearted perspective while Mr. Andrew Tan articulates the opportunities and implications of Transformation for the SAF. We will then take a peek into one of Singapore's most innovative but highly secret R&D organisations with the CEO of Defence Science National Laboratories hinting at how the creative energy is harnessed behind bolted doors.

To provide international perspectives, we are also pleased to have ADM (Ret.) Bill Owens, a leading champion of transformation in the US, and John Kao, a renowned personality in international innovation circles, share their thoughts on this subject in our journal.

The thinking on Transformation should not be exclusive to just the senior leadership and experts. Younger officers must think of the challenges and solutions for they are the generations that will see and employ the fruits of the Transformation. In this aspect, we are glad that a number of young officers have contributed their reflections and personal experiences in dealing with change and transformation.

In addition to the thematic articles, the journal will also feature carefully selected essays, book reviews and personality profiles to make it a well-balanced publication. In particular, in this inaugural issue, we are privileged to have Mr. Alvin Toffler's permission to re-publish his article on non-lethal weapons entitled "Kill" or "Do Nothing" – Inadequate Choices for Coping with the Riots, Looting and Terror of Tomorrow.

The re-invigorated journal is one key component of the expanded charter of the new POINTER. The other important component is the monograph series, which is created to provide a platform for our people to dissect cutting edge ideas and specialised topics in greater details. Creating the Capacity to Change and Realising Integrated Knowledge-Based Command and Control are the first of many monographs to come. To reach out to its internet-savvy readers, POINTER has also upgraded its web site, which includes a search function and a new discussion forum. The revamp

effort also involves the three Services which will be actively involved in providing quality articles, with each Service sponsoring one issue of POINTER a year.

In view of these exciting changes, and with the rising professional and educational profile of SAF warrant officers, it is now timely to extend POINTER subscription to our Warrant Officer Corps. POINTER provides a means for WOs to keep abreast of current issues and be engaged with policy changes in MINDEF and the SAF. We would like to take this opportunity to extend a warm welcome to all our WO readers who will be subscribing to POINTER starting from this inaugural issue.

Feedback is the best way to help us improve. We would very much like to hear your views on the revamped journal and suggestions on other areas to make further progress. Each published letter may be awarded up to \$80. We also encourage POINTER readers to participate in our Internet discussion [forum](#) and to give their views on the new journal in this discussion forum.

On a final note, we would also like to thank our invited distinguished contributors, both local and foreign, for taking time off from their very busy schedule to contribute articles to this inaugural issue.

Editor, POINTER

Eight Big Reasons Why Transformation is Not for the SAF

by BG Jimmy Khoo

Transformation, innovation or other good stuff of related nature, is not everybody's cup of tea. Indeed, it is no afternoon beverage. Many a story has been told about it being the life-saving elixir for chronically ill organisations or the magic tonic for corporations with aspirations to achieve some measure of longevity. But despite its proven resuscitative and health-boosting effects, many corporations fear and shun it as if it were snake-oil until too late.

What about the SAF? Should we embark on the journey of "Transformation"? Taking inspiration from Carl Jung's observation that "it all depends on the way you look at things",¹ let us venture to examine the matter from an inverse perspective to see if we can unearth different insights: why might the SAF not want to embrace "Transformation"? Since eight is a popular number, I will pick eight good reasons.

The SAF should not pursue transformation...

1 ... if the SAF had an all-seeing Oracle.

No, I am not referring to a particular database - whatever the name may suggest; databases are of little value in revealing what the future portends. In case the reader has not noticed, the need for clairvoyant services to foresee the future has been much more urgent of late.

In the neighbourhood, things have been particularly topsy-turvy. Before 1997, few would have expected that the Asian tigers would have their ferocious roars abruptly silenced. Or that after 30 odd years of uninterrupted rule under one man, Indonesia would see a quick succession of three Presidents. Or that terrorists associated with international terror networks would be in our midst. Or that a microscopic organism can hit the recuperating Asian economies with almost as much more force on the Richter scale as the 1997-1998 financial contagion.

On a broader front, the tectonic plates of the global strategic landscape have been shifting restlessly, changing the fortunes of countries large and small. The Soviet Union broke up. The Berlin Wall fell. The Chinese dragon awakened but the Japanese phoenix that rose from the ashes of war is now mired in a severe economic malaise. We witnessed in awe and with reservation the rise of the sole superpower and its recent unapologetic use of its economic and military might.

Uncertainty appears to be in-creasingly the order of the day. To make matters worse, things are also increasingly complex. The forces of globalisation have created network effects, which mean that local events today can have far-reaching worldwide consequences.

It has been a very humbling time for those whose business it is to make accurate assessments of future happenings. Take for example, LG Bill Wallace's comments about the war in Iraq. Despite spending billions in modelling and simulation systems, he lamented: "The enemy we are fighting against is different from the one we waged against."²

Therefore the need for precise crystal ball gazing is very pressing. Unfortunately, meticulous scouring through the Yellow Pages is unlikely to reveal any bona fide Nostradamus-for-Hire.

The SAF today is a capable force ready for many contingencies. But given the uncertain and complex security landscape, we need a force that will be flexible and adaptive, able to deal with any scenario that may evolve or erupt in the future. Since we cannot have our own Oracle, the next best solution is to transform the SAF into such a force.

#2. ...if the SAF were filthy rich.

The reality is that money IS everything. If we had an infinite amount of resources, the SAF could afford to attain absolute superiority by sheer brute force. What S-curve? What Transformation? What network centric warfare? An extravagant force structure of disproportionate numbers of the latest tanks, fighter aircraft and other high-end hardware would easily build enough military muscle to be able to swiftly and decisively settle the issue, pulverising the adversary if need be.

But this is neither realistic nor necessary. The truth of the matter is that until recently, defence budgets around the world were generally on a visible decline. Between 1989 and 1999, world defence expenditure dropped by some 35%.³ Defence budgets of developed countries suffered the most, shrinking some 48% over the same period.⁴ (see Figure 1).

However, in Singapore, the Government firmly believes in the need for a credible defence force and this is clearly demonstrated by the allocation of up to 6% of the GDP to the defence budget. This policy has ensured a steady level of defence spending, enabling the SAF to be built up to the respectable force of today.

In spite of such governmental commitment, it is plain that the flow of defence dollars is not a guaranteed stream as the economy itself will have its own share of trials and tribulations. In March this year, DPM Lee specifically said, "there are many uncertainties", pointing out that in FY2001, Singapore had ended up with a \$2.7b deficit instead of the forecasted budget surplus, and that Singapore was running a budget deficit for the third year in a row.⁵ He drew lessons from Hong Kong's experience, observing how quickly a country can move from an enviable position of generating 6% GDP surpluses to a situation of chronic structural deficit.

Expecting that the SAF would become filthy rich is therefore wishful thinking.

3...if most SAF officers think that J2EE is a trendy new line of apparel or XML is a particular clothing measure for those caught between sizes.

A revolution is in the making. But this revolution is not about to unseat any government in power - at least not in a direct way. The flames of this revolution are being fanned by clandestine activities happening behind closed doors in the R&D labs of telecommunications, software, chip-making and computer technology giants as well as in the backyard of small start-ups in Silicon Valley. This is the latest Revolution in Military Affairs.

Leading the current RMA are the developments in information and communications technologies. Technical professionals generally agree that a number of "laws" appear to be driving the incredible pace of ICT advances.

Moore's Law maintains that chip density will double every 18 months. This translates into increasingly powerful computers.

The "Law of Fibre" articulates that the carriage capacity of fibre optics cables, the backbone of the Internet, will double every nine months. This translates into increasingly huge bandwidth available and faster download speeds for users.

The "Law of Storage" postulates that for a given cost, storage capacity will double every 12 months. This fuels the ability to have very high-resolution pictures stored in cameras and other portable digital devices.

Metcalf's Law states that the power of the network goes up with the square of the number of people in the network. This suggests that as more people get on the Internet, the value of being part of the network increases exponentially.

At the same time, unlike the cost of labour or other resources, the cost of ICT is plunging. For example, relative to the price of labour, processing power has become cheaper by a factor of 5×10^{12} over the last ten years or by a factor of five trillion!⁶

But the excitement does not stop in ICT. Some like renowned futurist Peter Schwartz even believe that the convergence of the revolutionary breakthroughs in biology, physics and chemistry will herald a major scientific revolution akin to the last one in history.⁷

The benefits extended by partaking in this RMA are tremendous. A sneak preview of how this RMA will play out was shown to the world in the recent wars in Iraq and Afghanistan.

It is an enormous opportunity available to the SAF that we must not miss.

The SAF officer therefore cannot be in the dark when living in the swirling world of science and technology. If he

does not understand the technologies, there can be no transformation for the SAF. An RMA only happens when the technological breakthroughs are fully exploited by innovations in operational concepts and the latter demands sufficient mastery in science and technology.

4...if the SAF prefers to wait for its turn on Death Row.

Success is a poor predictor of continued success. Richard Foster and Sarah Kaplan, authors of *Creative Destruction*, noted that of the original Forbes 100 corporations from 1917, 61 have ceased to exist by 1987; and of the original S&P 500 companies in 1957, only 74 remained in 1997.⁸ Indeed, they found that the life spans of companies have reduced significantly through the years, and predicted that it would be shortened to about ten years by 2020 (see Figure 2).⁹ They concluded that if history is a guide, no more than a third of today's major corporations will survive in an economically important way in the next 25 years.

The incumbents of today become prisoners of their mental models and success formulae, and in the process, Forster and Kaplan argue that their failing is rooted in a fundamentally wrong assumption of continuity.

In a separate study of a number of industries, Clayton Christensen, author of *The Innovator's Dilemma*, made an even starker conclusion: success not only does not guarantee the extended existence of a company, on the contrary, it breeds failure. He believes that the leaders in each industry are doomed to failure in the long run because of a tremendous inertia to change formulae that work.¹⁰ In the industry he studied, the incumbents had conceitedly allowed insurgents to appear in the space they dismissed as unworthy of their resources or attention. In the process, these insurgents changed the rules of the game, resulting in disruptive transformation of the market structure. The industry leaders were eventually dislodged from their pedestals in the sky.

When Lou Gerstner took over IBM in 1993, it was an elephant about to collapse.¹¹ He managed to transform it into the powerhouse it is today. Like IBM, many companies only start to look closely at "Transformation" when Death is knocking on their doors. But few are as lucky as IBM in their last ditch attempts because the returns from transformation efforts, such as opening new markets, may not be realised in the near term. When your stock price is down, cash reserves are tight and the company is hemorrhaging, it is a terrible time to conceive and execute transformation. In such situations, attempts at "Transformation" are likely to be desperate first aid measures designed to stop the immediate bleeding.

The best time to explore and then execute transformation is when you are at the peak.

Hence it need not come as a surprise that Transformation guru Andrew Marshall was not referring to some third world country, but the armed forces of the world's sole superpower, when he said, "Transformation is....an imperative".¹² Here, we are talking about a country whose defence budget is so large that its 2002 budget is more than the combined total of the next top 15 spending countries in the world.¹³ Its military expenditure constitutes almost half the world's expenditure on defence equipment!

Therefore, the maxim of "if ain't broke, don't fix it" is not only completely inapplicable for corporate survival, it is also wide off the mark even for armed forces.

This lesson is well worth the while for the SAF to learn.

We should not wait for the SAF to become ineffective and irrelevant before we look at transformation to prepare for the future. We should explore transformation ideas and alternatives NOW - which is at a time of our choosing, when we have much more mental and resource capacity. This will allow us to take some amount of risk to conduct experiments and trials before we finally decide on the directions of the future SAF.

5...if most SAF officers cannot or pretend they cannot spell.

For those who cannot spell or do not care to notice, "Innovation" is spelt with the letter "I" in its beginning. The business of innovation and transformation is EVERYBODY's business. As a matter of fact, winning the people over is so crucial to any process of transformation that a whole branch of management science has been devoted to the subject of Change Management.

But surely we seek from each person more than passive receptivity to top-down motivated change? If creative concepts are the critical constituents to unleash the true value of new technologies, then the individual has a very large role to play. It can therefore be argued that the real network in the concept of Network Centric Warfare is the people network. This is the network that will provide the ideas and the concepts, and it is this same network that will passionately and competently implement them.

This is the network that makes the world of difference.

The people network is also important from another perspective.

Innovation is inevitably a numbers game. To find the mega hits, one needs numbers, competition and a marketplace.

Venture capitalists (VC) like Kleiner Perkins fund less than 1% of the original proposals they receive, but enough to get the big IPO winners.

In the jungle of life, the odds are even greater. 200 million sperms are needed to find that one single, determined sperm with the strength and endurance to beat the competition in long distance swimming. For its success, the prize is Life.

Many other statistics tell the same story. In high-tech start-ups, only one in six million ideas eventually becomes an IPO.¹⁴ Some 60% of companies that get seed money from VCs end up in bankruptcy. In East Asia, four out of five new businesses fail within the first two years. Even in the US, less than one in one hundred inventors make money. Many become road-kill on their quest for success but for those who do make it, the perils of the journey were worth it. Thomas Edison's "I have not failed. I've just found 10,000 ways that don't work" still rings true today.

If numbers matter, then each and every SAF officer matters in our own quest. Every year, we already generate some 370,000 suggestions under the SAF Suggestions Scheme. Unfortunately, most of these suggestions have only local impact. If we can harness the power of such numbers to deal with larger issues, perhaps facilitated through competition in an "ideas marketplace", the potential payoff for transformation is mind boggling.

#6...if the SAF prefers guided tours

Transformation is only possible if the SAF is prepared to embark on an uncertain journey with no definite destination.

It will be an expedition which will require a compass but there is no map to check our positions as we sail into uncharted waters. We will have way-points but we will need to constantly change course and even backtrack to find the right path. Occasionally, when the road gets rough and the search seems futile, we may be unable to rely on scientific methods to verify the value of the mission. To persevere, we would then have to rely on our dreams of the future, our belief that the end-point would be worthwhile and our faith in our abilities to arrive.

Transformation will be a journey not for the faint-hearted.

#7....if the SAF's idea of a good investment portfolio is 100% in FDs and capital-guaranteed funds

Every weekend, we are repeatedly reminded by the Sunday Times about the importance of sound financial planning for the family. But the Family Money section probably ends up quickly on the pile designated for the karang guni man. Yet, if we examine the concepts of financial planning closely, there is much to learn for those involved in preparing for the SAF's future.

The first is that a portfolio of only fixed income instruments is not a financial plan. It is merely a savings plan! A savings plan is generally good only for a future that unfolds according to one's expectations.

He who is satisfied with the security of a nest-egg of slow and steady income is unlikely to be on a keen look-out for bold opportunities, and even less likely to leap into immediate action to seize them. He would prefer not to take risks that could upset the comfortable, known status quo, even when the upside is clearly significant.

Risk-adversity, or probably more accurately, failure-adversity, is therefore not exactly an attribute that brings about phenomenal returns. In economics and finance theory, profit is solely the reward for risk-taking.

Unfortunately, risk-adversity is a widespread phenomenon stifling creativity and change. McKinsey for example found that "fear of failure" was the Number One barrier to innovation in a Fortune 500 company¹⁵. See Figure 3.

Therefore, if we are seeking innovative solutions with very high pay-off, the SAF cannot be only interested in tried and tested solutions. This is increasingly true as the SAF searches for capabilities that are not available off the rack.

The SAF officer must not be afraid to venture into unknown territory. We must heed George E Woodberry: "Defeat is not the worst of failures. Not to have tried is the true failure."

Next, as in the financial market, a system of managing risk is mandatory when one ventures into terrain where failure is a regular feature. At the system level, it is not just simply about risk-taking but about designing a balanced and diversified portfolio that matches SAF's risk-return profile.

In one part of this portfolio, we would pick equity with long-term potential. Here, the SAF would be like Warren Buffet and Berkshire Hathaway, carefully selecting products with strong basics. We would not be concerned about short-term stock market fluctuations, as we are confident about the eventual benefits.

In another part, we will explore high pay-off possibilities. Here, we will be like the venture capitalist making clever but small bets in many areas so that some will have huge returns. We will explore and experiment with ideas, concepts and technology, and take the risk that some of them will fail.

In a third part, we will hedge and buy options that will pay off under different scenarios. Here, we will seed initial capabilities that can be scaled up as needed when a specific expected scenario develops.

Clearly, all involved in trans-formation work need to go for courses on financial planning.

#8...if the SAF is completely vegetarian

In both The Innovator's Dilemma and Creative Destruction, the authors suggested that a major reason for corporate failure is their rigid mental models. Peter Senge also referred to the key role of dysfunctional mental models in organizations that do not learn in the Fifth Discipline.¹⁶

For innovation to succeed, the SAF must therefore be prepared to dissect its mental models to examine whether they continue to be relevant. Sacred cows in particular must be slain if they are impediments to a better end-state.

Mark Twain, probably a gourmet, went one step further and insisted that "sacred cows make the best hamburger". If we remain vegetarian and have no stomach for sacred-cow burgers, we could end up like those in the grave-yards for has-been great corporations.

These eight reasons are by no means the only barriers to transformation. There are others not mentioned here and more that I have not even thought about. Each of them will present a challenge that we must confront. Along the way, each that we overcome will give one more notch of confidence that we are closer to our destination.

The journey has begun. I know we will succeed. Singapore has a sound track record of beating overwhelming odds, be it in nation-building or defeating the SARS virus. But this requires every SAF officer to play an active part. Together, let us all work together to build the SAF of tomorrow.

Endnotes

1 "It all depends on the way you look at things, and not how they are in themselves" - Carl Jung

2 "How High -Tech Games Failed to Simulate What Happens in War", Wall Street Journal, Mar 31 2003

3 World Military Expenditures and Arms Transfer 1999-2000, US Department of State Bureau of Verification and Compliance. US Government Printing Office. Released June 2002.

4 Ibid

5 "The Budget in Context", Business Times March 13

6 "The Marshall Plan", Wired Magazine Issue 11.2, Feb 03

7 "The New View on the Next Decade - An Interview with Peter Swartz", Peter Leyden, Knowledge for Action, a Monitor Group publication

8 Creative Destruction, Richard Foster and Sarah Kaplan, April 2001.

9 Ibid, pg 13.

10 The Innovator's Dilemma, Clayton Christensen, HarperBusiness edition, published 2000.

11 Who Says Elephants Can't Dance, Louis Gerstner, HarperBusiness, 2002

12 "The Marshall Plan", Wired Magazine Issue 11.2, Feb 03

13 SIPRI data on military expenditure, published on website address: [projects.sipri.se/milex mex_data_index.html](http://projects.sipri.se/milex/mex_data_index.html)

14 Statistics from a 2002 talk to the Temasek Society by local entrepreneur YY Wong

15 Creative Destruction, Richard Foster and Sarah Kaplan, pg 247.

16 Fifth Discipline: The Art and Practice of the Learning Organisation, Peter M Senge



BG Jimmy Khoo is currently the Future Systems Architect and this would delight fans of The Matrix. Like his counterpart in the Matrix, BG Khoo aspires to play a small part in the transformation journey of the SAF. The new role enables him to finally put his favourite past-times of doodling and daydreaming to good use. His past command and staff experiences, especially as a division commander and leading the joint staff as Director of Joint Operations and Planning, are key to his personal understanding of the needs for transformation. His education in Oxford and Stanford, and intimate involvement in SAF's international collaborations have taught him that Mindef's global networks of knowledge are a huge force multiplier for the SAF.

Making Innovation Come Alive

by Mr Quek Tong Boon

Fostering a Culture of Innovation

The Economist says that innovation has become the “industrial religion of the 20th century” and Gregory Daines of Cambridge University says that it is the new theology that unites the left and right of politics. Gary Hamel says that “radical innovation is no longer an option for big companies — it’s the imperative.” We are all probably familiar with such rhetoric on innovation in recent years. Of its importance, nobody is of doubt. Of its mastery, few companies can lay claim.

One company that has frequently been used as a case study in the literature on innovation is 3M, where one-third of its annual revenues come from sales of products that are less than four years old. In the semi-conductor industry, Moore’s Law could not have been realised over the last few decades had it not been for the relentless and innovation-driven push to come up with ever smaller, cheaper and yet more powerful microelectronic devices such as microprocessors from Intel, the company co-founded by Gordon Moore himself.

For the purpose of this article, innovation is defined as “the embodiment, combination, and/or synthesis of knowledge into new and unique combinations”¹ to create value. This definition differentiates it from invention which is the discovery of things have not been discovered before.

Nature versus nurture and individuals versus teams are moot points in any discussion on creativity at the philosophical level. For an applied research and development organisation where most projects are undertaken by teams, this is an academic issue. Individual researchers would no doubt be capable of pursuing their own research interests. The real challenge is how to get a higher rate of innovation out of the research teams and how to reap greater synergy across the organisation.

If the researchers work on un-coordinated research and run in different directions, the organisation would be a very chaotic workplace. Although it is generally acknowledged that some chaos is good for creativity, too much of it will create anarchy with energy dissipated in different directions.

Applied research and development is about creating new knowledge to add value. A culture of innovation is therefore critical. As the transformation of culture involves human behaviour, human relationships and a shift of mental models, it is a challenging and long-term journey fraught with ups and downs. This article focuses on my experience with encouraging greater knowledge sharing, interdisciplinary R&D and ideation in the DSO National Laboratories,² an organisation whose main focus is applied R&D for national security.

Sharing Knowledge

The ability of researchers to build on each other’s knowledge is an essential ingredient for new knowledge to be created while minimising reinvention of the wheel. Seeking views and perspectives from others enables a researcher to open himself up to new possibilities, enrich his own knowledge base and develop fresh perspectives.

Examples of initiatives that have been put in place in DSO to change the instinct of staff from “why share?” to “why not share?” include peer reviews, technical presentations, intranet sharing of technical reports, sharing lessons learnt from projects through case studies, translating tacit knowledge into handbooks, and establishing active technical interest groups.

I started an annual management course for middle level managers in 1998 to enable the experience gained from different projects to be shared through case studies, one of which I wrote from a project that I led many years ago. As most of these require extra effort beyond the normal project requirements, the main difficulty that has been encountered is to instil the habit of reflecting on lessons learnt from projects. My observation is that participants who have benefited from such case studies are more inclined to write case studies.

The publication of the DSO 30th Anniversary commemorative book *Creating the Technology Edge* in October 2002 was a watershed in DSO’s effort to open up. It was a collective effort by many management and technical staff -

past and present - to put in a layman's language some of DSO history and capabilities that can be openly talked about. In June 2003, this was followed by DSO's first public technology showcase known as "Defence Science Matters!".

Forging a knowledge sharing culture is particularly challenging in an organisation like DSO because of its involvement with sensitive defence projects. Striking the right balance between openness and security remains a challenge for DSO even to this day. The key to doing so is appropriate classification of information so that what is really sensitive can be properly protected.

Borrowing and adapting some jargon from the recent Severe Acute Respiratory Syndrome (SARS) crisis, the vision I have for knowledge sharing in DSO is to maximise innovation infection or "inno-fection" by nurturing more innovation super-spreaders. In turn, they should encourage staff who are in self-quarantine to come forth and infect others. It would be very satisfying if such efforts result in a DSO that runs a high "inno-fever". Appropriate innovation-radar (iR) sensors for surveillance and tracking that have been put in place today include a set of indicators to track the trends in talks, handbooks, documents deposited, case studies, personal webpages and so on. A knowledge management unit known as iKM has also been formed to drive the effort.

DSO would have gone a long way in its knowledge sharing effort when its staff firmly embrace the notion that "we share, therefore we are".

Generating Refreshing Ideas

Ideas and imagination are the seeds of innovation. Though not all the seeds will germinate and grow into innovation, without such seeds, we cannot even begin to hope for innovation. For innovation to thrive, idea generation must therefore become a habit.

An environment that is conducive for creative sparks to fly must allow even the most junior staff to explore ideas, bounce them off with his colleagues, and float promising ideas up to his bosses without being inhibited by organisational barriers or sacred cows. I decided to experiment with the formation of cross-disciplinary idea generation teams about two years ago.

So far, more than 100 of the research staff have participated in such idea generation teams. They have generated more than 100 ideas, about 5% of which have been shortlisted for further studies. The rest are stored in an ideas e-bank.

No organisation can claim to have a monopoly on ideas. Networking with the outside world has helped us to broaden our perspectives and enrich our ideas. Today for example, DSO researchers work very closely with the officers from the Future System Directorate of MINDEF to dream up new ideas and concepts that could contribute to the SAF transformational effort. Research collaborations with R&D partners from other companies also provide useful references on what others are doing in related areas.

Ideas generated and technologies created need to be shared across the organisation. I have therefore asked for an innovation fair to be organised once in two years for researchers to share their latest ideas, technologies and gadgets.

One of the challenges here is to create sufficient momentum for the idea generation movement to take on a life of its own and for the habit of idea generation to be internalised, notwithstanding the competition for time from other tasks perceived to be more urgent by staff.

My vision for DSO is for it to be a wellspring of technological knowledge, a fountain of innovation, and an inspiration to the R&D community in Singapore.

Undertaking Inter-Disciplinary R&D

Another challenge is encouraging interdisciplinary research. In general, most researchers are highly specialised - very knowledgeable in their area of specialisation but ill at ease venturing beyond their own area of specialisation or discipline. In the May 2003 issue of the IEEE Signal Processing Magazine,³ Dr Allan Steinhardt of DARPA came up with his "Steinhardt's Asymptotic Law of Speciation"⁴ which states that :

lim P (salience) -> 0

Speciation -> infinity

The law states that, as disciplines in engineering become more and more specialized and insular, the probability that a salient solution will arrive from research activities becomes extremely slim. The point is that a balance is needed between depth and breadth. Over-specialization could result in the search for solutions to practical problems within a confined solution space while being blind to alternative approaches that could be more practical, robust or effective.

To maximise the ability of our researchers to come up with novel, inspiring, cool and elegant (NICE) solutions, the specialists from different disciplines need to dream and work together. At the organisation level, I have assigned two of the DSO directors the de facto roles of CIOs - not chief information officers but chief integration officers - to help to facilitate inter-disciplinary R&D.

System concept studies (SCS) by researchers from across centres are also encouraged. A particular SCS could for example be made up of team members who are specialists in radar, electromagnetics, electro-optics, acoustics, materials and aerodynamics to study the concept of a low observable aircraft. Another team could be made up of engineers, microbiologists and chemists to develop a field deployable chemistry-biological sensor on a chip.

During the recent SARS crisis, DSO operations researchers applied mathematical tools they had developed for critical infrastructure security assessment to model the spread of the disease in Singapore. Computer scientists who work on defences against computer viruses also chipped in to apply their skills to model the spread of the virus. The experience is now being applied back to their work on computer security. Our chemists apply their chemical defence expertise to help fight this biological threat. Diversity can certainly enrich the elegance of our solutions, much as spices enrich the taste of our food, provided we are able to converge and blend them well.

Between individualism and teaming, the latter is less instinctive than the former. Nevertheless, in encouraging teaming and interdisciplinary innovation, one of the key challenges is to ensure that creative individuals are not stifled. Like in team sports, world-class teams that excel and sparkle owe their success as much to outstanding teamwork as to the flair of the individual players.

Setting Stretched Goals

During the dot-com fever period of the late 90s, we came across stories of new start-ups almost on a daily basis. Success stories spoke of how small groups of individuals would work extremely hard to pursue their dream ideas to a stage when their start-ups would be ready for initial public offering (IPO). The IPO was the pot of gold every start-up was chasing. This prompted me to think about whether it would be possible to introduce some mechanisms to motivate small groups of staff to go the extra mile to push performance boundaries of their R&D work to the limit, as if they were working for their own start-up companies. Stock options and IPO were clearly not applicable for a not-for-profit, government-owned R&D company like DSO. I formed a task force to study the issue.

What the task force recommended was to put in place a mechanism whereby staff were encouraged to set stretched goals. The goals must be beyond what is feasible at the time they are proposed. If successful, the outcome should be impactful to be worth the risks.

To incentivise staff, a monetary award is given to teams that are able to achieve the registered goals. I also took the opportunity to revise the overall DSO reward and recognition system for team achievements to stimulate group innovation. The apex of the reward was what I dubbed the DSO KINETIC Award for teams that achieve outstanding capabilities with significant operational impact. The quantum depends on its impact. The highest reward given for a KINETIC Award to date is \$100,000.

When President Kennedy said the following on September 12, 1962, he was actually setting a stretched goal for the Americans:

"We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organise and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win."

At the time when it was set, there were many reasons to be skeptical and the goal seemed impossible to many. Yet

it challenged the entire nation and America succeeded in putting a man on the moon in 1969. While the scale of organisational projects cannot be compared to that of the moonshot, the principle of setting ambitious goals to inspire staff to excel and create is equally applicable. My experience with the stretched goals initiative bears this out. It also bears out the truth of what Gary Hamel said, "No company outperforms its aspirations... Beliefs set the upper limit on what is possible."⁷

Researchers have to register their goals up-front after convincing a panel that the goals are indeed stretched. While hard work may work, in most cases smart work would be necessary. As researchers invariably have to tap on their creative juices in reaching for stretched goals, the journey itself can be as important and instructive as the destination. Since 2001, about 30 projects with stretched goals have been registered. One-third of these are still on-going. One third did not meet their goals and have been terminated. The remaining one-third have achieved their goals. The failure rate is therefore 50%. But in most cases, those who have taken up the challenges have found them rewarding, irrespective of whether they attained fully the goals set.

One of the main challenges here is to encourage staff to pluck up the courage to set stretched goals for their projects. The notion that failure is a stepping stone to success has yet to be widely embraced.

Sharpening Customer-Focus

As researchers allow their imagination to soar and aim for the stars in their aspirations, they must also keep their feet on the ground to ensure that they remain relevant. Keeping in touch with the potential users of their R&D outputs is a very useful reality check. It also ensures that they focus their energy on solving real problems that matter rather than chasing blue-sky research to satisfy their intellectual curiosity or simply to publish papers.

In solutioning, it is one thing to hypothesize based on simplistic assumptions but quite another to ensure that our solutions are robust enough to perform well against real data, under typically noisy and realistic field environment. In signal processing for example, where signal-to-noise ratio is widely used as a measure of the quality of signals to be processed, it is sometimes said that theoreticians design their algorithms to handle signals while real engineers design their algorithm to handle noise!

The challenge for the researchers is to strike a good balance between demand pull and technology push in their quest for NICE solutions to practical problems. Customer focus must however not be at the expense of the researchers' ability to generate bold ideas and concepts to capitalise on technological opportunities and meet unarticulated needs.

Growing and Glowing

Innovation leverages on human ingenuity. It is therefore not something that can be mechanised or automated. The real competitive edge of organisations that strive to be innovative ultimately lies in their people and how they are employed. An environment that is conducive for creative sparks to be ignited and where talented people can work on challenging projects is a powerful magnet that attracts other talent.

There must therefore also be an appropriate human resource management system put in place to enable the knowledge creators to grow and glow. In the DSO context, the initiatives that have been put in place include an employment scheme optimised for R&D work, the streamlined reward and recognition system mentioned above, a technical career advancement ladder, and establishment of an intellectual property management system. To further inspire staff, a unique sculpture known as "Tropical Brainforest" was unveiled as a tribute to the DSO knowledge creators in January 2003.

Conclusion

Fostering a more innovative culture is a journey that takes years. Even then, you are never really quite there because the destination itself is also dynamic as one adapts to new reality and new challenges along the way. No doubt the trans-formation journey of the SAF will face similar challenges.

One of the key measures of success is the ability to convert potential creative energy into kinetic energy and continuously expand the intellectual space as it is the wellspring of the convertible energy.

If there is a single lesson I have learnt so far that is generally applicable, it is that there is no point just simply dreaming or talking about innovation or lamenting about the lack of it - just do it! The whats and hows of doing it is itself a great and exciting challenge in innovativeness and adaptiveness.

Endnotes

- 1 Definition adopted by the American Productivity & Quality Centre (APQC).
- 2 The mission of DSO is to develop technologies and solutions that can provide technological surprises to sharpen the cutting edge of Singapore's national security.
- 3 Alan Steinhardt, "Making New Stuff Work", IEEE Signal Processing Magazine, May 2003, p14-18.
- 4 "Speciation" has its origins in biology. Steinhardt uses it to describe the urge to become increasingly specialized.
- 5 Salience here means that the essence of a practical need has been captured in the mathematical formula of a problem to such an extent that a practical solution is offered once the theoretical problem is solved.
- 6 KINETIC is the acronym of the DSO value system that I introduced in 1998. It stands for Knowledge creation, seeking and sharing, INtegrity, Excellence, Teamwork, Innovativeness, and Customer-focus.
- 7 Gary Hamel, Leading the Revolution, p244-245



Quek Tong Boon has been Chief Executive Officer of the DSO National Laboratories since January 1998. Having experienced at first hand during his early years in the organisation what project teams were capable of achieving when they believed passionately in what they were doing, he now tries to impart similar values organisational-wide in the hope of igniting a passion for innovation in DSO. Since joining DSO in 1979, he has held various R&D appointments before becoming the Director of the Defence Materiel Organisation (now the materiel group in DSTA) until 1997.

Military Transformation in a Changing Security Landscape: Implications for the SAF

by Mr Andrew Tan

Imperative of Change

Most of us are familiar with this experiment. Throw a frog in boiling water and it jumps out. But if we gently bring the water to boil, the frog, not sensing the rise in temperature, allows itself to be cooked. Such is the fate that awaits those who fail to adapt to their environment. Today, armed forces confront a similar situation. Faced with a rapidly changing battlefield, they must either adapt or face destruction. As the example shows, waiting for circumstances to change is not a viable strategy. Mastering adaptive change is the only way to survive.

Change in the military context is often misunderstood to mean the use or acquisition of new hardware. The recent success of Operation Iraqi Freedom in bringing about the quick defeat of Saddam Hussein's army will no doubt reopen the debate as to whether Precision Guided Weapons (PGWs) were instrumental to the Coalition's victory. Five decades ago, at the end of the Second World War, a similar debate raged on both sides of the Atlantic over whether the failure of Allied strategic bombing in bringing about a quick defeat of Germany meant that airpower was a waste of resources and incidental to the Allied victory. But focusing on selective aspects of successful military operations can be misleading, even dangerous.

Just as PGWs and strategic bombing represent but one spectrum of responses, we should be careful not to draw the wrong conclusions from the on-going Revolution in Military Affairs (RMA) that technology is the answer.¹ Indeed, as the recent conflict in Iraq has shown, the Coalition's advance to Baghdad was slowed down not by sophisticated means, but by the constant harassment of irregular Fedayeen forces in its rear. Lord Acton's famous words that "power tends to corrupt and absolute power corrupts absolutely" can similarly be used to describe an over-reliance on military hardware. The US experience in Vietnam is a case in point. Despite using every technological means at its disposal, the US failed to neutralise the Vietcong. Indeed, as the Americans learnt the hard way, "absolute technology corrupts absolutely".

The change advocated here is of a different nature. It is not to be confused with technical change. Adaptive change involves a transformation of an organisation's beliefs, thought processes and approaches in dealing with existing and new problems. It accepts the reality that the environment is dynamic, not static, and that both positive and negative feedback to the organisation is an integral part of its growth. An organisation that stagnates will atrophy in no time, which explains why nature is in a constant state of renewal. Death is nature's state of equilibrium. The distinction between technical and adaptive change is important in exploiting the full potential of military transformation.

Military Transformation in Perspective

History gives us clues as to why military transformations have had such vastly different impacts on society. The first point to note is that military transformations seldom take place in a vacuum. They occur in periods of great chaos and uncertainty, often when the established order is on the verge of collapse. Thus for the Japanese, their humiliation at the hands of the West sparked the Meiji reform in the 19th century; for the Germans, it was their defeat in the First World War; and for the Americans, it was Vietnam and the Cold War.

Early adopters of a new technology often benefited from its use. It was no coincidence that these were often the same groups of people at the fringes of power out to challenge the status quo. The Germanic tribes known as the Goths, which overran the Roman Empire in the 5th century AD, were among the first to make use of the stirrup, one of the most significant inventions of that time. The stirrup, in conjunction with the saddle, provided the horseman with the stability to strike at the enemy without falling. With this invention, the knight and horse emerged as a dominant force in medieval Europe. By the time the Franks (successors to the Goths) had conquered much of Western Europe under Charlemagne in the 9th century AD, stirrups were in widespread use.

Although some scholars have gone to the extent of arguing that the invention of the stirrup led to the birth of feudalism in medieval Europe, suffice it to say that knights were expensive to upkeep and it gave rise to a new social order linked to land, that sustained this type of warfare. Once entrenched, feudalism created its own vested interests, such as the move to promote chivalric codes of conduct. This was in essence an attempt to regulate war

and limit its damage. These vested interests blinded the Franks to changing circumstances. Thus, they were defeated by the Normans who used their crossbows. The Franks had never seen crossbows employed in war. The development of heavier armour did little to revive the role of cavalry, as it only reduced its mobility. Incidentally, this is a good example of how a technical change failed to address an adaptive challenge.

Eventually, the demise of cavalry in Europe was as much caused by advances in weapons technology as the breakdown in the old social order that supported it. Yet much of Europe continued to cling to the outdated concept in the early 20th century, even after the *levee en masse* (military conscription) was introduced. Most West European armed forces still had up to a third of their military on horseback at the time of the First World War. Ironically, the copying of each other's armed forces served to delay the transformation process.

Aside from institutional interests, entrenched mindsets can also obstruct reform, as in the case of the Maginot Line. Built between 1929 and 1940, French generals hoped that this extensive defensive perimeter would deter the Germans from invading their country. Stretching from Switzerland to the Ardennes in the North and from the Alps to the Mediterranean in the South, it was considered the state of the art defence system, with a series of underground interconnecting tunnels that stretched for kilometres. Ironically, the Maginot Line served its purpose but only too well. While it deterred the Germans from attacking France in its eastern frontier, it also blinded the French army to developments in tanks and aircraft that led the Germans to develop blitzkrieg, which was a key paradigm shift from the trench warfare of the First World War.

At the end of the Second World War, we encounter a similar entrenched mindset in the development of intercontinental ballistic missiles (ICBMs). The US Air Force was highly resistant to its development. The Air Force was filled with men who had flown their bombers in the Second World War and saw no better alternative. Even mainstream scientists, including Vannevar Bush, who became President Truman's science adviser, dismissed ballistics missiles as a futuristic development. A review in 1947 analysing the future of missiles predicted that, "for the next ten years, at least, the subsonic bomber will be the only means available for the delivery of long-range (1,000 miles and over) air bombardment." In 1949, the National Security Council re-affirmed the need to give priority to the production of atomic bombs and B-36 bombers. It took the launch of the Russian Sputnik in 1957 to jolt both military and civilian planners out of their complacency. Indeed, as Ernest Schwibert, an Air Force historian, notes, "The hurdle which had to be annihilated in correcting this misunderstanding was not a sound barrier or a thermal barrier, but rather a mental barrier, which is really the only type that man is ever confronted anyway."²

However, just as institutional forces and entrenched mindsets can impede change, they too can foster change. The reformers of the Meiji era (1868 - 1912) are often credited for their systemic efforts in modernising Japan, including the military. They were not afraid to learn from the best - modelling an army after the Prussian force and a navy after the British. They also understood the importance of building a strong economic foundation to support their military expansion. Eventually, these efforts paid off and the Japanese military made its mark in the Sino-Japanese and Russo-Japanese Wars in 1894-1895 and 1904-1905 respectively. The Meiji era reform of the military was truly a revolution in every sense of the word. Western technology was introduced and far-reaching changes in military organisation and doctrine were made. Unfortunately, it also gave the military a new found prominence in national affairs that eventually proved its own downfall.

Let us now fast forward to the 21st century. Unlike previous military revolutions, the current RMA is driven by advances in civilian technology, in particular, the convergence of several technologies, notably information and communications technologies which have considerably shortened the sensor-to-shooter response times. Among the established armed forces, the US has successfully exploited these advances, given its advanced science and technology capability, huge resources, and extensive operational experience.

Today, the US has the ability to strike almost anywhere and anytime, with pinpoint accuracy. Many will recall how a US Predator unmanned combat aerial vehicle (UCAV) successfully launched a Hellfire missile against a top Al-Qaeda operative in Yemen in November 2002, killing him and five others in his vehicle. Post-September 11, the US has shown a willingness to take pre-emptive action against its adversaries with little regard for international rules. Aside from the controversy this engenders, from a purely military perspective, US policymakers have assessed that the best way to exploit their military advantage is to change the rules of the game.

The Bush Administration's reasoning is that the rules of international behaviour apply only to state actors. Since terrorists and the like are non-state actors, they should be dealt with outside the established framework. In the tragic aftermath of September 11, the US is even prepared to sideline multilateral arrangements if these hinder its perceived national security interests. While few have the clout or influence to do what the US is doing, or-

ganisations seeking to transform must be prepared to redesign the rules and alter the contexts in which they operate.

The use of high tech weapons against terrorists may lead one to conclude that superior technology can take the place of good strategy or compensate for a weak one. This would be simplistic. It is akin to thinking that ridding the world of Osama bin Laden will bring an end to terrorism. But the causes of terrorism are more fundamental. Many of us may be interested to know that the Dutch Army, which is in the midst of preparing a new field manual for counter-insurgency and counter-terrorism, still rely on the old manuals used by General Johannes van Heutz during the early 20th century in what is now the Republic of Indonesia. The Dutch are also reading the British counter-insurgency manual, which is still considered one of the most detailed on the subject.³ In other words, a successful application of technology must accompany a good strategy and organisation.

Some Observations

From the above discussion, it can be seen that military transformations are anything but technological in character. They are multi-faceted phenomena requiring change on several fronts. The cast of players and the technology may be different, but the same forces are at work. An awareness of these forces is important in understanding the basis of military transformation.

Several observations stand out. First, military transformations take place in conditions of uncertainty and chaos. Stability does little to promote change. Often, disequilibria come from outside the system, usually from the ones with the least interest in preserving the status quo. As one scholar observed, RMAs are rarely brought about by dominant players.⁴ For example, Britain and France, the dominant European land players in land warfare at the end of the First World War, did not develop the blitzkrieg concept of tank warfare, and the British navy did not bring the concept of carrier warfare to fruition.

Second, the way we frame our responses is critical. Responses drive needs, and needs in turn determine solutions. In the case of the French during the First World War, so deeply entrenched was the "Maginot mentality" that there was no serious study into offensive operations. The static castle defences of medieval Europe may have weighed heavily in the French psyche but they should have noted that during the Franco-Prussian War of 1870-71, the Germans focused on rapid advance and did not allow themselves to be delayed by French-held fortresses.

Third, institutional factors can work for and against change. These can be found either in the vested interests that have developed around a particular system, as in the chivalric codes of conduct aimed at regulating conflict or the domination of ideas by a select few, such as French generals Joffre and Petain had over doctrine. The French manufactured some of the best military equipment during the First World War but unfortunately, failed to exploit their use. Consequently, they lost the technological edge they had in the First World War in the Second. In contrast, the Meiji reformers started off wanting to learn from the best and put their hearts and minds to it.

Fourth, as another scholar has pointed out, the crucial element in any military transformation is conceptual breakthroughs.⁵ The German break-through in the Meuse can be attributed to the advantage conferred by its combined arms doctrine. The other armed forces had not studied this with any seriousness. A further point to note is that conceptual breakthroughs can only take place in an environment where there is a certain intellectual fervour and rigour, and a willingness to learn from the lessons of others.

Implications for the SAF

The security environment has become more fluid since the end of the Cold War. If recent developments are any guide, the challenges posed by humanitarian interventions, terrorist attacks and other forms of un-conventional conflict have led military operations to become more diverse in nature. Consequently, the demands on armed forces to play a multiplicity of roles ranging from homeland defence to conventional military operations and operations other than war have never been greater. With greater use of coalition forces, the need for inter-operability with other armed forces has also increased. At the same time, armed forces face increasing budgetary constraints, shortfalls in manpower and greater public scrutiny.

The SAF's own experience is telling. For a greater part of its existence since its formation in 1965, the SAF's single-minded goal was to defend Singapore's territorial integrity and sovereignty. To a large extent, this goal remains unchanged. However, the scope of the SAF's duties has broadened, not unlike other armed forces, in line with changes in the regional and international security environment. Over the years, the SAF has participated in a

growing number of peacekeeping missions, sending military observers. During the Asian Economic Crisis in 1997/1998, the SAF and the Police had to develop contingency plans to handle a large flow of illegal immigrants.

In 1999/2000, Singapore along with other ASEAN countries took part in INTERFET to restore peace and stability in East Timor. RSN ships were also called to provide logistics support. This was followed by the deployment of the SAF's first combat peacekeepers to the territory in 2001. The break up of Jemaah Islamiyah (JI) terrorist network in 2002 opened a new chapter in the SAF's history, as it had to deal with the threat of regional terrorism and cooperate more closely with domestic security agencies. More recently, the SAF had to confront a different form of regional threat. The outbreak of Severe Acute Respiratory Syndrome (SARS) saw the SAF working closely with other home front agencies to isolate and contain infected victims in what is the closest approximation to managing a bioterrorist threat.

Technology has traditionally played a key role in the SAF's development. It is deeply embedded in the SAF's psyche and manifests itself in various aspects of the SAF's operations. Starting with a virtually non-existent technological base in the late 70s, the SAF has over the years developed niche competencies that now allows it to cooperate with leading research institutions in the US, Europe and Israel. Over the next few years, the SAF will be taking in many new and sophisticated systems into its inventory. Clearly, the SAF is on the threshold of a new phase of development. In this regard, the RMA holds great potential for the SAF. It allows the SAF to combine these new systems with the proper doctrines and organisation to achieve the desired force multiplier effects.

However, as history has shown, successful military transformations do not come about naturally. First, we have to face the reality that circumstances have changed. Secondly, we must be prepared to change. While the SAF has proven to be nimble and adaptable, it is unclear if the current incremental approach will work. The SAF has reached a certain critical mass. While the SAF is too small a player to shape military developments anywhere, it is one of the most advanced and well-equipped armed forces in the region. This puts it in the category of an "incumbent force". The downside to this is that incumbents are not known for their ability to break free from the mould that has made them successful. Thirty years of development may seem a relatively short span of time, but long enough for vested interests to emerge. Resistance to change can take many forms, from a reluctance to change mental models to an adherence to out-of-date force structures.

Indeed, one of the key challenges facing the SAF today is developing the right mix of forces. The integrity of the national conscript system is often cited as a factor preventing major changes to the system. This need not be necessarily so. There is no reason why smaller units or forces of varying sizes cannot be established, freeing up manpower for other military tasks without compromising on our national objectives. One should perhaps also re-look at the teeth-to-tail ratio, given that the distinction between war fighters and support personnel is increasingly blurred with the digitisation of warfare. For the US army, the ratio was 50:50 during the Second World War. It dropped to 30:70 during the first Gulf War, reflecting advances in firepower, changes in doctrine and organisation. It is a significant shift, notwithstanding US aversion to committing its combat troops on the ground.

Next, without the benefit of operational experience that other more established armed forces have been exposed to from time to time, the SAF can only test its operational doctrines against itself, the partners it exercises with and the overseas missions it participates in. Obviously, these have their limitations. The danger of self-testing is not so much that benchmarks are set too high or too low, but that the wrong set of benchmarks are used. Furthermore, a certain degree of self-selection takes place in the training with foreign armed forces. The tendency is to train with armed forces that are familiar, with the same doctrine and compatible systems. If training were done on different criteria, say operational concepts, perhaps the list of training partners would be different. Likewise, SAF overseas missions could be reviewed to derive maximum operational exposure, even in non-traditional fields, while balancing what is in the national security interest and the SAF's own operational needs. The challenge is to find new ways to continuously question the old way of doing things.

Being an incumbent also means that the SAF's core competencies will be challenged by conventional and non-conventional means. Re-cognising this, the SAF has been developing various countermeasures to prevent its military advantage from being eroded. However, the key is to move away from core competencies based on any form of numerical advantage and to develop a keen qualitative edge over a wide range of capabilities. In order to do so, the SAF needs to focus on promoting a culture of innovation and creativity. The breakthroughs in concepts that are required are as much a function of good systems and good people, as it is of good ideas.

The Way Ahead

To fully exploit the benefits of the RMA, the SAF needs to sit back and think through two key questions:

What lessons can we learn from the past and present?

The SAF must refrain from jumping blindly on the RMA bandwagon. History has shown that military transformation does not take place in a vacuum. It is a product of space, time and knowledge. The SAF must be conscious of its security environment, keeping an eye on trends and regularly reviewing its position. The SAF also needs to be conscious of its place in time. It must decide whether the transformation should be evolutionary or revolutionary in nature, or even a series of small revolutions. Finally, the SAF must make a serious effort to learn from past military revolutions - not pay lip service. There are many useful insights from history beyond the scope of this paper.⁶

The SAF should embark on a systematic effort to learn from the experiences of the others. This can take place at several levels. We can learn from past conflicts - not just the military campaigns but also those who shaped the strategic doctrines of their day. We can also learn from others undergoing similar transformation. Rather than just focus on the technological and military aspects, these studies should take a broader perspective to understand the intrinsic factors needed for success. Indeed, this was how the SAF started in the early years. We learnt the best from the British, Israelis, Germans, Japanese and the Americans, among others. Unless those involved in the transformation efforts have a rigorous understanding of the subject, we will end up with a technocratic solution. It will have no permanent impact on the organisation. The US armed forces reached its current state of enlightenment only after it had put its best and brightest to study the lessons of the past. The literature on various historical aspects of the RMA runs into volumes. Indeed, just as wars are too important to be left to generals, so too military transformation is too important to be left to a handful of technologists.

What is the best way to break the mould?

The SAF must avoid the "If it ain't broke, don't fix it" syndrome. There are two aspects to breaking the mould. The first is structural. To foster change, the SAF will need to dismantle the organisational "silos" that prevent the cross-pollination of ideas. Whether in the field of policy, planning, operations, logistics or manpower, various departments would need to be reconfigured to support the broader transformation effort. In addition, organisational barriers hampering effective coordination between and among government agencies and departments should also be demolished. The second aspect is behavioural. Change is disconcerting for most people, especially when jobs are put at risk. If not properly managed, morale suffers. Yet it is necessary to bring everyone on board the change effort and to give them an active stake in its development.

Some concrete steps to promote change from within include (a) using multi-disciplinary project teams to spearhead the change effort rather than relying on the existing bureaucratic/ hierarchical structure. These teams can function across organisational boundaries; (b) rewriting the rules of the game. Once critical areas for reform have been identified, it will be necessary to systematically review the underlying assumptions, identify the new core competencies and rewrite the rules to fully exploit the gains; (c) embedding "change agents" within the organisation. It would be useful for the various Services and their departments to form small units within their own set ups to monitor the environment and tap into experimental concepts developed by other armed forces; (d) avoiding homogeneity of views, and (e) finally, adopting a culture of experimentation and appetite for risk to allow new ideas to flourish.

The need for diversity of viewpoints is worth elaborating. The SAF needs to encourage a greater diversity of viewpoints by taking both a top-down and bottom-up approach. An example of a bottom-up approach is that of the German General Staff. Whenever there was a discussion, the protocol was for the most junior officers to speak first. Otherwise, if the most senior spoke first, the younger ones would defer to them and not offer any alternative views. And to broaden military mindsets, more SAF officers should be exposed to all levels of regional and international security affairs. Senior officials from the SAF and other countries, as well as leaders from the corporate world, should also be invited to share their experiences. As business and military practices overlap, a multi-disciplinary approach will help in promoting lateral thinking.

Charting Our Own Course

At the end of the day, change must be relevant to our strategic circumstances. At the most basic level, the SAF must be able to repel a conventional attack. This means that conventional forces will still have a key role, although its configuration might be different. For lesser threats, the SAF would need to develop a portfolio of capabilities to deal with the diverse range of anticipated threats. The greatest challenge is to achieve a breakthrough in strategy, doctrine and organisation. In the recent conflict in Iraq, decision makers were given a wide array of weapons to choose from. In the end, the Pentagon chose PGWs and Special Forces. But this does not mean that PGWs and Special Forces will be used in every other conflict. No two conflicts are alike. Likewise, the SAF must be able to provide various options to the political leadership in a time of crisis.

The SAF's effort at transformation is ambitious but timely. As Peter Ho, Permanent Secretary (Defence) puts it succinctly:

"Today, the challenges facing the SAF are more varied and more complex than the singular task we faced in 1965, which was to quickly build the SAF from scratch. The strategic clarity of the Cold War has given way to uncertainties of the post-September 11 environment. The SAF has plucked all the low hanging fruits. The SAF cannot safely assume that what it does well today will be good enough for the future. Going forward, uncertainty and the rapid pace of change suggests that the SAF should not tie its future development to linear projects from the present."⁷

Ultimately, the success of the SAF's transformation efforts will depend on its capacity to change. Change will be a series of adaptations to an evolving security environment, not a one-way street with a visible end point. The signposts of history can help us avoid the common pitfalls but they cannot tell us which direction to take. We will have to chart our own course, limited only by our own imagination. But we should do so with humility. As futurist Alvin Toffler describes in his book *War and Anti-War*, published nearly a decade ago, the world is moving from Second Wave (industrial age) to Third Wave (knowledge age). Each wave will generate its own war forms. To survive, we need more than instinct. "For all of us, civilians and soldiers alike, it will take a profound understanding of the revolutionary new linkage between knowledge, wealth and war."⁸ We would do well to heed this advice.

Endnotes

1 The RMA is often described as a military technical revolution combining technical advances in surveillance, C4ISR (Command, Control, Communications and Computer-based Intelligence, Surveillance and Reconnaissance) and precision munitions with operational concepts such as information warfare, joint operations and rapid manoeuvre, with the ability to strike deep into the enemy's nerve centres.

2 An excellent account of this episode can be found in Thomas P Huges, *Rescuing Prometheus - Four Monumental Projects that Changed the Modern World*, Vintage Books, 1998.

3 Rob de Wijk, *The Limits of Military Power*, Centre for Strategic and International Studies and Massachusetts Institute for Technology, in *Washington Quarterly*, Winter 2002, pp 75-92.

4 Richard O Hundley, *Past Revolutions, Future Transformations*, RAND study, 1999.

5 Williamson Murray, *Thinking about Revolutions in Military Affairs*, *Joint Force Quarterly*, Summer 1998.

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The New World...The RMA Failed.

by Admiral Bill Owens, U.S. Navy (Retired)

Let's start this discussion with some observations which I think are critical to our subject. We live in a very different new world than we did 15 years ago, and we are fond of commenting that new directions preclude the old ones. This is not an article about policy or politics. It is an article about the kinds of issues that simply don't have the public's attention. It is an article about the promise of technology, management of the world's largest business, the US Department of Defense, and about the American defense budget. I assert that:

"Seeing" the strategic (large) battlefield and precluding an "enemy" from doing so leads to DOMINANCE, and that we have this technical capability in our midst and have not developed the promise of it.

High bandwidth communications delivered securely and reliably everywhere in the battlespace to every soldier leading troops, every ship, and every pilot is a critical commodity and NO country can provide anywhere near enough of it today, nor will they in our lifetimes.

Knowledge warfare is MUCH more important than "mass" (numbers of ships, tanks, and airplanes).

The soldier in the battlefield is "where the action is"....EVERY OTHER military capability must be focused on the soldier's efficiency and on his support.

Integrated C4ISR is critical to the above....and we are doing poorly at FUNDING it or realizing the enormous capability it provides. We seemingly CANNOT create the culture for change in our services to accept that information is more important than platforms and should not be considered to be in "support of" real operations.

JOINT operations are critical to success. Indeed, thinking about "individual" Army, Navy, Marine, and Air Forces' doctrine, budgets, culture, and tradition is the enemy of needed change and transition to a new kind of military.

Much of our present and future technical capability was borne and produced inside the commercial marketplace yet we have little true understanding of our new defense information partners, little real mindshare with them. Further, we rely far too much on the traditional industrial ones.

A few observations of our operations of the last ten years including Iraq II:

The perceived cost of imposing force is rising. Each platform costs MUCH more than it did ten years ago. Witness the rise of the defense budget in the US from the \$230B/year budgets of the last administration to the "push to \$500B/year" by this administration.

Navigation and precision weapons have proven to be DEADLY. The kill potential of these weapons has increased tenfold in the last 12 years. Yet, we continue to demand the same number of delivery platforms (Tomahawk launching ships, bombers, fighter aircraft, etc.). Real direct information is available for support of the troops in the battlefield, and WE ARE SPENDING TOO MUCH OF OUR CITIZEN'S MONEY AND DOING IT VERY INEFFECTIVELY!

We have blue-on-blue casualties at the rate that we've experienced in all previous wars, and often the blue casualties are from the militaries of our allies....a diplomatic problem!

We still deploy forces on the basis of Lancaster's "win ratios" (and Napoleon's historical doctrine), despite our dominance in pre-cision force delivery. "Smarts", flexibility and mobility should be part of weighting not just mass!

Defense budgets have continued to only pay lip-service to the RMA, while funding ships, tanks, and airplanes. No additional emphasis on C4ISR is evident in either absolute or relative budget terms.

It is now technically possible to achieve knowledge dominance!

AND

We did not find Osama.

We did not find Saddam.

We have been unable to find "what happened to weapons of mass destruction" in Iraq.

We did not discover that N. Korea, was violating the agreement on non-development of nuclear weapons (note that an information umbrella over these countries might have been much more than a technology!).

We were unable in our own country to consolidate information from multiple intelligence agencies to determine that we had a direct terrorist threat to leadership in Washington, DC and to the World Trade Center.

We have FAILED TO DELIVER ON THE PROMISE OF THE RMA!

This is a time for serious cultural change. We must pursue the opportunities before us and we need to change. One of the theses of "Good to Great Companies" is that those who choose to continue without change, will, in the end fail. I contend that is the case in the US military as well. Some say that to change is to risk the future. I would contend that the worst possible thing is to NOT to do so. 15 years from now, if the US military was left on its present course, we would be dealing with an Army of about six divisions, a Navy of less than 200 ships, and an Air Force of 12 or 13 tactical fighter wings of 48 airplanes each, not 72. We mustn't cross over that threshold where we're not able to do even the next large contingency operation. Technology, C4ISR, jointness, innovation, and knowledge warfare are the only answers to provide real capability to those fewer platforms and troops.

I am a strong proponent of the joint requirements process. The joint requirements process should be the core to determine where we spend our money, and I think the time has come when we need to stop producing the best Army or Navy we can and focus on how we can produce the best military force. Now how we do that, whether it's a Joint Requirements Oversight Council (JROC) or some other high level joint group is not central to my concerns. I'm keen on a joint requirements management board which has high level civilians, civilian leadership and four-star representatives from each of the services including the Chairman or Vice Chairman of the Joint Chiefs. And we must do this as a part of the "science of joint requirements". There is no existing academic science of joint requirements, hence no real analysis capability. The Joint Warfare Capability Assessments were the first attempt at this, and have lost considerable "steam" in the last few years. We have wonderful academically based processes for how the Navy does ASW, and how the ARMY conducts land warfare and how we project mobile land forces, but we don't have any science based analysis of Joint requirements. There is no academic discipline for doing this, and there is no money going into providing it.

If you had a true joint requirements process that WORKED it would be possible to sweep the acquisition decision process immediately under it and use the output of the requirements process to immediately put in place the required acquisitions. It is little understood that to build the finest militaries at the lowest costs, a country must commit to a disciplined cross service requirements process and that process needs to be the feeder for the acquisition process. This is poorly done in most nations. There are many layers in the services and the Dept of Defense that could be eliminated as a result of these processes.

More money needs to go into that joint analysis structure. In the US, about \$20 million a year goes into joint requirements analysis. Something in the order of four or five hundred million dollars goes into the services and the agencies requirements. There's something wrong with that!

There is a new world in commercial information technology. Most military departments and leaders fail to understand this. This technology is today America's greatest strength. We tend to stick with our legacy systems to the great detriment of funding our real future. And I just ask you, where do you go in our militaries to have a discussion of TCP-IP? or XML? or OC-192 networks? Or SAP web based Business enterprise solutions? or Java or C++? These kinds of tools and hundreds more like them are our future, our strength. We must understand this as part of our requirements process.

So ask your communicators, do they really understand this "stuff"? Do they understand how to bring it together? Because if you can understand the range of these information technologies, ranging from the sensors that can see a battlefield to the wideband communications to deliver the information to the warrior, there's some remarkable potential. Who in your department knows about the ballistic laser that can lase through clouds by using a Pico

second shutter? You can find lots of sensor technology that's in the civilian marketplace. You can integrate legacy systems with Java and C++. You can use the Internet to revitalize our infrastructure to get more tooth and less tail. We're doing it in industry. It's enormously important that we do it in defense. For the US, I estimate there are \$50 billion a year of savings residing in the conversion to the new world of IT (and much more effective warfighting!).

So could we put together a joint information umbrella to replace a nuclear umbrella over an entire country like Iraq or North Korea so that you could see "everything that mattered" in that large strategic battlefield? That is, every armored concentration, every vehicle in that concentration, every truck on a road and identify it and have it done with a locational accuracy of ten centimeters, 24 hours a day, real time, all weather? YES! YES! YES! So why don't we do it? Many people in our electorate think we can do that now. But, we don't have that capability. It's would be there for us if we were able to organize ourselves culturally so we get the EP3s and the Rivet Joints and the Guard Rails and the J-STARs and the FOPEN radars and all other surveillance systems integrated together. But you can't do that if each of these systems belong to individual services and are controlled service by service, with the data links unable to speak together. It is terribly important if you see that battlefield. And it seems to me that it's the one certainty that whatever that battlefield is, if it's the next Mogadishu, or if it's the next Desert Storm, or if it's Korea or Iraq, the one thing that matters most is to see the battlefield. And to be repetitive "If you can see the battlefield and the enemy doesn't, then you have dominant battlefield awareness and if you have 'good enough' platforms, you win!". So that is, as my grandson says, huge!

Commercial technology is the key to effective joint and combined operations because every one of our NATO allies, our close allies in Asia (Japan, Korea, Singapore, Australia, and the Philippines), the Gulf Cooperative Council, all could be on the same commercial high bandwidth, global telecommunication systems if we only embraced commercial technology. We could integrate Link 16, the JSTARs SCIDL data links, and Singars/Joint Tactical Radio all over the same network if we saw the vision and applied the effort.

If we were doing a zero based review of national defense capability and requirements today, would we have a Navy, an Army, an Air Force, and a Marine Corps? Is that what we would choose? I don't think so. I don't think that's the way we'd organize today. I'm not saying we should do away with the four services. But if it is functionally optimal to do things differently, maybe we should think about how to functionally organize ourselves better and how we should apply our budget dollars. A new organization might result in one force that 'sees and transmits the information of the very large battlefield', maybe a second force would be one that has a "precision joint strike capability" (one that has Apaches with Hell Fire missiles, or Long Bow, and Navy Tomahawks and Air Force B2s and a variety of other strike forces brought together in a coordinated way). The third force might be a cooperative defense force which would integrate defensive systems for missile and air threats. And a fourth force might be a mobile ground maneuver force encompassing a new army, special forces and marine capability. A fifth force might be a "smart logistics force" with the mission of supporting logistically the other four. These 5 forces are basically the pillars of Joint Vision 2010.

So if we would "do it" differently, how would we do it? I think it's an important academic question to ask, however I should add that if for some reason we are unable to "change" in some profound way and therefore if it is a given that we stay pretty much the way we are today, I suggest that the Army is the most relevant service and needs more money. We need to do whatever we can to get much more money into U.S. Army and Army support programs because of the Nation's needs for an un-questionably strong ground maneuver force capable of all expected "less than war" scenarios. The Army's needs and relevance in the world of anti-terrorism, unconventional special forces, high mobility environment is unquestionable. Even at the expense of that favorite submarine or a thousand other things that are too expensive and were built for a different world!

If we had had a complete information umbrella over Iraq for 60 days before the 2003 war, I predict that the UN would have sanctioned the war (much more information would have been available about what was happening on the ground), our knowledge of WMD would have been significantly enhanced, and when we deployed our military on the ground and in the air they would have had much more complete information, been much more likely to find the "deck of cards" quickly and consolidate their successes before the Sadaam Fedayeen became "organized". Further, we might have been able to avoid the level of friendly fire that we experienced.

So in summary, I believe the real "answers" are increased jointness, taking advantage of that special information technology that America and the developed world offers us, and true innovation in things that we don't allow ourselves to think about, whether it's the 6000 foot long mobile sea base or whether it's airships.

We have to understand that the challenge is more a matter of process and culture than reorganization. We have to put in place a process and a culture that makes the right things happen and work together to make them occur. After all is said and done, the issue will be "who gets what" inside our national security budgets and how to spend the

money effectively. I've alluded to where I think some of the priorities should be. Let's not let the RMA fail again.



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From 1991 to 1993, Owens was the deputy chief of Naval Operations for Resources, Warfare Requirements and Assessments. Owens served as commander of the U.S. Sixth Fleet in 1990 and 1991 during the last Gulf War. Between 1988 and 1991, Owens served as senior military assistant to Secretaries of Defense Frank Carlucci and Dick Cheney, the senior military position in the Office of the Secretary of Defense.

Owens has written more than 50 articles on national security and authored the book "High Seas." His latest book, *Lifting the Fog of War*, was published in April 2000. He is a 1962 graduate of the U.S. Naval Academy in mathematics. He has bachelors and masters degrees in politics, philosophy and economics from Oxford University and an MBA from George Washington University. He is a member of several boards of directors of public, private, and charitable organizations including: Telstra, Polycom, Symantec, TIBCO, Cray, BAT, and Nortel, as well as the Carnegie Corporation and the Fred Hutchinson Cancer Research Center.

The Way of Transformation

by John Kao

This article is formed around twenty precepts on the nature and dynamics of transformation at a strategic level that I have found to be true, regardless of the size or type of organization being considered. Each precept is accompanied by a commentary designed to expand the topic under discussion. The intention of this piece is threefold:

To offer a working definition of transformation

To stimulate debate and discussion

To galvanize relevant action

Overall Transformation Framework and Concepts

1. Transformation is the portfolio of intentional change efforts that move us from a default future (what we get if we do nothing) to the desired future (our vision of the desired future state).

Commentary: The desired future state may take many forms. For entrepreneurs, it is the brass ring of business success that they strive for. It is what has always guided the work of artists, explorers and other kinds of talented individuals. And it is the “promised land” that keeps organizations vital and in a state of constructive reinvention. It is an essential ingredient of what Jim Collins calls “built to last.”¹

The importance of transformation arises from our universal desire to progress. One thing is certain; we are all going to get a future. The challenge is to get the future that we want; one that approaches our desired future state. One very apt definition of the discipline of design defines it as “the ability to move from the existing to the preferred.” So in a sense, we must all become designers of our desired future.

2. Transformation is different from change. Change moves us by specific increments and improvements. Transformation operates at a different level of magnification; it changes the nature of the game. In one sense, we are always changing - as people, as enterprises - but whether we transform or not depends on the robustness of our practices as well as the seriousness of our intent.

Commentary: Change may create something new, which may or may not be transformational. When we speak of transformation, we are talking about wholesale reinvention and disruptive innovation,² developments that change the nature of the game.

Change is incremental by de-finition; it is an improvement to something in particular. Change happens all the time; it is a part of life. As human beings, as biological entities, as organizations, we are in a constant state of flux; we cannot avoid change. Transformation, on the other hand, does not happen without Herculean effort; it is enabled only by developing appropriate capabilities for change.

3. Vision is essential for transformation initiatives to succeed; it determines the vector of transformation by making our desired future state both palpable and desirable. Without a guiding vision, we may have change, but not transformation.

Commentary: Transformation requires a vision - a sense of what is possible that serves as a North Star to guide our efforts. That vision must be specific enough to guide action, but aspirational enough to engage our passions and suggest new possibilities.

Our vision must be conditioned not only by the knowledge we have, but also by “what we don’t know we don’t know.”

Put another way, if transformation is the answer, what is the question? Perhaps it is how we deal with unknown unknowns in order to avoid strategic surprise and reap the rewards of mastering disruptive change.

4. Transformation is not a destination; it is a journey that requires a certain attitude and cannot be fully prescribed in advance. It must be entered into as a process that is unpredictable. Any transformation roadmap that is drafted in advance will at best incompletely reflect the journey that is to be taken.

Commentary: Defining and describing the envisioned future is an elusive task. This cannot be a product of analytics or engineering alone - it involves the ability to mobilize intuition (the knowledge you have even though you don't know how you have it) - that translates gut feel into a set of convictions (and bets) about the future.

The envisioned future shapes the fundamental imperatives of the design process, as well. The future is fundamentally unknowable, yet it poses a set of deep challenges since all of our important decisions lie in the future. The dilemma is further compounded by the fact that all our knowledge is in the past. We march into the future looking into the rearview mirror, as Marshall McLuhan once said, or at least firmly in the grip of our existing mental models.³

The central question we must address is whether we are going to be passive or active with regard to our future, and whether we can overcome our traditional mental models to perceive new possibilities.

5. Transformation is driven by innovation. With the benefit of 20/20 hindsight, transformation drives are the sum of big hairy audacious goals achieved.

Commentary: Transformation is only a word unless it is enabled by countless acts that link creative ideas to the realization of value for the organization; what we define as innovation. Innovation thus becomes the engine that drives transformation. Creativity - the ability to generate what is new - is in turn the fuel for innovation.

The journey of transformation is enabled by leadership's ability to establish what Collins and Moore have called "BHAG's" - Big Hairy Audacious Goals - 10 to 30 year goals that are both achievable and dramatically stretch the organization.⁴

6. Transformation efforts are usually messy and inefficient. They disrupt the existing order of things.

Commentary: Transformation can be anathema to those who value operational effectiveness and readiness and whose strategy may be to pay lip service to the goal of transformation, while playing another game entirely.

Every reaction generates an equal and opposite reaction. Every effort to change is accompanied by resistance, fear of the unknown, nostalgia for the status quo and concerns about the loss of efficiency and control that result from trying something new. It is far easier to persist in familiar routines shaped by a known mental map than to venture into unknown territory.

7. All transformation efforts are by definition political in nature, since they involve replacing an existing order with a new one. Transformation inevitably begets resistance. It will threaten those who insist on operational effectiveness in the present or who are highly compensated owners of the status quo. Existing mental models may lead to denial of the need for transformation.

Commentary: The sociologist Gramsci has written that in the transition from the old to the new, a number of morbid symptoms may occur. The time of transition occasioned by a transformation drive may see the emergence of a wide range of often unexpected political behavior.

The politics of transformation can lead to push-back from vested interests of every kind and those locked into the prevailing mindset and culture. Those who benefit from an iron rice bowl will not want to lose it. Transformation threatens them to their core.

The economist Joseph Schumpeter talked about the importance of creative destruction. Instead of a chief innovation officer, our organizations may need a chief destruction officer, one dedicated to changing the existing status quo so that a new order can emerge. Such creative destruction requires attacking the existing order; including the very attributes that have made the organization successful in the first place, but which now must be given up in order to get something that we hope will be preferable, but is as yet unknown. There is no free ride. You must leave something behind to get something.

And history provides at best an incomplete report card. Those who write the history books determine the merits of a set of changes. Galileo, reviled by his contemporaries as a heretic, is now referred as a father of modern astronomy. What a difference a century or two can make!

Necessary Ingredients

8. Transformation depends on execution, an ability to move from “getting it” to “getting it done.” Many transformation drives fail because they pay insufficient attention to transformation processes, focusing instead on the more obvious agenda of identifying and working with technological innovations that may be transformational.

Commentary: Most experts on transformation talk about the importance of the “what” of transformation, but then pay scant attention to the actual processes by which transformation will take place, or the “how”.

Such lip service is not an accident. Transformation is hard work and involves agendas with which most organizations are weak: human behavior, culture change, organizational restructuring, and shifts in the role of leadership. In addition, transformation is inherently interdisciplinary, and requires collaboration across organizational boundaries that may not be easy to achieve.

It is much easier to default to a pre-existing comfort zone, for example to talk about how certain technologies will transform the organization, how certain warfighting concepts in the context of military affairs are transformational, rather than to get to the deeper and more sustaining question of the capability by which organizations may transform themselves on an ongoing basis.

9. Any transformation drive requires a conceptual framework and credo unique to the intent of that effort. While maps may be of limited value, we need some guidelines or rules of thumb in order to navigate at all.

Commentary: The framework and credo that guide transformation drive must be home grown. Every transformation effort is a unique product of its organizational culture, opportunities and challenges. There is “no one size fits all”. Like vision, transformation strategy cannot be copied from a book; it requires a process of internal reflection and design.

Organizations that fall short of their transformation goals often fail to think through a strategy for transformation and a process that includes a continuous updating of that strategy.

They fail to recognize that transformation is a multi-dimensional effort ranging from consideration of new organizational models and business processes, to a reassessment of the role of leadership in the organization.

The roadmap they employ tends to replicate the official hierarchy and culture of the organization. It usually fails to include or empower broad array of people in the organization, and thus is brittle and easily superseded by the press of real events.

10. Transformation requires a bias towards experimentation.

Commentary: Good designers understand the importance of prototypes as a medium of collaboration and as a way of accumulating new insights that lead to the need for a new and improved set of prototypes that reflect deepened understanding that in turn lead to a new set of prototypes in a continuing cycle of iteration and learning. Our desired future is also an object of design and requires the same practices of prototyping and iteration as those that attend the creation of new industrial or consumer artifacts.

11. Despite a prevailing preference for planning and control, transformation is a non linear process. It requires intuition as well as analysis, a sensibility regarding situational awareness, priorities and the unfolding agenda. It requires the ability of leaders to sense emerging possibilities.⁵

Commentary: A host of new approaches to facilitation and the care and feeding of new ideas are needed that allow senior stakeholders to overcome traditional, limiting norms of collaboration to transform their mental models and act differently. Using techniques from scenario planning, adopting on-line collaboration platforms, employing various techniques to “stand in the future” in order to look at the present can all unleash the disciplined “gut feel” that allows leadership to fulfill its responsibility of “sensing emerging possibilities.”

12. Transformation requires a shift in organizational culture.

Commentary: Transformation is not simply a new suit of clothes or a new color of paint applied to the walls. It involves deep change in an organization's culture - its sense of what is real, what is important, what it values.

Organizations embarking on the journey of transformation are often steeped in an engineering culture. They know what they know and have optimized the ways in which that work will be done. But to get to the desired future state, organizations must learn to think more like designers.

Similarly, a culture that values flawless execution of procedures may not have the mental models or managerial skills to engage in experiments. Structured and well-defined processes govern the operational world, while a kind of enlightened improvisation tends to guide the world of expeditionary experiment.

The real payoff for an organization lies in understanding that success comes from a blending of cultures, from amalgamating the cultural elements that support successful execution with those that fuel experimentation and the imagination.

13. Transformation requires an ability to see things differently - it is based on an ability to create new knowledge, not just manage existing knowledge. What is needed is an ability to diagnose emerging patterns, and carry out effective environmental scanning. We need to be adept at foresight, not just planning, and at teasing out what is tacit rather than explicit.

Commentary: As we move to a managerial environment shaped increasingly by visual media, our ability to help others "see" things, to share our vision, our sense of what is possible, is key to achieving a shared ability to explore new possibilities and to change the pattern of our thinking. Cultivating divergent perspectives, going to the edges of established disciplines to scan for new patterns, understanding the implicit shape of customer desires and needs are all part of the process of seeing more deeply into the nature of things.

14. Transformation efforts requires motivation to fuel their progress. An emotional case must be made for why the hardships of the journey will pay off. This comes about by having the right stories and robust metaphors.

Commentary: In a sense, any organization that embarks on the journey of transformation has a marketing challenge: how to convey a sense of the desired future state in terms that are compelling and appeal not just to the head (product features) but to the heart (change in desired future state, aspirations, definition of the "good").

An organization may know what the right things to do are, but not have the ability to communicate them in compelling fashion to the organization and its various constituents.

Therefore, the overriding question is whether the organization will create appropriate and effective ways of messaging the transformation drive. Senior leadership needs to tell a story, explaining what the map for the journey is and why the voyage is worthwhile.

Organizations that fall short of their transformation goals often get the content right, but fail to use appropriate communications vehicles to express a sense of urgency and arouse human emotions so that their people have zeal for the journey ahead and a vivid "common operating picture" that can serve as a conceptual referent and team integrator.

The organization must consider a wide range of communications vehicles, ranging from storytelling tools drawn from drama and fiction, to web-based multiple-media production practices that create persistence and impact for the new message. In general, taking the idea of transformation from a special event (conference/meeting) to a process (ongoing opportunity to learn and interact in terms of the new agenda) is where the biggest payoff will occur.

15. Transformation requires trans-formational leaders - it comes from the top and from leaders at all levels.

Commentary: Good leaders are architects of transformation. They create a useful and everchanging framework for their constituents. They create disequilibria that allow new things to happen. They create tempo for the transformation process. The role of the leader is to find the sweet spot that balances contradictory imperatives. They are the patrons and sponsors of new things. They run interference for the productive insurgents.

Leadership requires ownership of the process of transformation. This ownership is expressed through the development of a guiding coalition, building relevant skills, setting BHAG's, communicating the strategy, assuming responsibility for the transformation strategy, build-ing an architecture of transformation processes that will define future operating capabilities, and managing a portfolio of transformational opportunities.

Effective leadership enables the achievement of transformational results at all levels in the organization. Its support of new practices is essential around such agendas as environmental scanning, knowledge creation, strategic foresight to look at unknown unknowns, investment, training, experimentation, and prototyping.

Organizations fail to transform when leaders talk the talk, but do not walk the walk. It is easy to talk the talk of transformation. It is much harder to walk the walk, to actually make the initiative happen. When leadership does not support transformation efforts at a deep level, when processes are not in place for meaningful funding and people are not empowered to make things happen, cynicism can easily set in, making future trans-formation efforts doubly difficult.

16. Transformation requires metrics - a managerially useful definition of meaningful progress

Commentary: Transformation efforts benefit from employing systems to hold people accountable. Relevant metrics arrives from or-ganizational culture and strategic situations. In general, it matters less what is measured than the fact that it is being measured.

Making It Happen

17. Transformation is a management and leadership skill set. It requires orchestration. It involves making choices and executing at different levels of intensity depending on circumstances. Transformation efforts can be superficial or deep. Of course, to be successful they must go beyond the surface layer or "mascara" in order to alter the course of the organization in a meaningful fashion.

Commentary: Having a trans-formation credo and effective leadership of the process enable the organization to achieve results that are transformational. Moving from "getting it" to "getting it done" carries an additional set of imperatives: to establish appropriate procedures, portfolio management concepts and design processes that enable the campaign to unfold over a broad array of fronts, and over time.

Smart leaders will cultivate a portfolio of transformation initiatives. They will develop and champion a long term and a short term perspective that are inter-connected. When launching a transformation drive, having short-term wins is important. At the same time it is important to maintain a sense of transformation as a long-term process. The journey to mastery of any skill involves periods of exhilarating forward motion, set-backs, as well as plateau periods when nothing seems to happen despite one's best efforts.

The journey to transformation involves mastery of the "capacity to change" that will result in continuous, ongoing, sustained, strategic transformation.

18. Transformation requires re-cognition that mastery is a road with twists and turns, ups and downs. New habits require practice. Converting a change event into a process requires sustained effort. Psychologists have observed that personal habits usually change after at least 60 days of sustained practice. New organizational habits require at least the same amount of "burn-in".

Commentary: Organizations that fail in their transformation efforts tend to underestimate the difficulty of the process, and/or are unwilling to tolerate the inefficiency that may result.

Embarking on the journey to transformation carries costs. Resources, both in terms of finance and people, must be set aside for new initiatives. New process skills require investments of time and opportunity cost. Launching the new initiative leads to losses in efficiency, at least in the short term. The organization can feel more chaotic, more messy.

The organization may be perceived as "dangerously" flirting with new things at the expense of an ability to fulfill all-important current missions.

Yet the organization must understand that it needs both organizational agendas: operations and experimentation, governed by the twin values of effectiveness on the one hand and foresight/imagination on the other.

19. Transformation needs to become a popular movement if it is to succeed. It requires the dedication of a critical mass of people who form a community, a coalition of the willing.

Commentary: In an organization's real politik, the resources for transformation may be located in a variety of islands of innovation. The trick lies in connecting them with a common vision, metaphor and plan that allows a set of sparks to ignite a prairie fire.

20. Transformation doesn't happen by itself or with good intentions. It involves investment, commitment and a willingness to stretch.

Commentary: Manhattan projects require Manhattan-sized funding. "No bucks, no Buck Rogers," as the old saying goes.

Transformation is supported by stagecraft, by a host of ever-changing symbolic acts. When we want to change our habits, we change our context (go to the gym, clean out our refrigerator). It is important to start. "Just do it".

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"Kill" or "Do Nothing" - Inadequate Choices for Coping With the Riots, Looting and Terror of Tomorrow

by Alvin and Heidi Toffler

When near-anarchy broke out in Baghdad after US forces entered the city and ended the regime of Saddam Hussein, looters began ransacking government buildings, hospitals and even private homes. They took everything from cars, computers, electric wiring, desks and chairs to money and window frames. American troops, still busy suppressing fire from Saddam supporters, did little to stop the pillage. This drew bitter criticism from both the Iraqi citizenry and media around the world.

Not surprisingly, Washington reacted by announcing that, in the words of the New York Times, "United States military forces in Iraq will have the authority to shoot looters on sight under a tough new security set-up." An official was quoted as saying: "They are going to start shooting a few looters so that that word gets around." This meant, the paper declared, that "assaults on property, automobiles and violent crimes will be dealt with using deadly force."

Anyone who thought that would silence the critics, however, were naive. It was immediately pointed out that killing young, jobless or desperate Iraqi civilians (after claiming that it was trying to limit civilian casualties) would trigger greater violence in the streets.

At this point the press began to report backtracking by Washington, leaving matters murky for the moment. What no one asked was why authorities had to choose between doing nothing or killing people. The answer to that question lies in a long-term failure of the Pentagon in the past decade.

Do we need to kill looters? Or for that matter hostage-takers or violent crowds? Or could we stun them, make them temporarily ill or sleepy while police or soldiers disarm them, take back the loot and weapons, and either lock up the looters or send them home to sleep it off?

Fully 10 years ago, in our book *War and Anti-War*, about the future of warfare and peace movements, we forecast four major changes in the military. Scanning terrorism and other threats on the world scene, we correctly argued that armies - and not just that of the United States - would pay much more attention to and invest a lot more money in "special operations" forces.

We were right. In Afghanistan and later in Iraq "special ops" played a larger than customary role. These are the highly trained, small teams that, in fact, entered Iraq before the formal attack began, seized airfields and protected oil fields so that Saddam's forces would not blow them up, stole in by night to rescue US prisoners of war and supported intelligence operations. They are pinprick fighters - the opposite of massed forces seen in traditional industrial-age warfare.

We were also right, 10 years ago, in forecasting that satellites and space would prove more and more important in warfare. And, in fact, even more than in the first Gulf War, the ousting of Saddam's regime was accelerated by the improved communications, intelligence, targeting and other advantages made possible by satellites.

Again we were right in saying that, in any war of the future, we would see more robots at work. And, indeed, we did. Predator drones performed reconnaissance missions, the Packbot robot was used to search for enemy soldiers or booby traps, Global Hawks provided intelligence and conducted surveillance.

But we were wrong in our fourth forecast - that we were about to see great advances in the use of non-lethal weapons. These are weapons designed to limit, rather than increase, bloodshed, and they are exactly what US forces in Baghdad could have used to suppress the looters with minimal killing.

We wrote that "today a new arms race may be about to dawn on the planet - a push for weapons that minimize, rather than maximize, lethality." We pointed out the need for peacekeepers to have options other than rubber bullets, Tasers and the like and described several initiatives under way in Washington to explore and develop non-lethal anti-materiel or anti-personnel weapons.

The term itself is controversial. Some weapons on the drawing boards are truly non-lethal. Others are potentially

lethal if used incorrectly or at too close a range - rubber-coated metal bullets, for example. Still others provide adjustable lethality - non-lethal at low doses, lethal at high.

Some are designed to disable buildings, roads, airfield runways and other physical targets as distinct from people. Some of these are chemical. Many could prove dangerous if they fall into the hands of an adversary.

Unfortunately, while the Pentagon correctly anticipated that the military campaign in Iraq would be brief and was correct in betting that the Arab masses in surrounding Middle East countries would not erupt in protest and perhaps topple existing regimes, it routinely under-estimated the complexity and danger of chaos in the post-combat period.

The broad promise of non-lethal weapons held out a decade ago has not been fulfilled, nor have their uses and limitations, or their technological and political dangers, been adequately discussed by the public. The reasons for the comparatively slow development of such weapons are cultural, scientific, political and financial.

First, military culture for thousands of years has been oriented to increasing, not decreasing, lethality. Even today, troops are trained to kill and, until recently, the minimization of civilian casualties has been at the bottom of a soldier's priority list. It has now become far more important because images of civilian casualties, instantly transmitted around the world by the media, galvanize political and diplomatic outrage and counter-pressure.

Moreover, within the military - and not just in the United States - prestige and power generally go to combat-experienced officers who command the largest number of troops and the biggest, most expensive weapons systems. Advocates of non-lethal weapons include a number of leading retired generals. But amounts of money and numbers of people allocated for research into non-lethality have been comparatively minute.

Second, it turns out that the scientific and engineering problems encountered have proved more complex than many assumed.

Third, opposition outside the military is small but fierce. It comes from those who see non-lethal weapons as tools for governmental or police suppression of political dissent and civil liberties. Thus police were armed with tear gas, water cannons and rubber bullets to keep protesters at bay from participants in the World Economic Forum in Davos in Switzerland.

Fourth, cases like the deadly misuse of the sedative Fentanyl against Chechen terrorists in Moscow - leading to the deaths of 129 - have further dampened support for non-lethal weapons.

But the entire issue was placed in striking perspective recently in the United Kingdom when police in Liverpool shot and killed a man brandishing a Japanese samurai sword. The case made headlines in the Liverpool Daily Post that quoted a police constable who called for wider use of Taser stun guns that deliver a temporarily disabling electric shock. According to the constable, the Taser "gives the police the ability to effectively stop armed criminals without having to resort to a firearm ... without causing serious injury. This has got to be a good thing." A 13-year veteran of the police force, the constable was Veronica Doyle - sister of the mentally ill man who was killed.

It is absurd for a military force armed with as many different weapon systems as those used in the attack on Baghdad to lack appropriate non-lethal weapons with which to deal with looters. The choice should be not between do nothing or kill. The Pentagon and other military forces will pay dearly if they don't close that gap in the terror-filled years to come.

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The Learning Military Organisation - Revisited

by BG Bernard Tan

"People learn most rapidly when they have a genuine sense of responsibility for their actions..... if we know our fate is in our own hands, our learning matters. This is why learning organizations will, increasingly, be 'localized' organizations, extending the maximum degree of authority and power, as far from the 'top' or corporate center as possible."

- Peter Senge

in The Fifth Discipline¹

Introduction

Can a large hierarchical organization like the military be a learning organization?

In an article entitled "Leadership, Quality and the US Navy",² ex-Naval officer, Robert Masten asserted that the US Navy, as a "large hierarchical, mission-driven military organization could never become a learning organization". Masten argued that war was the height of competition, about winning and losing, about death and destruction - elements that he felt were not ingredients that made up a learning organization. To perform well in this environment, the Navy instead needed "authoritarian leaders, trained and practised in making life-threatening and life-saving decisions". The heat of battle was no time for groupthink and instead was a time for clear-cut authority and decisive action. As such, what was required in military leaders was the ability to "solve problems" rather than their ability to "advocate dialogue, empowerment or continuous process improvement." Masten concluded that it was still necessary for the Navy to breed the "authoritarian leader the nation needs to defeat the enemy". Reflecting the principles of Weberian bureaucracy, Masten fundamentally believes that in the interest of speed (or efficiency), decisions should be made at the top while the rest (soldiers, sailors or airmen) should merely execute orders in precise military fashion on the battlefield. Good training will ensure that the decisions made by commanders are sufficient reliable and that there was therefore no need for the involvement of other levels in the hierarchy to be involved in decision-making.

I will, in this essay, make the reverse argument. Masten's basic view perpetuates a widely believed myth held by those outside the military fraternity, that a military organization must be authoritarian to be effective. This assumption is not only highly questionable but is wrong, and is not supported by military history. Learning organizations are organizations that thrive in an environment of high uncertainty and rapid change. Given that the environment in warfighting is precisely subject to uncertainty and change, effective military organizations are therefore quintessential examples of learning organizations. They are not only un-authoritarian, but are highly decentralized, empowering, organismic organizations, embracing the use of initiative by commanders at all levels. These organizations accept "openness" and "localness" as part of the organizational make-up,³ provide a high level of autonomy to commanders throughout the organization, and thrive on a high level of interaction between all members throughout the organization, both vertically and horizontally. This enables all to see the big picture, enabling all (the parts) to work towards the success of the whole, without the need for authoritarian control - the very essence of a learning organization.

Managing Uncertainty

The biggest organizational challenge for the military in war is the quest for certainty.⁴ Uncertainty is at the heart of war. Clausewitz, the famous philosopher on war, reminds us that the fog of war is real. "A great part of the information that is obtained in war is contradictory, a still greater part is false, and by far the greatest part is uncertain."⁵ Information is moreover subject to interpretation. War brings out the most powerful emotions known to man - including fear, anger, vindictiveness, and hatred. These emotions create conditions in which the quest of certainty cannot proceed rationally. Secondly, war is a contest of wills. With each side free and presumably, willing to double-cross the other to the utmost of their ability, the progress of the struggle is largely unpredictable. Logically, the attainment of certainty is, a priori, impossible.

Van Crevald, in his masterful study of command in war⁶ argued that command systems in military organizations are basically systems designed to cope with a high degree of uncertainty. In a study of command systems throughout history, militaries have adopted two basic approaches in coping with this uncertainty -centralization or decentralization.

Properly understood, the two ways of coping with uncertainty do not consist of a diminution of uncertainty as opposed to acceptance, but rather a different distribution of uncertainty amongst the various ranks in the hierarchy. Under centralization, the security of the parts is supposed to be assured by the certainty of the whole. However, by restricting the freedom of action of the parts, the risk the parts face increases. Under decentralization, the security of the whole is assured by the certainty of the parts. By allowing greater freedom to the parts, the risks at the higher level are increased. There is hence a trade off.

Van Crevald is in no doubt that military history shows that de-centralized command and control systems are far superior to centralized ones. He concludes that, those armies which have been most successful were those that "did not turn their troops in automatons, did not attempt to control everything from the top, and allowed subordinate commanders considerable latitude."⁷

The Learning Military Organization

The German Army in the Second World War, and the Israeli Defense Force (IDF) from 1956 to 1973 have been widely recognized as the most formidable armed forces in the history of warfare and are two outstanding examples of military organizations with fundamentally de-centralized command and control systems.

Both armies placed a high value on offence. Spurred by the invention of the tank, the German Army in WWII invented and operationalized the war fighting doctrine of blitzkrieg or lightning war. Instead of fighting in well-ordered lines that was characteristic of earlier wars on the continent, German doctrine emphasized speed, movement and dislocation, through the penetration of enemy lines at key points with heavy armoured formations. Once behind enemy lines, instead of stopping, forces would continue to advance deep in the rear, disrupting supply chains, artillery positions, communication networks, and command facilities, and avoid fighting the strength of the enemy at the front. Attacking the rear would deny the front of these essential support elements, and lead to such confusion that this would lead to a rapid collapse of the front. The key idea was to deny the enemy the luxury of fighting orderly sequential battles.⁸ In a series of wars from 1956 onwards, the IDF built on this German doctrine and perfected it to become the masters of mobile warfare.

This doctrine of fighting stressed the traditional command and control systems in two areas. Given the emphasis on manoeuvrability, the command system had to cope with a much higher level of complexity, fluidity and uncertainty. Secondly, since the doctrine sought to dislocate the enemy, it had to foster greater responsiveness within the system. In military speak, it would have to have a faster observe-orient-decision-action (OODA)⁹ cycle or loop than the enemy so that it could out-think and out-maneuver the enemy at every turn. Making quicker decisions in a more uncertain environment was the key command challenge.

The only command system that was workable in such an environment was one that allowed a large measure of independence to all levels.¹⁰ Given that the best battle plans do not survive beyond the crossing of the start line, a high premium is placed on allowing the maximum use of initiative by junior commanders to react to (adaptive learning) and develop (generative learning) the highly fluid situation before them, constrained only by the higher command's strategic intent and broad guidelines. This command and control philosophy was called by the German's *auftragstatik*, which translated roughly means "mission oriented tactics". Subordinate commanders are not given detailed orders but given clear objectives. They are allowed considerable autonomy and leeway in deciding how they achieve these objectives. Autonomy also extends to the fact that junior commanders can even change the objectives assigned to them if the situation has developed such that the mission has become irrelevant.¹¹ (Generative learning resulting in innovation.) This degree of freedom makes the entire organization "organismic" - countless local decision-making processes that continually respond to changes.¹²

To more properly illustrate this system (which operates even in peacetime), it is worth quoting General Mordechai Gur of the IDF:¹³

"A proper command system should be able to set itself goals and then strive to attain those goals in spite of the clear realization that things will go wrong, but also in the confidence that, when they do go wrong, the system will be able to overcome the obstacles. Such a system might operate in two different ways. The first is to plan everything in detail and then start going. The second is to lay down general objectives only and to start going at once. The system then gains momentum, and the details are filled in even as progress is being made. The IDF normally takes the second of these ways. It is like a smart bomb being released on the basis of general data, without the target even being seen. Later, after a few miles, the bomb identifies the target and is locked on it. From this point, it flies accurately until the objective is reached...."

Can an Army be constructed in this way without missing too many of its objectives? The answer is that doctrine, research and development, and organization cannot be built on the basis of detailed plans. Guidelines must be laid

down and the system put into gear. However this is only possible when the bureaucratic machine is reasonably lean and fast in operation, and on condition that the information passed by it is correct and accurate. Without fast and accurate feedback, it would have been impossible for the IDF to exist, much less to respond to changing times.

A proper command system, then, consists of a combination of thorough, even pedestrian, preparation with freedom that is granted to imagination and individual daring. Its operation is based on three principles, namely a) a clear definition of the objectives to be attained; b) thorough planning; and c) a proper order of priorities. The third condition implies the recognition that, whatever one's priorities are, some things are going to suffer neglect. One's list of priorities should be subject to constant reexamination. The danger of adhering to a single idea, and even worse to a predetermined plan, must be avoided. Discipline and teamwork must be combined with improvisation. Controls, both external and internal, must be in continuous operation.

All three conditions must appear self-contradicting; but in reality, it is the balance between them that determines the IDF's unique character.....

Innovation during execution itself; discipline; and improvisation - these are the three basic elements that make up the IDF's command system, even if the latter two sometimes contradict each other."¹⁴

Operational control in such a decentralized system is achieved through the issuance of guidelines, not through an adherence to a series of orders from top down. In the IDF, the system of "optional control" ensures maximum independence to subordinate commanders to react to changing situations. Superior headquarters interferes only when major changes in plans have an impact on other units.

Effort is kept aligned through a thorough explanation of the commander's intent, and kept in check by extensive communications allowing the passage of "correct and accurate" information, "fast and accurate" feedback.

The alignment of effort is vitally important so that the operation does not degenerate into chaos. This is a necessary condition that must be achieved before individuals are empowered.¹⁵ This is achieved by having commanders attain a deep understanding of the strategic intent of the superior commander (shared vision). Subordinate commanders are trained to understand not only their superior commander's intent, but also their commander's commander's intent - i.e. two levels up. This helps them focus on the big picture. Considerable effort is therefore placed in explaining the concept of the operation - the "why" in the mission statement.¹⁶ In so doing, individual unit commanders are expected to identify with the objectives of the greater whole. Unlike autonomous units that compete with each other in many corporate organizations, each subordinate unit in the IDF actively cooperates with one another to achieve the overall goal of winning the war.

The alignment is kept in check by a high degree of openness in communications, built around a system that allows for the transmission of information "from top down, from bottom up, and laterally among the subordinate units".¹⁷ This is indispensable in keeping all units on the same page and working in concert. In operations, IDF units operated on common radio nets, and communicated extensively. It was not unusual for IDF commanders to listen in to subordinates communicate with one another and to meet them personally at the front.¹⁸ But it is also the quality of the communications that matters. The aim is to have "conversations" or "dialogues", of the quality that Senge advocates. This provides the common basis for future action.¹⁹ Dialogue (a free flow of meaning between two people) underlines team learning and allows the military to engage in collective sense making in a very confusing environment. This was the very skill that was dismissed by Masten as being irrelevant in the military. The conditions that allow for this "openness" are the ones that are emphasized in the IDF - good leadership, a common "language" that allows for understanding during tense periods, and an especially high degree of operational trust, "where each team member remains conscious of other team members, and can be counted on to act in ways that complement each others' action",²⁰ something that develops from having spent extensive time training together, and of deeply holding to the cause. It is only through this "openness" that a military organization is capable of adaptive and generative learning. Priorities are subject to "constant reexamination".

These key features that make up the command system of the IDF appear to be high decentralization and autonomy, distributed leadership throughout the organization, the ability of parts to work towards the good of the whole, and the interactiveness that leads to a wide sharing of information and consensus in taking action. These are essential elements of a learning organization. The parallels with organizations in the business world are easy to see. It is possible that traditional centralized "command systems" in corporations are likewise ill suited to succeed in an environment of high uncertainty and rapid change and can only operate if they incorporate the elements of the learning organization that can be found in the IDF. It is only through this that adaptive and generative learning can take place.

As always, the IDF system is not perfect. In fact, the basic assumption of a learning organization is that there will be

a certain amount of confusion and waste given the wide leeway afforded subordinates. In the IDF, this is accepted as a necessary evil. In fact, such confusion is not inconsistent with, but may be a prerequisite for results.²¹ Van Crevald notes that in the 1957 campaign, a highly successful campaign for the IDF, the wide latitude afforded the IDF commanders resulted in some brigades being successful, others less so, yet others too much so. Efficiency and neatness are not the hallmarks of a learning organization. On one occasion, an entire brigade stood by with folded arms, while two others were fighting.²²

Conclusion

The IDF from 1956-1973 provides a good example of a large hierarchical military organization as a learning organization. Context matters. Hierarchy need not stop the development of a learning organization. Organizations are complex systems comprising of interacting sub-systems - organizational design, culture and politics.²³ Features within the organization, such as the command and control system and, especially, the cultural and value system that underlines the organization, can make a difference as to how hierarchy affects behaviour throughout the organization.

It is for this reason that replicating the Israeli system is not easy. In the IDF's case, being in a state of war helps. The loose form of command and control is also supported by history and the cultural values within Israeli society. While many Western militaries have traditionally upheld authoritarianism within the military, the IDF had a fundamentally different starting point. The forerunner of the IDF was the Hagana - an underground, semi-partisan, regular formation, largely non-authoritarian and loosely stratified²⁴ where members took pride in their slovenly outlook. To an observer therefore, the IDF is a defence force of contradiction. It is a military force of considerable strength, but is extremely casual in behaviour. The concept of discipline in the Israeli Army is limited to the need for obedience in executing orders in war, but disposing with all other symbols of submission reflecting their roots as a partisan army.

Israeli culture also promotes a "loose" attitude towards authority. Israel society is singularly devoid of any disciplinarian climate - the lack of repressive control and prohibitiveness is particularly in evidence in Israeli schools and homes. The average Israeli soldier, while accepting the need for obedience to orders, is an unquenchable arguer, not willing to let anything pass without commenting on it. Israeli military culture therefore does not seek to eliminate rank and authority, but seeks to maximize participation in implementing decisions at all levels. "Command" gives way to "leadership" where a commander is a team leader, who is taught to temper his command with explanation so that there is "enrollment" in the plan. The image of a professional officer is not that of a disciplinarian but a teacher (or coach) in the art of war.²⁵ Soldiers are equivalently viewed as interested pupils eager to learn. These social dynamics supports learning in a fashion that is unattainable in many other traditional militaries.

Endnotes

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9 Lind, William, op cit

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11 Ibid, op cit

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13 Gur, M, "The IDF - Continuity vs Innovation", (Hebrew), Maarachot, March 1978, pg 4-6.

14 Another common argument for a decentralized command and control system is that it is less vulnerable to enemy action. In a highly centralized system where the top only makes the decision, the military machine grinds to a halt once key command nodes are neutralized. In contrast, a system where leadership is distributed throughout the organization, the system can continue to function in spite of the loss of some command nodes. What essentially led to the rapid collapse of Saddam's Army in the Gulf War in 1991 was the fact that the Iraqi's Army's command and control system was centralized in Saddam's hands. Once the communication nodes were neutralized, the entire Iraqi Army remained effectively static because they were left awaiting orders that would not come. See Friedman, Norman, Desert Victory, Naval Institute Press, Annapolis, 1991 Chap 13.

15 Senge, Peter Chap 12

16 See Lind William, op cit

17 Van Crevald, pg 271.

18 Van Crevald gives a good description of this by observing the habits of Gen Gavish in the 6 Day War. See pg 199-200.

19 Senge, Peter Chap 12

20 Senge, Peter pg 236.

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22 Ibid pg 198.

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Viewpoints: Beyond C2C (Capacity to Change) to C2I (Commitment to Innovate) and Higher Strategy

The monograph, “Creating the Capacity to Change: Defence Entrepreneurship for the 21st Century”, is praiseworthy for its sharp prose and cogent thoughts. The monograph reflects on the strategic challenges facing the SAF in a dynamically evolving world, and outlines a broad schema on the way forward. This schema boils down to applying the precepts of the knowledge economy, where ideas and innovation are prized, to the business of warfighting with change in mind.

For Transformation, Better Innovation than Change

Change can be purposeful and directed, or otherwise just an open-ended exercise in retooling the status quo depending on what it defines. Instead of “Creating the Capacity to Change”, it may be more meaningful to advocate “Creating the Capacity to Innovate”. One may well ask, “What’s in a name? Isn’t a rose a rose by any other name?” But if Mindef had dropped the reference “reservists” in favour of “Operationally Ready NSmen”, choice of words does matter, if not in substance, then at least in nuance. This is not a trivial quibble over semantics: “innovation” expresses a conscious choice and implies a creative act that value-adds, whereas “change” does not. “Innovation” better conveys the essence of the monograph, which is not about change alone but about transforming in a focused way that produces a superior outcome. Should the SAF just change? Or should we innovate? The first is no more than a call to action whereas the second is an exhortation to transform. Trans-formation is, after all, the desired end-state of innovative change.

Stability Amidst Change

The SAF needs to maintain its bearings in the midst of innovative change. The way to do this is to hold fast to our “core” even as we innovate. The “core” refers to our mission, primary competencies and value system. Preserving our “core” will enable us to maintain policy clarity amidst the smoke and thunder of change; it is a safeguard against being caught up in a swirl of flux as we engage in “competitive tension and de-construction” in our effort to transform.

Jerry Porras and James Collins, in *Built to Last: Successful Habits of Visionary Companies*¹, provide a well-researched account of how leading US companies have consistently achieved corporate success by innovating and staying true to their “core” at the same time. Stimulating innovation and preserving the core are not self-contradictory; on the contrary, they are mutually reinforcing. It is by deftly balancing the dichotomous goals that superior outcomes are possible: excessive innovation without an anchor in current realities can be chaotic, whereas a fixation on preserving one’s core can lead to organisational sclerosis.

The SAF is not a corporation, but these are nevertheless useful insights from the corporate world. There is synergy in duality, however antithetical this may initially appear.

No Master Architect, But a Master Guiding Hand

Transformation cannot be master-planned; neither could it be decreed. Yet the SAF’s transformation effort may drift, even fragment, without a master guiding hand in the form of a broad vision. We will need a broad vision not just to provide a conceptual guide for our transformation effort but also to enthuse the masses.

The vision must begin with a new warfighting concept. We will need an overarching SAF warfighting concept rather than diverse service-centred ones to provide that singularity of focus. Antecedent thoughts on blitzkrieg motivated the transformation of the Wehrmacht in the interwar years into the remarkable fighting machine that it became, and Airland-Battle thinking in the 1980s seeded moves within the US military towards a “system of systems” force-structuring that emphasises dominant battlespace awareness and precision strike.² In the specific case of the SAF,

we will need to further crystallise the concept of IKC2 (Integrated Knowledge Command and Control) warfare and its applicability to the services for better synchronisation of plans and effort.

History suggests that the foundation of new conceptual thinking often lies in studying and imbibing the lessons of war. The Germans succeeded in pioneering blitzkrieg not so much because they were operationally more learned than the French or British, as because, amongst other reasons, they studied key aspects of World War One with great seriousness and promoted spirited debate on the lessons learnt. The German Army organised no fewer than 57 committees almost immediately after the war to study the experiences of 1914-1918, "while the impressions of the battlefield are still fresh and a major proportion of the experienced officers are still in leading positions".³ The Germans learned, while the British and French were unlearning, seeking comfort in accepting evidence that squared with their doctrines and rejecting conflicting findings.⁴ The SAF should, in this regard, establish an organic agency (as opposed to a project assignment approach) to undertake rigorous study of war and recent conflicts to distill learning and to feed new thinking on warfighting concepts and operational strategy.

History is an inexact discipline, and the future is not a linear extrapolation from the past. But a deep study of past wars will infuse us with an intimate understanding of the relationship between strategy and military outcomes and therefore of their analytic relevance to our transformation effort. A sound appreciation of strategy and military history provides intellectual nourishment for deep learning on transformation.

Experimentation as Gateway to Transformation

Transformation can be stabilising or destabilising depending on how well it is managed. The approach to transforming the SAF must be one of managed evolution, with experimentation as the dominant vehicle. Whatever may be the merits of creative destruction and innovative reconstruction, these need to be tempered against the need to maintain the incumbent force structure largely intact to minimise institutional chaos. Experimentation, as a controlled and deliberate process of incubating innovative change, will allow strands of transformation to take place in an orderly fashion and with minimum fuss.

For experimentation to be fruitful, it needs to focus not just on new military applications of technology but also on doctrinal and organisational innovations. Indeed, technology, doctrine and organisation constitute, in sum, the trinity that undergirds any transformation effort; it is only when these three parameters are appropriately reconfigured that true transformation occurs.

The experiences of the British, French and German armies before World War Two provided compelling evidence of this. By 1939, the British Army had been wholly motorised and the French had developed some fine tanks. The German Army, in contrast, had motorised only 20% of its forces and possessed tanks that were not always the technological equals of French tanks. But the Germans did a better job, as evident in subsequent battlefield successes, of integrating its motorised forces with its armour units in a clever adaptation of technology, doctrine and organisation.⁵

Arguably, the extent to which each of the three parameters (technology, organisation and doctrine) bears on the transformation equation is not uniform over time: depending on the state of progress, one parameter may be more influential than another in shaping the transformation outcome. The assertion may be made that technology is perhaps presently a greater driver of transformation given advances in C4ISR, guidance technology and precision munitions. Yet technology, despite its cutting-edge promises, is not determining. Military organisations should guard against being bewitched by the glitz and wizardry of high-tech and allowing transformation to be led and fed by technology alone.

Of Rich Pickings and Cherry-picking

The C2C monograph has outlined steps to stimulate change in the SAF by quarrying organisation-wide for ideas. Yet mining ideas is not the same as harvesting these ideas: wealth of ideas does not simply aggregate into intellectual

wealth from these ideas. As a case in point, what will we pick as winners in the marketplace of ideas, and assuming we can pick winners, how can we then be sure that we have achieved a breakthrough⁶ in transformation and not go on experimenting ad infinitum? Where, along the innovation pathway, are the “eureka” moments in the lead-up to a transformed future? Indeed, how may these moments be identified short of proof in war? These questions define perhaps the greatest challenge in our transformation effort.

The questions are easily asked. They cannot be as easily answered, and the benefits of transformation are rarely self-evident in advance. Nevertheless, achieving a transformation in mindset, as a first step, will at least enrich our mind-mapping and signpost us to possible answers. Transforming mindsets will require us to be generative in our thought process by stepping out of our ideological corners and fixed mental alleyways, and to start judging ideas and outcomes through new lenses.

Picking winners will always be more an art than a science even if we start examining ideas through new lenses. The filtering process will involve trade-off amongst a range of options that will require cost-benefit calculations but more importantly, value judgements. We will have to rely less on stark logic but more on intuition to succeed at this; more than before, we will have to be able to sniff out winners and “gut feel” our way to unorthodox military solutions.

Mavericks, Young Turks and Old Hands

Having mavericks in the SAF of the likes of Guderian and Liddell Hart would help somewhat in propagating innovative thinking and in picking winners. A maverick is, by definition, someone who is not shackled by conventional wisdom and whose ideas are generally unorthodox but constructive, with a wide-ranging impact on an organisation and at the strategic level. A maverick is a product of circumstances; he can be born or nurtured, and it is circumstances that will allow him to manifest his maverick streak.

The SAF will need to generate ideas from the masses as a first step towards effective innovation; but to go beyond “idea-count” to “ideas that count”, we will need “new thinking” young Turks and deep-sensing old hands with a maverick orientation to generate and cross-fertilise quality ideas. Mavericks need to be uncovered from amongst us. Once uncovered, ways must be found to allow them to make a multiplier impact in the SAF, as in deploying them in our experimentation outfits to form multi-disciplinary, mixed-seniority teams to influence concepts and choices, and in our schools to shape thinking modes and to inspire attitudinal shifts.

But mavericks, being mavericks, they are not “naturally occurring”, much less in a hierarchical, command organisation like the military. Nevertheless, the C2C framework, with its emphasis on intellectual networking, tolerance for diversity and “Hundred Schools of Thought” advocacy, may just create the right ideational milieu that fosters maverick-ism.

Commitment First and Foremost

In the end, short of a crystallising crisis (such as defeat in war) that compels change, leadership will be the threshold factor in the success of any transformation. Mindef decision-makers and SAF senior commanders can spur innovation or otherwise dampen it. Which way a decision swings would depend on the frame of mind, intellectual tolerance and level of risk aversion among decision-makers at the apex of Mindef and the military high command. Some “out-of-the-box” ideas, especially if they are unproven and seemingly risk-laden, may require no more than a leap of faith to bring to pass. Yet such a leap of faith, for an organisation deeply accustomed to rational decision-making, may well amount to taking leave of our senses. Only the sure-footedness from a leadership commitment to stay the course and stake out uncharted territory will strengthen our willingness to take more than calculated risks on military innovations. Trail-blazing is, after all, an act of faith as much as it is an exercise of visionary leadership.

Not a Substitute for Strategy

Transformation or no transformation, war will always remain a contest waged in the minds of opposing military high commands and political leaderships. Whatever operational brilliance may accrue from successful transformation, it will not displace strategy as a key determinant of victory in war. The German Army of World War Two was militarily superior, yet German military advantages could not be consolidated in part because of flawed strategy. Nor could American military might prevail in the Vietnam War on account of a strategy of limited war being misdirected against a foe whose war aims were unlimited.⁷

The SAF will need to be good not only at fighting war but also at waging it and winning the peace after it. Even as we invest in transformation, we should strengthen our strategic mastery in waging war and winning peace. Good strategy requires rational analysis, learned reflection and calculated opportunism; and it is, above all, defined by the quality of the interactions between the military top brass and the political masters in determining the means-end relationship and the endgame.⁸

But good strategy does not happen by chance; it derives from educated knowledge and accumulated wisdom which, in lieu of war experience, is culled by proxy from campaign-level, scenario-based training in war colleges and defence universities.

The SAF should look into upscaling its top-end professional military education to level up its general proficiency in the art of war and in supporting the political leadership in war-making. Establishing a defence college as the pinnacle training institution in the SAF is perhaps an idea whose time has come to fulfill such a need. A defence college can further provide a dedicated platform for marshalling the SAF's considerable intellectual capital for the study of conflicts and strategy through full-time research and short-term fellowship programmes. A defence college, strongly coupled to our experimentation centres and operating interactively and symbiotically with them, will constitute a vital backbone of transformation.

Transformation for What End?

Short of proving the efficacy of transformation in war, the implicit assumption must be that transformation also strengthens our deterrence strategy. Deterrence has its limitations arising out of its paradoxical logic: deterrence, when it is visible and effective in a competitive setting, will trigger, if not a matching, then certainly an asymmetric response. If the intent of deterrence is greater security, the response it elicits in a competitive environment will undermine this. Transformation can, in extremis and in a scenario of competitive force modernisation, trigger the unintended consequence of inadvertent conflict; so sharper teeth with transformation may not necessarily bring deeper security.

Arguably, the issue of the pathologies of deterrence has not pressed on our minds as we are not on the verge of the tip-over point where regional force developments have assumed an escalatory dynamic. While we should certainly not abandon deterrence as a strategy (and ought, in fact, to continue strengthening it), we should, in due time, complement it with an assurance strategy that is distinct from diplomacy and that embraces specific confidence-building measures under the rubric of co-operative security. The point is: in the interest of strategic stability, even as we bare our brass knuckles, we need to demonstrate our benign intent in deeds and work towards a reciprocal trusting relationship. For suspicion is the root of skewed perceptions and imagined threats, despite the best of intentions.

This will require "out-of-the-box" solutions, for which transformational thinking in the higher realm of strategy is called for. In the long run, peace is better safeguarded not through deterrence alone, but through deterrence wedded to a stratag of mutual assurance, transformation regardless.

COL Goh Teck Seng

Endnotes

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3 MacGregor Knox and Williamson Murray, *The Dynamics of Military Revolution 1300-2050*, (NY: Cambridge University Press, 2001), p.158.

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5 William Murray and Allen Millet (ed), *Military Innovation in the Interwar Period*, (NY: Cambridge University Press, 1996), p. 46.

6 By 'breakthrough', the author does not mean reaching a specific end-state since transformation is a journey. Rather, 'breakthrough' is taken here to refer to a milestone achievement that impacts warfighting strategy.

7 Colin Gray, 'On Strategic Performance', *Joint Force Quarterly*, Winter 1995/96, pp. 30-31.

8 For a rich account of the relationship between generals and politicians, see Eliot Cohen, *Supreme Command: Soldiers, Statesmen, and Leadership in War* (NY: Free Press, 2002). The book contains specific case-studies on the interactions between statesmen and their generals involving such statesmen as Winston Churchill, Lyndon Johnson.

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Viewpoints: From Boys to Men: The Centrality of People-Centred Leadership in People Transformation

Training schools are the first transformational experience we go through in the military. Nothing clears the head and focuses the mind quite as well as when you get your hair shaven off during Basic Military Training or when you undergo the tough training expected of commanders in either School of Infantry Specialists (SISPEC) or Officer Cadet School (OCS).

I had the privilege of developing some young officers-to-be in the OCS last year. It was a posting I was looking forward to as I wanted to provide young and able officers with a highly positive experience of the army. I wanted to make them believe that they can go out into the army and make a difference. OCS provided the perfect opportunity to equip these young men with that ability to make a difference and I was happy to find many like-minded colleagues in my training wing.

There were many horror stories about trainee life in OCS and I told my cadets that all the horror stories were true: they will be treated with respect and dignity, we will have an open management system, making mistakes are crimes punishable by further encouragement and learning can be made fun.

We know, as instructors, that this fear is irrational but, to a new cadet, it is nevertheless palpable and real. As leaders, we need to be sensitive to the anxieties of our men, regardless of how irrational those fears may seem to us. In OCS, there is a ceremony where the cadets will remove their lanyards as a sign that they have become initiated members of the cadet fraternity. It is an important rite of passage but is viewed with some trepidation by the cadets. They felt that without their lanyards, they have somehow lost their “get-out-of-jail-free” card, that their instructors would treat them differently and dish out punishments more liberally. But in reality, the removal of the lanyard does nothing to change the status quo.

And this is the same point I would make to the cadets at their commissioning parade — nothing changes the day before and the day after their commissioning. The rank on your shoulders does not change who you are.

The Importance of Trust

Trust is integral to people-centric leadership. It is the key to transforming others. Cadets need to trust instructors to look out for them and have their interests at heart. Subordinates need to trust commanders to lead them into combat. Uncertainty and change further underscore the centrality of trust in an organisation.

Trust can be a petty sentiment. It needs to be gradually cultivated and proven over time, and once lost, is difficult to recover. This is why in OCS, we were conscious about maintaining consistency and keeping our word. Therefore, if we truly believed in a learning organisation, and encouraging people to improve, we had to put our money where our mouths were. One example of how trust was built up was in the way we managed cadets who were not performing as well. It was only too easy to fail cadets, but much harder to give them opportunities and train them to improve. We needed to work extra hard to develop them into officers who can make the cut by spending extra time to counsel, train and coach. We not only had weak cadets become increasingly motivated to perform so as not to betray our trust, other cadets also saw that we were genuine in our approach and felt that their trust in us and our system was not misplaced.

Trust is mutual. Just as the cadets trusted us, we too placed our trust in their good sense and initiative. We had confidence in their potential and gave them space to grow, make decisions and manage their own time and learning. They were treated with respect and professionalism. We deliberately did not dictate their schedules down to the finest

detail. Furthermore, we did not just want to train them. We also aimed to impart to them the art of training others. In this regard, we shared with them the “how” and the “why” of our training regime. This stemmed from our belief that leaders could not be developed if they were not treated like leaders-to-be from the start.

The issue of trust goes beyond the training of cadets. At an organisational level, trust is critical in building solid relationships either between the organisation and its people, commanders and subordinates or even between departments and services. What I observed in OCS was only a microcosmic example of the potential that trust - when appropriately placed - can unleash for the organisation.

The Importance of Fun and Realism

Beyond developing trust, we also wanted to make sure that genuine learning was taking place. We did not want to conduct exercises that merely went through the motions. We took it upon ourselves to deliver fun and realistic training. One memorable exercise was the Patrol Field Camp (PFC). The main purpose of the PFC was to teach the cadets how to write good operational orders and familiarise themselves with section-level operations.

By design, the Patrol Field Camp was an interactive two-sided exercise conducted on Pulau Tekong where the cadets were split into two opposing forces and made to conduct operations against the other side. However, for efficiency reasons, the exercise became “routinised” such that the instructors often gave out orders for sections to be at pre-determined areas so as to ensure contact between opposing forces. Almost nothing was left to chance. With this arrangement, the spirit of the exercise was lost. Spontaneity was replaced by a mechanical implementation. The cadets generally would have been denied the chance to practise the technique of using information to discern a live enemy’s intent and more significantly, to use operational orders to communicate a robust plan of action that would be capable of reacting to a live enemy

We decided to re-inject spontaneity into the exercise. We devised our own scenarios and created a dynamic engagement process. Other than the initial set of orders issued, the rest of the exercise was based on events as they unfolded. For instance, if some of my patrols made contact with the enemy, subsequent orders would task forces to pursue. Even though this turned out at times to be physically very demanding (they may keep getting cycled out to pursue enemy forces), it was for good reasons that the cadets could understand. Planning became realistic as both cadets and instructors tried to discern the intent of the other side. As we planned late into the night, we brought the cadets into the process so they understood the instructors’ planning considerations.

We also introduced innovative practices to increase the fun factor. One example was our inventive use of alarm clocks with a five-minute time-lapse to simulate time bombs (this was used in the exercise where we simulated a successful raid on a protected installation). This was an inexpensive way of effectively recreating the signal for a bomb going off. The alarms, when it went off, were effective in creating the desired negative morale effect on the cadets who were “performing protection duties”.

Amidst the fun, the cadets were given the experience of dealing with a live enemy that reacted to their actions and to whom they had to react to. My conclusion was that it was the realistic training that contributed to their enjoyment. The scenarios were realistic and the planning considerations and follow-on activities were relevant to their future work. By helping the trainees relate to their training, we gave meaning to their training experience. Fun and realism need not be antithetical concepts. It just depends on how we strike the balance.

People-Centred Leadership

The OCS experience was generally a positive one for both the cadets and the instructors because we focused on developing the cadets as people and as individual leaders in the making. The ability to drive this transformation can be summarised in one concept: people-centred leadership. People-centred leaders create the environment for

transformation to take place. It was due to the presence of open-minded, innovative and confident commanders and colleagues in OCS that we were able to have the space to change and implement innovative processes and exercises to develop our cadets. Their support and encouragement were essential as we developed an open culture of learning and removed unnecessary fear from our trainees. Good commanders may not deliver innovative or transformational results per se. But they can certainly create an environment conducive for innovation and transformation.

People are capable of greatness, if only we let them. People-centred leaders inspire those around them to greatness. Part of that process depends on building trust. We gave our cadets a lot of leeway and they used the opportunity to grow and develop as responsible leaders. This allowed them to face their future postings and challenges with confidence. We understood that perpetually caged birds would never learn to fly, no matter what their wing-span. We also understood that future leaders are not created overnight. The commissioning parade does not automatically transform a cadet into an officer. That transformation process begins the moment they step into OCS.

People are precious and need to be developed to their full potential. They are the sustainable competitive advantage for the SAF. We must therefore challenge them to become adaptive to an uncertain future by equipping them, not purely with vocational skills, but also with the learning skills to cope with different scenarios that may challenge their innermost-held assumptions. We must expect our people to meet high standards. But any organisation is not judged by how they reward the strongest, but how they help the weakest member. If we do not quit on our people, they are less likely to quit on us.

Conclusion

There are many organisations that claim “people developer” status. But behind the nice tag-line, what does it really mean? As an organisation, we appreciate better than most the practical difficulties associated with being a real people developer, as opposed to being a “people developer” in name. This is because as an armed force based largely on conscripts, we are expected to lead a diverse group of people with different backgrounds, motivations, interests and abilities. It is not easy to exercise people-centred leadership and to exercise it well even under the best of circumstances. Recognising the difficulties is an important first step to take, however small it may be.

CPT Frederick Teo

Viewpoints: Sometimes, the Missing Ingredient is Faith

In a world where analytic thinking and careful planning dominate, we sometimes forget how simple faith in a vision can still yield powerful results.

I work as a controller in an air operations control squadron in the RSAF, one of two primary squadrons responsible for managing all day-to-day flying operations conducted by the Air Force. Due to the intricate and myriad skills involved in different facets of air operations, these two squadrons have traditionally specialised along different skill lines and thus perform distinct, yet complementary roles.

Although specialisation has brought tremendous efficiency in training, operations and doctrinal development for each squadron, this distinct separation of responsibilities is not quite ideal from a system point of view since it creates vulnerability. The loss of either squadron would prove catastrophic to air operations, because the other would be unable to take over the lost functions.

Recognising this vulnerability, in the past decade we have thus made several attempts to create greater system redundancy.

The first idea was to cross-train controllers in both skill lines, so that controllers in either squadron could perform all the roles and functions necessary for managing air operations. This initiative quickly proved unworkable, as the intense training needed for each skill line precluded maintaining proficiency in both. There are limits to human ability, after all.

We then turned to the idea of cross-deploying controllers so that both squadrons contained an equal mix of both specialities. After extensive testing during several large-scale Air Force exercises, it was proven to work within the exercises' limited scope. Several hurdles remained to be scaled, however, before cross-deployment could be accomplished on a day-to-day basis. These included fundamental computer system incompatibilities that would prevent full duplication of functions, as well as more mundane but nevertheless important issues such as the administration, training and peacetime operation of the deployed controllers.

Despite the significant obstacles and uncertainties involved, top commanders decided that cross-deployment would be the way to go. New computer systems were specified and developed which would allow full replication of functions at each squadron. At the same time, a gradual implementation roadmap was drawn, ramping up from an initial experimentation cell of three controllers, to an operations complex of about 10 controllers after a year, and eventually to complete binary division of each squadron for deployment to the other. This roadmap was targeted for completion by 2004, when the computer systems would be fully ready.

However, even after the vast amount of planning and analysis that went into this effort, sceptics remained at every level. To them, the cross-deployment would disrupt both training and peacetime operations, since teaching and operations resources for each skill line would be divided into two, thereby losing economies of scale. Worse, these costs were clear and present, while the benefits - that of increased redundancy and survivability - could only be realised in a contingency. As each individual squadron is already built with multiple layers of protection and backup, the sceptics rightly questioned under what catastrophic circumstances could all these individual backups fail that would trigger a need for the other squadron to take over.

The sceptics were right in their analysis. Even those who supported the plan had no ready answer as to when this idea would prove beneficial, other than the clear conviction that our single-node vulnerability had to be plugged. We were, in some sense, moving ahead only on faith alone; and at times, during the darkest hours of adversity, we questioned whether it was worth all the effort and trouble.

But sometimes, only faith can answer the unanswerable.

On 22 March 2003, initial reports surfaced in the media about a new infectious disease which caused pneumonia-like symptoms in victims. Most dangerously, the disease begins mildly with only fever and muscle pains, causing unsuspecting carriers to delay seeking treatment and in the meantime infecting all those who came into close contact. Within two weeks, the initial three cases in Singapore had developed into a full-blown epidemic, with almost a hundred hospitalised and many hundreds more quarantined within their homes. Schools were closed; public places became deserted as people avoided going out. This disease was SARS.

Since there was no way to accurately diagnose SARS until its advanced stages, drastic measures had to be adopted throughout the country. Those who came down with fever were immediately monitored closely and, if they turned out to be infected by SARS, everyone who had close contact with them would be quarantined for at least 10 days.

This requirement had dramatic implications on our operations. Were any one of our controllers affected by SARS, the entire squadron would have to be quarantined as well. Thus, like other critical units SAF-wide, we had to come up with separation plans to divide the squadron into distinct teams that would have minimal contact with each other. This way, should anyone get infected, only the immediate team would be quarantined. To create this physical and temporal separation, the best solution turned out to be... cross-deployment of controllers between our two critical squadrons. We accelerated the implementation roadmap, deploying a full operations complex to each other one year ahead of schedule. Such quick reaction to this crisis would not have been possible without the groundwork laid by all the original planning.

Nobody predicted SARS. Not even the supporters of cross-deployment could have foreseen that this was exactly the kind of contingency cross-deployment would solve. The scenarios we were thinking of revolved around more exotic wartime catastrophes, rather than the seemingly innocuous scenario of a peacetime infectious disease.

But perhaps this is why faith is so powerful and so important to innovation and transformation. Nobody can predict the unknown unknowns, the fundamental surprises.

As long as what we are doing fulfils a clearly important need (in this case, the unambiguous vulnerability of having two specialised squadrons), we should have faith that our work will prove useful one day.

There is more to innovation than cold logic and dry analysis. Sometimes, the missing ingredient is faith.

CPT Choy Dawen

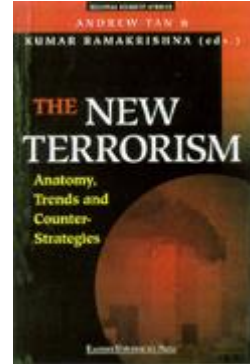
Can Sheep Teach Us About Transformation? Review of David Hutchen's Outlearning the Wolves

by CPT Choy Dawen

Warning: This book review probably contains more words than the book itself.

Transformation is a subject that seems deeply intellectual, where

- mind twisters such as “unknown unknowns” are talked about frequently (but how do you know something you don’t know you don’t know?)...
- catchy acronyms are manipulated repeatedly (capacity to change, care to change, commitment to change and capacity to cope)...
- numbers are thrown around freely (seven habits, six thinking hats, five disciplines, four levels of choice and three-legged stools)...
- and everything overnight has become transformational, including the ways in which to talk about transformation (we used to have plain books, now we have monographs).



Yet the simple story of *Outlearning the Wolves*, written with fewer words than this book review and packing some cute pictures of sheep and wolves in action, contains in it powerful lessons for transformation. It tells the charming story of a flock of sheep who led peaceful and comfortable lives on a farm. They were a contented lot, spending the day grazing idly with hardly a worry about the future. After all, they had plenty of grass, beautiful weather and wide, open spaces to roam around - what more could a sheep want?

The Wolf Threat

The only threat to their happy existence was a pack of wolves living in the forest next to the farm. Although the farmer had erected a big fence to keep out the wolves, somehow the wolves have occasionally managed to sneak in and run off with a sheep for dinner. Though tragic, this did not happen too often so the sheep had come to accept this state of affairs. They even made up truisms for themselves, such as “The wolves will always come, just as the sun always rises,” believing that this was the natural way of things which could not be altered. This was the way it was, this was the way it would always be.

But not every sheep thought that way. There was Otto who, from the pictures, was white, rather plump, had cute short legs, and amazingly could stand on two feet - in other words, an ordinary-looking sheep just like every other in the book. However, Otto harboured maverick thoughts; he questioned why the flock had to live in the constant shadow of the wolf threat. He would tell those who gathered around him, especially the younger sheep, about his vision - that one day, if the flock tried, they would be able to live without worry from the wolves. These thoughts disturbed the flock’s elders, for they felt Otto was sowing discontent amongst the sheep, making them think dangerous thoughts.

Sadly, Otto suffered an early demise. One night, he was taken away by the wolves (who must have had pretty good intelligence officers) and never seen again. But his nonconformist views lived on in some of the younger sheep, who began to doubt what their elders had been teaching them. The most vocal of them, Curly, began making public appeals for the other sheep to believe in Otto’s vision. She exhorted them to think for themselves how they could counter the wolf threat, so that they could forever live in complete peace and lack of worry.

Beating the Wolves

Under Curly’s prodding, several sheep began discussing what they knew about the wolf threat. They noticed that the wolf attacks tended to coincide with dry spells, when there would be no rain for several weeks. This fact did not seem relevant, until an inspection of the fence revealed a spot where the fence ran over a small stream. Clearly, during the dry seasons when the stream dried up, the wolves used the opening created to sneak into the farm and run away with a sheep for dinner. Eureka! But now they had to find ways to plug the gap. One sheep then came up with the idea of blocking up the stream with a dam made of stones, so that the wolves would not be able to sneak

underneath the fence. After a great deal of effort by many sheep, they finally erected a stone dam at the fence - which not only plugged the gap, but also created a small pond where the sheep could come to play.

All the sheep were ecstatic that they had finally solved the wolf problem. There would be no more wolf attacks for the next few years, until... such time when the wolves figure out another way into the farm.

Lessons for Transformation

Originally, *Outlearning the Wolves* was written to introduce the ideas of learning organisations. The second, more “intellectual” portion of the book discusses how the story illustrates the power of learning organisations, where staff members are not afraid to think for themselves and learn new knowledge so as to solve their work problems.

But it is often the simplest stories that contain the most numerous nuances, and in this regard *Outlearning the Wolves* does not disappoint, containing in it some lessons for transformation as well. You will probably discover more for yourself after reading the book, but here are two of the more pertinent and personal lessons.

1. Never be satisfied

Often the greatest impediments to innovation and transformation are not those of insufficient intellect, but rather those of insufficient imagination. Otto was not necessarily any smarter than the flock’s elders, but unlike them he was not satisfied with the status quo. He felt that as long as the wolf threat remained, the sheep only had a false sense of security and lived at the mercy of the wolves. He was not content accepting the premise that the wolves will always penetrate the farm’s defences. He could imagine a better future, instead of being trapped in the satisfaction of the present.

Satisfaction leads to complacency, which goes a long way towards explaining why successful, mature companies frequently lose out to emerging, hungry start-ups, or why winning armies sometimes learn the wrong lessons and end up losing the next war. No matter how rosy the current situation, there will always be ways to improve it and better one’s lot. Indeed, this is why the SAF - despite being respected as one of the most professional armed forces in the region - must never become satisfied with its current performance, but instead constantly look for ways to progress.

2. Have strong, inspirational leaders

It is remarkable that, although many acknowledge the importance of good leadership, conventional literature on innovation typically focuses attention on structural and organisational remedies. They talk a lot about creating special teams to look into the future, carefully designing incentives to innovate, or even setting up marketplaces for ideas, but devote much less time to studying the most appropriate skills, characteristics and personalities for leading change. Yet it is never easy communicating your vision to others or convincing them to join your cause. It is even more difficult motivating and managing a team to work on a seemingly unreachable goal that others disdain or have abandoned. Pity, then, that change leadership receives so little attention.

However, *Outlearning the Wolves* demonstrates clearly that strong, inspirational leaders like Otto and Curly are vital to change efforts. Their ability to inspire performance from others, and their strength of resolve to persist against resistance, are crucial to successful innovation. Otto and Curly did not teach the sheep how to build a dam, or look for the weak spot in the fence; the knowledge and skills were already there in the flock. Instead, like what leaders everywhere should and must do, they galvanised the sheep with the right ideas and skills to take action and solve a problem collectively. Without such strong and inspirational leadership, the sheep’s latent capacity to innovate would have been squandered.

Of Sheep and Wolves

Outlearning the Wolves appears to be a simple children’s storybook, but it is in fact a poignant parable of learning and transformation. Its simplicity makes it easy for us to relate our real-life experiences; but more importantly, that very same simplicity also makes it easier for us to discern powerful lessons and remedies without resorting to fancy words or radical organisation restructuring. The next time you think nothing can be improved, or when you find others sceptical of your ideas, remember Otto, the sheep, and how they beat the wolves.

The above mentioned title is available for borrowing at the [SAFTI MI Library](#). The catalog references are:

Outlearning
David
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the

Wolves
Hutchen

Featured Author: Bruce Berkowitz

Bruce Berkowitz graduated from Stetson University in 1976. He began his career at the Central Intelligence Agency where he served from 1978 to 1980 and from 1982 to 1985. Berkowitz was a professional staff member for the Senate Select Committee on Intelligence from 1985 to 1987, and has been a member of the Council on Foreign Relations since 1990. At present, Bruce Berkowitz is a research fellow at the Hoover Institution at Stanford University where his work focuses on areas of defence, intelligence, and technology policy. He serves concurrently as a senior consultant in the Office of the Secretary of Defense and a senior staff member at RAND. He lectures frequently at the National Defence University and the Joint Military Intelligence College on national security issues and is a frequent contributor to the Wall Street Journal. He has also published articles in Foreign Affairs, The National Interest, Foreign Policy and other publications.



A leading authority on national security affairs, Bruce Berkowitz has published several books on the subject. One of his earlier books is *Strategic Intelligence for American National Security* co-written with Allan Goodman (Princeton University Press, 1989). The book outlines the issues that the US intelligence faces then and discusses the challenges it will face ahead. The authors provide an insight into how intelligence analysis may be made more effective, how intelligence planning and intelligence collection work and what are their limits, drawing upon historical analysis, interviews with intelligence officials and their firsthand professional experience.

In *Best Truth: Intelligence in the Information Age* (Yale University Press, 2000), Bruce Berkowitz again teams up with Allan Goodman. In this provocative book, the authors call for a radical reform to America's intelligence agencies. In the era of the Information Age, they recognise the need for fundamental changes in the way that intelligence is collected, processed, and distributed. Recent technological developments have been remarkable and the Information Revolution affects every aspect of the world economy and politics, and the way people use information. The authors contend that in the post Cold War period, the intelligence service need to move away from a rigid, hierarchical structure towards a more fluid networked organisation. In their alternative model, Berkowitz and Goodman draw upon some concepts from the commercial world where companies need to respond quickly to challenges. The authors recognise that these changes may be difficult for bureaucratic, established organisations, but argue that to survive, the intelligence community must adapt to the Information Age by adapting its culture.

The exponential effect of information technology on modern warfare forms the theme of Bruce Berkowitz's most recent publication, *The New Face of War: How War Will Be Fought in the 21st Century* (the Free Press, 2003). Berkowitz contends that modern warfare is information warfare, and as American and coalition troops fought the first battles of this new century across continents, from Afghanistan to Iraq, they did so differently from the days of old. Information technology is no longer merely one of the factors to be considered in warfare. It is the overwhelming factor. But if the US has a technological advantage over its adversaries, the Al-Qaeda is also adept with computers. Linked together by flexible, secure communications systems that span across the globe, they will be able to efficiently deploy weapons of mass destruction. As war is being waged against terrorism, Berkowitz's book provides a framework for understanding how this war will be fought. Berkowitz presents four key dynamics to the new warfare: asymmetric threats, information-technology competition, the race of decision cycles, and network organisations. Written in a personal and easy-to-read style, *The Face of War* draws upon many examples, from individual experiences to incidents from history, to illustrate the author's points. For those who wonder about the future of battle and how modern wars will be fought, *The Face of War* offers many answers.

The above-cited books are available at the SAFTI MI Library. Besides these, Berkowitz has also published *American Security* (Yale University Press, 1986), *Calculated Risks* (Simon and Schuster, 1987) and *The Need to Know: Covert Action and American Democracy* (with Allan Goodman, Twentieth Century, 1992).

Personality Profile: General Heinz Wilhelm Guderian

At the start of the Second World War, the German armed forces scored resounding victories - defeating Poland in one month, Denmark and Norway in two months, Belgium in 17 days, Holland in five days and forcing the French to surrender in six weeks. The contrast with the First World War, which saw more than three years of trench warfare, eventually resulting in German defeat, could not be more stark. The radically new operational art of blitzkrieg was widely credited for these successes. The transformational effect of using armour with close air support, coordinated by wireless communications, stressing deep penetration and mobility and based on joint Army and Air Force planning affected all the major armed forces even after World War II. One of the key actors who made blitzkrieg possible was General Heinz Guderian whose fame as a dynamic and effective field commander in Poland and France is matched by his reputation as a maverick who strongly advocated armoured warfare against the doubts of conservatives in the German high command.



Heinz Guderian was born in Kulm, East Prussia, in 1888. His family had a long history of being landed gentry and lawyers but Guderian decided to follow in his father's footsteps to become an army officer. In the cadet boarding schools, he was subjected to the strictest of Prussian discipline. Though seen as rigid and unbending, this Prussianism also stressed the right and desirability of an officer to express his own considered opinion right up to when an order was actually given. Such a trait of energetic frankness was to be exhibited by Guderian for the rest of his life.

Although he was trained as a light infantry officer, Guderian saw better prospects in signalling where he could build up his professional as well as technical expertise. The introduction of new wireless communications was also an area where Germany was taking the technological lead. He joined the radio company of a telegraph battalion from October 1912 to September 1913. After that, he received his General Staff training in the Berlin War Academy until the outbreak of the First World War where he served with signals units for most of the conflict. His experience was to strongly mould his future concepts of mobile tank warfare when he argued for a wireless set in every tank. This would be necessary to the style of fighting that he envisioned –commanding the battle as close to the front as possible with rapid co-operation from all other arms and a high degree of tactical flexibility among the tanks.

The successful use of tanks by Allied forces, for example in the Battle of Cambrai in November 1917, deeply impressed Guderian during his retrospective study of the First World War but senior German officers were sceptical because of better anti-tank weaponry and the expense of development costs, and continued to place their faith in cavalry which they regarded as having superior mobility. Guderian was posted to a motor transport battalions where he could experiment with mechanisation with less interference from conservatives concerned with preserving their traditional roles. But even his own commander, General Otto von Stulpnagel, gave him little encouragement, saying that "neither of us will ever see German tanks in operation in our lifetime."

It was in the 1920s that Guderian built up his expertise on tanks. Because Germany was forbidden from owning tanks by the terms of Versailles Treaty, only a few experimental models were secretly tested in Russia, with the collusion of the Soviet government. It was not until 1929 that Guderian first got into a tank during a visit to Sweden. In lieu of actual experience, Guderian learnt from the experiences of others by reading voraciously. He delved into detailed historical study of the use of tanks in the First World War as well as the exercises of the British Experimental Mechanical Force of 1927. He also read theoretical and doctrinal works by British and French officers, including Ernest Swinton, JFC Fuller, Giffard de Quesne Martel and the then-obscure Charles de Gaulle. Wargaming, initially using tank dummies with canvas or sheet metal bodies, was also carried out.

Teaching and writing also helped Guderian to consolidate, develop and disseminate his ideas. From 1924-27, he instructed transport corps officers in military history and tactics and won such acclaim that he was transferred to the War Ministry as a lecturer on transport until 1930. From 1924 to 1935, in the Prussian tradition of an educated officer, he also expounded his military thought in numerous articles in military journals and magazines. Among the key

concepts that crystallised in his mind in the 1930s was that the speed of the attack should be predicated on the speed of the tank, with the implication that armoured divisions with their own organic mechanised infantry, artillery and engineer units should be formed. This blatantly contradicted conventional wisdom held by the senior generals that the speed of any attack should be tied to the infantry's rate of advance with tank formations being no larger than brigade strength and acting as an infantry support platform.

Against resistance from the Chief of the General Staff, Beck, and the cavalry arm, Guderian and his superior, General Lutz, successfully pushed through the initial formation of three Panzer (literally, "coat of mail") divisions, which can be seen as the precursor of the Combined Arms Division, in 1934. While Lutz was the senior officer, Guderian was considered the intellectual driving force behind the Panzer idea, who had won followers, laid down the main training doctrines, command and control procedures, logistical systems and coordinated with industrial suppliers. His book, *Achtung - Panzer!*, was published in 1937. It served as the tank advocates' spearhead in the battle for intellectual and institutional legitimacy when various arms were fighting for their share of resources in German rearmament. The positive results of the 1937 autumn manoeuvres also helped to prove that the Panzer division was a viable fighting force. Despite continued scepticism from the army leadership, Guderian's ideas found favour with Hitler who was seeking the means for quick victory and avoidance of a two front war. He was finally promoted to General of Panzer Troops and Chief of Mobile Troops, and was given a direct reporting line to Hitler.

Hitler's invasion of Poland proved to be the Panzer divisions' first test in battle, after the nearly bloodless annexations of Austria, the Sudetenland and Czechoslovakia where the tanks had merely taken part in a show of strength. The Panzers, together with overwhelming air superiority, allowed the Germans to swiftly overcome fierce but confused Polish resistance. Poland's situation had been further exacerbated by the Soviet Union's attack on the East. Hitler and the hitherto sceptical General Staff were surprised and overjoyed at the apparent ease of victory. However, Guderian also garnered valuable lessons from the Polish campaign, such as the need to replace the Panzer I and II with models that were more heavily armed and armoured as well as better organisation and direction of fuel supply columns and field maintenance units. The unsatisfactory performance of the four Light armour divisions, whose formation had earlier been insisted on by the General Staff, also gave Guderian strong grounds to have them converted into full Panzer divisions. Thus, by the eve of the Battle of France, Guderian had put together ten Panzer divisions.

The Battle of France was to be Guderian's crowning glory. He supported General von Manstein's proposal to send the Panzer divisions across the forested Ardennes, and was instrumental in its energetic execution after the Manstein plan was eventually endorsed by Hitler. Having achieved complete surprise over the Allies, the Panzers broke through the French lines and Guderian, now a Corps Commander, kept up the momentum of his advance in the absence of any direct orders of what to do after the breakthrough had been achieved. The French and British actually had superior numbers and quality of tanks and artillery but squandered this advantage by committing them in a piecemeal and uncoordinated manner. The stunning rapidity of Guderian's advance and the increasing vulnerability of his flanks made Hitler so nervous that he ordered the Panzers to halt just short of Dunkirk, thus allowing the bulk of the British forces to escape. Nonetheless, after the offensive was resumed, the French were already psychologically shattered and the Allied toll stood at 300,000 dead and two million captured.

In 1941, Guderian was given command of the 2nd Panzer Army for Operation Barbarossa - the attack on the Soviet Union. After initial successes in enveloping and destroying large numbers of Soviet forces, the offensive eventually bogged down in the face of improved Russian leadership and the deployment of large armour formations, with advanced tanks such as the KV1 and T34s. The onset of winter also exposed the inadequacies of German preparations. Finally in December 1941, under intense Russian pressure, Guderian conducted a retrograde strategic withdrawal in defiance of Hitler's orders and was relieved of his command. Guderian spent a relatively uneventful two and a half years, the former half unemployed and the latter half as Inspector General of Armoured Troops. In the aftermath of the 20 July 1944 bomb plot to assassinate Hitler, Guderian was appointed Chief of the Army General Staff where he oversaw an increasingly desperate situation until he dismissed in March 1945 after a string of heated disagreements with Hitler over strategic and operational issues. After unconditional surrender was declared on 28 Mar 1945, Guderian entered American captivity. He was a prisoner of war until June 1948 and was eventually not charged with any war crimes. His book, *Panzer Leader*, was published in 1952 and serves a valuable record of the build up, deployment and eventual collapse of the Panzer forces as well as an autobiography of the "father of the Panzer divisions. Shortly afterwards, his health declined rapidly and he died on 17 May 1954.

Guderian was a rare officer who was both a man of ideas and a man of action. Through diligent study and experimentation, he gained insights into armoured warfare and proceeded to push for the implementation of his maverick ideas against scepticism and resistance from conservatives and entrenched interests above him. Drawing on the doctrinal, command and logistical systems that he was instrumental to building up, Guderian then realised his vision with success in the field of battle where also clashed with superior commanders who could not adapt to his battle style of concentration and movement. However, ironically, the success of his Panzer divisions may have helped to inspire the Nazi leadership's over-confidence and to feed Hitler's megalomania. His ideas were also effectively copied by Germany's opponents and executed by able generals such as Britain's Montgomery, America's Patton and the Soviet Union's Zhukov who were also backed with tremendous industrial resources. In the final analysis, the gains of Guderian's trans-formational efforts were whittled away by geopolitical realities and squandered by an incompetent political leadership.

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