

- Empowering the relationships between government and big data companies (Google, Amazon, Microsoft, and IBM) and making these relationships similar to the relationships between the government and companies such as Boeing and Lockheed Martin.

PART 3

Plan of Action

A Framework and Principles for the Plan

The Top 5:

1. Building data centers
2. Developing an innovation system+
3. Structures and functions that can support FAST transformation
4. Accelerating the acceleration
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Epilogue and Personal Notes

CHAPTER 7

A Framework and Principles for the Plan

A Goal without a Plan Is Just a Wish¹⁶⁵

“Don’t talk to me about the ‘what.’ Talk to me first of all about the ‘how.’” From my experience, to lead AI transformation, the “how” is much more important and more consequential than the “what.” Furthermore, the organization as a whole must undergo transformation. The missions change, processing bodies change, there are new positions and structures, and so on. “Context” is a magic word. The secret to success (or lack of it) lies in the ability to build up power in the relevant context. A plan of action for leading The Human-Machine Team transformation requires functions that will manage the relationship between the previous paradigm and our generation.¹⁶⁶

Can We Grow into the Future and Lead Transformation without Crisis?

As we discussed in the introduction, Thomas Kuhn, in his *The Structure of Scientific Revolutions*, maintains that the great revolutions of humanity grew from crises. Kuhn views the periods in between paradigms as “crisis periods” that usually emerge as such only in retrospect. Hence, when it comes to digital transformation, there is no need to fear clarifying the situation and pointing to the current crisis because, obviously, without crisis there will be no revolution. Until we formulate and define which crises each of our organizations have failed to provide responses for, we cannot begin transformation. However, the new potentials of The Human-Machine Team need to be strong enough to force transformations on our organizations. In addition, national security organizations have long been accustomed to being at the forefront of emerging technologies, but when it comes to AI, the private sector is way ahead.¹⁶⁷ Acknowledging this gap could be a motivating factor to help national security organizations grow into the future and lead transformation without crises.

In Praise of Ontology

Ontology is a complex philosophical issue. When we talk about AI and digital transformation, the main points that we need to take away are the relationships between different types of data. Ontology was born long before the digital era. It is the

theory of “what is,” of existence, and it poses questions about the various entities that exist in the world and the network of connections between them. Ontology deals with things that are shared, with what causes them to exist, and with what causes them to be connected.

In the Information Age, clarifying, defining, and conceptualizing ontology is important. Information includes different entities that have a network of connections between them. A main precondition and key to success in organizing the data is defining the ontology of the information. These connections between the different types of data (ontology) are the basis for guiding the organization’s digital transformation. For defense establishments, the basic ontology concerns the network of relationships and links between the person and the place.¹⁶⁸

For example, when targeting the enemy, one first seeks to mark the location and then focus on the people there. It is the relationship between places and people – in this exact order. Another example of ontology is a way of organizing data in order to thwart terror attacks. In this case, the point of departure is often a person (who may want to perpetrate a terror attack), and following that, we try to locate him. In this example, the relationship is between people and places in this exact order (i.e., people first). Ontology, of course, involves additional and complex levels of relationships and links between the entities (different objects, additional people, other places, fields of activity, etc.). Without a precise definition of ontology, one cannot craft a strategy and an architecture for information.¹⁶⁹

Acceleration: Big Enough and Small Enough; Foundations: As Wide as We Can

Machines can learn from experiences, and the best way is to learn from experimentation. Therefore, to accelerate the development of AI, we need more and more experimentation. At every moment, every organization needs to be conducting at least three to four AI experiments. We need to learn from AI successes as well as from failures, and to systematically improve our machine-learning and our organizations. The concept is to choose steps that will be both big enough and small enough: big enough to be relevant, and small enough to successfully contain the first new steps. Again, the idea is to increase the pace of development and help achieve acceleration. However, when we talk about foundations, they need to be as wide as possible. Foundations can improve the current situation and, more importantly, they are the required conditions to fulfill the potentials of AI.¹⁷⁰

The Human-Machine Team: The Next Generation of Moore's Law

Moore's Law, a term coined 50 years ago, is the observation that the number of transistors in a dense circuit *doubles* about every two years. It is named for Gordon Moore, the co-founder of Fairchild Semiconductor and CEO of Intel. In 1965, his paper described a doubling in the number of components per integrated circuit every two years, and projected that this

rate of growth would continue for at least another decade. It is amazing to see that this is still relevant today, especially regarding automation. In other words, with each passing year, every organization, every unit, and every nation should strive to double the functions that are automated by AI machines. Since automation involves such a wide spectrum, we can and we should use Moore's Law as a metaphor for a model of how to increase the pace of partial and full automations year after year.¹⁷¹ Moreover, the concept of The Human-Machine Team ("super-cognition") has the potential to be the next generation of Moore's Law.

Resources and Efforts

In the next few years, we will need money and "brains" invested in AI to take us to the future. How much money, and how many brains, depends on the mission and also differs from one organization to another. However, the resources need to be related. Artificial intelligence first of all will improve traditional capabilities and traditional missions, and therefore these investments can be made using internal resources. When someone goes to a psychologist, the fact that he pays \$200 an hour is of value, and it requires him to assume part of the responsibility for the treatment's success. Similarly, organizations need to understand that AI is a core requirement to improve their missions, and the requisite funds must be found inside their current budgets. We have no choice: It is our responsibility, and we cannot wait for additional outside funding.¹⁷²

CHAPTER 8

The Top 5

The Plan of Action needs to be organized with three main efforts. First is the “data effort,” to acquire more and more data and organize it. Second, a “cloud effort,” to effectively use and maximize all the potentials of cloud technology. Third, the “acceleration effort,” to choose specific missions that can be accelerated by AI and update organizations to accomplish these missions.

1. Data Centers

Data Centers, Data Scientists, Data Analysts, Data Data

I have chosen to begin the main chapter of this book with the word “Data.” At the end of the journey we can say, “Tell me what your data is and I’ll tell you your potential for successfully completing your mission.” Therefore, every nation, every organization, and every department needs people and resources

focusing on data (tagging, organizing, cleaning, and storing it). For this we need to build data centers in every country and every organization, and we need data scientists and data analysts. “Tell me your data and I’ll tell you your potential.”¹⁷³

The National Data Carrier (NDC)

Traditionally, governments are responsible for building national water carriers. Water is a basic requirement for all humans, and so the governments must meet this need and enable water to be distributed to the people. Since the dawn of time, water has been the basis for the existence of humankind. During the Agricultural Revolution, people developed ways to bring water to their villages, and during the Industrial Revolution, nations built water carriers across and between nations to bring this vital resource to their populations. During the Industrial Revolution, petroleum and coal were two resources that enabled the innovations during that period. Hence, governments developed the infrastructures for transporting fossil fuel products from place to place and to use it all over their countries.

“Data is the new oil,” and data is the basis and foundation for the Digital Era; this means that innovation and success in the DE are dependent on the data.¹⁷⁴ Therefore today, governments need to build “national data carriers” (NDC). Governments need to provide academia, industry, and the private sector, as well as their entire populations, with as much data, as varied data, and as organized data as possible. Governments that build national data carriers will provide their populace, companies,

and academia with a huge advantage. An innovation system and innovation ecosystem is first of all based on data for the system. Moreover, the data carriers will be a new opportunity for governments to build relationships with Google, Amazon, Microsoft, IBM, and others in ways similar to their current relationships with companies such as Lockheed Martin and Boeing. An NDC has the potential to be the tipping point and game changer in the competition between nations and between organizations.¹⁷⁵

2. Innovation System+

One of the magic properties of U.S. strategy is the bridges between the government, academia, and industry that create the U.S. innovation system. One of the ways this circular system is enabled is by the small players who help function together with synergy to strengthen the whole system and to empower each player. Examples of these small players are government labs, DARPA (Defense Advanced Research Projects Agency), DIU (Department of Defense Innovation Unit), and IARPA (Intelligence Advanced Research Projects Activity).

The *government* enables and generates this system, which means that it invests the initial capital, establishes policy that enables the innovation system, and takes care of the system as a whole. *Academia* is located at the center of the knowledge and at the center of the creativity that accelerates the system; it is also the place to ask complicated questions and lead innovation without limits and without the requirement

to monetize. Interestingly, innovation hub systems are located around prominent universities (Boston with Harvard and MIT, San Francisco with Stanford and Berkeley, and even smaller cities such as Pittsburgh with the University of Pittsburgh and Carnegie Mellon). *Industry* and the *free market* have the responsibility in the process to take good ideas to the real world and lead creativity for systematic solutions. Industry and the free market also need to monetize these innovations.

Small players empower the bigger ones and help the circulating nature of the system. A good way to help the system innovate is through the mutual capabilities of two or three big players acting together in one small organization. These players have one foot in the academic world and the other foot in industry, or else they have one foot in government and the other in the free market, and so on. An interesting example is DARPA, an agency of the U.S. Department of Defense (DoD) that is responsible for the development of emerging technologies for use by the U.S. military. It is a small organization, with only about 240 employees, of whom more than 100 are product managers – and a budget of \$3 billion. Most of its employees are professors from academia who work for DARPA for four years as leaders of a technology project. The projects help the military to address their missions, and support industry and the private sector to earn their profits. DARPA uses government money and invests it in academia, in industry, and in the private sector. We can look at DARPA as critical oil on the chain that helps the whole system run better and faster. This small organization makes a significant contribution to the U.S.

innovation system.

In order to lead success in AI, we need to strengthen these kinds of bridges, build new bridges, and build them with a simple process to influence each other. For example, in the cyber domain, the bridges with industry are relevant, but the strongest cyber company is still the NSA (National Security Agency). In the field of AI, the best companies are in private industry (in Silicon Valley, for example), and so we must build bridges between the private sector and the government to strengthen each other. The national security organizations don't need to be "No. 1" in AI, but rather they need to be "No. 1" in using AI capabilities to meet their challenges and accomplish their missions. Today, the competition of AI is a competition to lead the innovation system globally.

The "Secrets" of the U.S. Innovation System

One "secret" of the U.S. innovation system and the environment that enables this ecosystem is that each player becomes stronger as a result of being a component of the whole system. At the same time, the entire system is strengthened by the participation of all the players. Here, the classic saying is true – that the system is greater than the sum of its parts. It is a win-win system called "The Triple Helix." "One foot here, and one foot there" is a unique characteristic of the Triple Helix. This means, for example, that there are professors in academia who spend part of their time working for companies in industry and the private sector, and managers who have positions in

different fields at the same time. Another example is the labs in academia that get their budgets from the military to create new technology for the military. Moreover, the government invests money in academia, academia works with industry and with the government, and industry is highly focused on government organizations.

The second "secret" is the process. There are superpowers like China, with strong markets; countries like Russia, with good universities; countries like Saudi Arabia that invest a lot of money in their militaries; and countries like Israel, with "startup cultures." The strength of the innovation system in the U.S. is the process, which is strong and systematic, and enables all these fields and all these players to act together like a team.

The third characteristic is the high priority placed on research and development. This means that resources are allocated for R&D (for labs, institutes, academia, industry and government organizations). It is important to note that there are also many R&D centers in different countries that participate in the U.S. innovation system, thereby enabling the system to benefit from other ideas, cultures, and brains.

Finally, and most importantly, the American culture of innovation is paired with a culture of working within a system. This means a culture of defining problems and developing solutions; the "American Dream" – that if you work hard you can achieve just about anything; thinking about issues on a large scale; long-term planning; and embracing processes and systems. Together, these cultural characteristics enable the U.S. to build an innovation ecosystem not only in big cities and big

locations, but also in small cities and small locations.

For example, in Pittsburgh there is a budget from the State of Pennsylvania to build a startup incubator. This incubator has strong ties to the University of Pittsburgh. The ecosystem in Pittsburgh collaborates with the military and focuses on innovations in robotics – it is an example of the circular innovation system. In this case, the government empowers the private sector, then the private sector empowers national security establishments, and the local economic situation improves as well. Moreover, the circular innovation system continues to mutually empower every element going forward into the future. The bottom line is that the U.S. innovation system is not just collaboration or close relationships, it is a “win-win” system with a culture of working within a process and a culture of innovation.¹⁷⁶

The Unique Challenges for the Innovation System in the AI Era

Traditionally, national security establishments have known how to lead procurement systems and innovation systems. As we discussed, over the last few centuries, security establishments used to be the “No. 1” inventor and developer of weapons and military capabilities. For example, the U.S. Air Force is also the power behind the acceleration of airplanes for use in the private sector. The best airplane is always an Air Force plane. Moreover, companies like Lockheed Martin are a kind of “inside ability,” because even though they are part of

industry, the company, in essence, is part of the U.S. national security system. Therefore, operating the acquisition system with companies like this is much easier.

Today, the opposite is true in the field of AI. The free market and private industry have many more resources than anyone else, and they lead the field of AI. National agencies and national organizations do not know how to deal with the new AI reality. In addition, national establishments know how to buy and lead acquisition for hardware capabilities, yet in the AI field, the innovation system requires the organization to also lead acquisition and innovation in software. This is a cultural challenge for national security establishments.¹⁷⁷

Innovation System+ (An Innovation System to Lead FAST)

“We don’t have one strategy; we have a system and an ecosystem.” This refers to the strength of the system and the ecosystem of innovation in the U.S. Moreover, it refers to a system that became a growth engine for technology and economic prosperity, and leads the world’s innovation systems. Today, the competition for AI is a competition to lead the innovation system globally. To be a leader in AI, a nation needs to create the “Innovation System+.”¹⁷⁸ This refers to strengthening the bridges and empowering the connections between government, industry and academia to fulfill the idea of FAST and harness the AI era. The traditional innovation system helps the military to empower hardware capabilities such as vehicles, planes, and weapons. The Innovation System+ will empower

military operations by bringing in the software capabilities of AI. The challenge is that AI is scattered among industry players (including many small companies). The Innovation System+ can lead the next generation and the next revolution of the Digital Era.

3. Structures and Functions that Can Support FAST Transformation

A structural perspective is a key factor in leading organizations to the future. Structural changes are a basis for relevant transformation. One of the complicated and unique challenges that security establishments have is to lead transformation, yet be prepared for war at the same time. How can the security establishments reach the next high-level paradigm and at the same time be prepared to achieve victory in wars that are operating in the previous paradigm? In other words, one of the main characteristics of a military organization is the responsibility to be prepared for war at all times, 24/7. The possibility of a war breaking out at any given moment makes preparedness the top priority.¹⁷⁹ It is very difficult to dream of innovation, to carry out the transformation, and to improve preparedness in the same organization with the same resources.

Therefore, a new national security establishment structure is required to go forward and at the same time maintain preparedness by using traditional capabilities. In addition, one of the structural challenges is to decide when to build a new unit, section, or organization, and when to keep the same

unit and the same structure, and just change issues inside the organization.

Structures to Support the Idea of Innovation System+

As we discussed, “small players” have the potential to make acceleration happen. The idea of aggressive acceleration refers to our responsibility to accelerate the process and bring the future to the present. Small players, who have the ability to empower the big players and help the circulating nature of the system, can make it happen. Therefore, every specific idea to accelerate AI capabilities needs to have an organization (a small player) whose responsibility is to lead this “acceleration mission.” For example, if you want to build a “smart border,” it is advantageous to first establish a new unit (small player) in an organization that focuses solely on this mission. Likewise, if you want to accelerate the utilization of drones with AI capabilities (e.g., a swarm), you should establish a new unit for this purpose.

These new small units (players) must have mutual capabilities of two or three different big players (government, academia, and industry). For this they need to have “one foot here, and one foot there” and operate together in a specific, small organization. Every acceleration mission should be led by a related small player. In addition, due to the unique challenges for the innovation system in the AI era, government organizations like the DoD need to build related sections that will have professionals trained in how to merge AI capabilities into

government bodies. On the other side, AI companies and “data superpowers” like Amazon, Google, Microsoft, and IBM need sections or units with a focus on merging with government organizations.

Building New Digital Units Based on AI (to Accelerate the Pace)

National security organizations should establish new units that specialize in big data and data science and are based on merging between human intelligence and artificial intelligence. There are at least three reasons that it is so important to build these new units: (1) they have the potential to be more focused, and have more knowledge and ambition to achieve success based on AI; (2) they can help address the challenge of taking our organizations to the future while the other traditional units can prepare for wars based on the previous paradigm;¹⁸⁰ and (3) they can be models to motivate all the other units in the organization. In addition, automation is a unique ability and we therefore need to create divisions that specialize in AI.

One type of new unit should be based on collaboration between humans and robotics. In 2050, army field divisions will be based on robotics, but it is unrealistic to achieve this vision within the next few years. Therefore we need to choose a few small, special units and build them toward the vision for 2050. These new units will help fulfill part of the missions during the next few years, envision the future, and develop a long-term plan to realize this vision.

Creating Data Analyst Positions and Professional Data Sections

Each national security body must have a specific department whose activity is data. This unit will help connect the data tasks both within the organization and among the other organizations. Such a department will be responsible for continuously organizing the data in the relevant context, bringing more data into the organization, and being connected to the databases of other organizations. In the coming years, every organization that wants to survive and to succeed in its digital transformation must build its own specific department to deal with the foundations of data.

Another trend that is developing, and for which the information field should assume responsibility, is the professionalization of information. Every basic intelligence division (section, small department, etc.) needs to have its own data analyst officer; such a position will require an individual to have expertise in the various databases and to serve as the organization's information expert.

Creating Data Mining Analyst Positions and Data Mining Sections

Another unit is the one that specializes in the use of information (mining and manipulating data). While each officer or operative must know how to probe the data by him- or herself, experts are also needed who are able to investigate various

databases and who specialize in constructing complex queries. The information-mining intelligence officers need to have one foot in with the technological specialists of data science and the other foot in with the intelligence analysts in all the units in order to facilitate deep collaboration.

Building Expertise for New Sensors

Additionally, intelligence units involve sensors and specific sources. In the DE, all sensors are an integral part of the information explosion. There seems to be no need for task-specific sensors because each one creates items of information that are supposed to be part of the information endeavor. Nevertheless, task-specific sensors are relevant, particularly those that “dwell” in a particular location and are able to collect and compile information that is found there. Without these types of sensors, this information would be lost. Usually, the purpose of the sensors is the opposite of those designed to create accessibility; these are designed to ensure that existing information is not wasted. Furthermore, specific sensors play a unique role in the transformation of the organization. A sensor gives a tangible view of a new capability in a location, thereby creating energy in connection to its establishment. Deploying specific sensors is important when it comes to exporting the Digital Revolution, because when sensors are deployed, one must insist on an enabling architecture. This means that all of the sensors are connected to the information tasks (in real time), and fused with the other components of the information.

4. “Accelerate the Acceleration”

The key point is that every organization, every unit, and every department should choose issues that can be accelerated by AI and just do it – which means building units that can lead this acceleration and create new job positions to achieve it. The whole notion of acceleration can yield enormous success.

Leading a Revolution in the Possibility to Produce “Targets in Context”

As we discussed, synergetic learning between human intelligence and AI has the ability to produce tens of thousands of targets before a war and also produce thousands of new targets every day during the war. In addition, the ability to create “targets in context” means that the military can attack the right targets at the right time. This new opportunity enables us to create many more more targets than before and to change the battlefield.¹⁸¹ Therefore, in order to realize this idea, we should create new units to produce targets based on big data.

Automation for Intelligence Processes

One of the first questions that should be asked in order to lead the AI Revolution is what are the actions, processes, and capabilities that we can automate. AI enables the building of automated machines that perform and represent parts of human cognition; hence, one of the main innovations of AI is

automation. For example, China and Russia decided to automate 20-30% of their military equipment by 2025. The era in which human intelligence and artificial intelligence are merging enables automation of intelligence processes traditionally done by analysts. Every organization must ask itself what are the actions, processes, and capabilities that can be automated by using AI. After that, they must formulate concrete plans to improve these automations every month, and to achieve bigger advantages every year. The first new opportunity is to automate intelligence processes in a way that can create new abilities that were not possible beforehand. Under this umbrella are new opportunities to do the same things – only faster and on a larger scale.¹⁸²

Positions and Functions That Can Be Replaced by AI

Over the next few years there will be at least a few positions and functions that could be replaced by AI machines, and we can imagine a distant future in which different kinds of functions and jobs will be replaced by the machines. In the near future, it will be our generation's responsibility to discover these initial positions and functions that can be replaced by the machines.

Automation for Tasks of Audio-Lingual Analysts and Image Analysts

Today, intelligence establishments have thousands of audio-lingual, image, and video analysts. The idea of Speech-to-Text (STT) and machine-learning for images and analysts creates the potential that within five years, more than 80% of these tasks can be replaced by AI machines.

AI Machines for Cross-Checking Data

For years, intelligence analysts have been working hard to cross-check data. "Is it cross-checked information?" is a familiar question for every intelligence officer. Data with one indication does not have the same credibility as cross-checked data. Over the last few decades, one of the exams for intelligence analysts is to successfully cross-check various pieces of data; this means finding different pieces of data that support each other. Machine-learning has the ability to cross-check the different types, but more than 50% of this function can be replaced by AI machines within just a few years.

Accelerate Narrow Automations for Specific Robotics

Automation covers a wide spectrum: On the one hand, no automation at all, and on the other, full automation. Accelerating the process of automation requires narrowing the capabilities chosen to be replaced by automation and beginning with these

choices.¹⁸³ Robotics also comes from the family of automation. Our weapons and vehicles have the potential for automation over the next 20 years. From the perspective of 2020-2025, we need to choose specifically which of these can be replaced and improved by robotics.¹⁸⁴ The first part of this mission is to build a concrete, narrowly focused plan. Drones are a great example.¹⁸⁵

Drones have a new potential to acquire tremendous image knowledge. Drones with AI capabilities can control a specific geographic location and accelerate the potential to collect details as well as analyze the relevant information. Moreover, the potential to build a swarm that includes hundreds of drones with AI capabilities is a vision that can be realized in two to three years and can be a game changer for our missions. The great potential for drones is the reason that China made their interesting decision to build AI-capable drones and to build them with the ability to act together in a swarm of more than 1,000.¹⁸⁶ Reaching their potential – to be a player in national security – requires the development of a “drones division.”

5. FAST for Enabling MDO (Multi-Domain Operation)

Over the last several years there has been a discussion in the U.S. military about moving from the concept of Multi-Domain Battle to Multi-Domain Operation (MDO). This means merging different capabilities and different domains (air, sea, ground, cyber, information, and space) to a joint operation. During the fourth Industrial Revolution, changes and

incredible innovations occur at a rapid pace, one after another. These advances are built “on the back” of the previous innovations. In addition, there are collaborations between innovations that create new capabilities. However, it is difficult to merge different types of innovations. The data is infinite and expands every moment, there are ever-increasing new technologies, and every day there are new capabilities. Therefore, it is complicated to join and merge all of these new technologies together.

From a military perspective, the Navy can collaborate with the Air Force, but it is very difficult to merge all of the forces into MDO. Every organization has its own big data, and it is difficult to have them act together. Traditionally, there have been collaborations on missions, and in the last few years there have been multi-domain battles. However, this is collaboration and joint forces for a specific battle, and not for Multi-Domain Operation. Although this will be one of the missions in the coming years, there are challenges to realize the concept. For example, can a common operating picture of all the domains be created? Another challenge is that each domain works on a different timeline. To realize the idea of MDO, the military needs the ability to merge the various domains’ abilities into a common operating system on the same timeline, as well as to build foundations that can support this new concept.¹⁸⁷

How and Why the Idea of The Human-Machine Team and the Concept of FAST Can Realize the Plan for MDO

The first reason is the new potential from data and intelligence. The domains are different, but if the "playground" is based on common foundations, all domains can operate together. Traditionally, data and intelligence have been a "support effort." For years, the function of the intelligence establishments for the military has been to be a support effort, similar to the logistic effort. There are main efforts and there are support efforts, and the information that the intelligence analysts are required to provide is one of the support efforts. However, as we discussed, in the Information Age the data is not only "to support," it is the basis for almost everything. Data is the basis to create targets, to attack these targets, and to find the enemy. It is also the basis to understand when, where, and how both friendly and unfriendly forces are active on the battlefield. A lot of the data is classified, and the unclassified data is also more relevant when it merges with the classified. Therefore, intelligence organizations are responsible for organizing the data for all the military organizations and for making sure that the data designs the playing field for everyone. When the foundations include a common "data center" and the ability for every domain to use it, there is potential for building a Multi-Domain Operation.

Common or mutual foundations means: 1) keeping and tagging all the big data with cloud technology; 2) having a closed-open-closed network to address the classified and unclassified data in the same system and on the same network; and 3) strong

power-computing to use all this data. The foundations do not have to be same, but they must be mutual for all domains, with connections among the domains and similar architecture. An example is an air force cloud that can connect and pass data from the navy cloud, or a cyber network that can use data from the ground forces network.

The second reason that the idea of The Human-Machine Team and the concept of FAST can realize the plan for MDO is the new potential for "joint acceleration." This means building small, multi-domain units based on collaboration between the capabilities of fighters from different domains with robotics and AI automation. It includes the automation of military hardware such as weapons, vehicles, and drones, and the automation of analysts' functions, etc. These types of units have the potential to be growth engines to lead the concept of MDO.

The third reason is that The Human-Machine Team and FAST create a new potential for merging different timelines and pictures due to the collaboration between human and artificial intelligence. For example, over the last few years, the IDF (Israel Defense Forces) has developed a new concept of Intelligence Centric Warfare to connect intelligence to the fighters in the field.¹⁸⁸ This revolution follows the changes in the DE. One of the goals of intelligence-centric warfare is to expose the enemy and make intelligence accessible to the soldiers at every level and in every location. The concept of The Human-Machine Team will be the next generation of the merging of intelligence and warfare, which can be a new potential of collaboration between different domains. In other

words, when data, innovations, and fighters can merge into one vector, there is the potential to realize the vision of MDO.¹⁸⁹

CHAPTER 9

4 x 4: A Powerful Management Tool and the Required Leadership

“4 x 4” (4 years, 4 months, 4 weeks, and 4 days) is shorthand for a great management method to lead digital transformation. Specifically, 4 x 4 is a relevant method for leading nations and organizations to the future era of The Human-Machine Team. In my professional experience, we implemented 4 x 4, and it appears to be a winning method. The size and complexity of the AI Revolution also poses a challenge to the management approach that will be used. Traditionally, leaders and managers used to say, “I will tell you what to do, and you will tell me how you are going to do it.” The teaming of humans and machines, combined with the fast pace of innovations, has changed the order. This means, as we discussed, that the “how” defines the “what” more than the “what” defines the “how.” Therefore, a method of how to lead nations and organizations to fulfill the plan is more important than the plan itself. One of the concerns is that we will dream too big and be left only with dreams and

presentations without real transformation. There is also the fear that in order to be sufficiently practical, we will carry out measures that are too small and too local, that will not bring about a wide-scale revolution. Thus we arrive at the management tool in 4 years, 4 months, 4 weeks, and 4 days to organize the complex, dynamic nature of our missions.

It is extremely important and takes courage to dream that we have the ability to change both the security concept and a way to implement the change. The DE provides a tremendous potential for massive revolutions. Therefore, a practical tool is required to build the road, step-by-step, to fulfill the dream. The 4 x 4 tool requires us to begin the process, accomplishing the mission by (1) summing up the concrete steps we can and must take within the next 4 days; (2) identifying what information, its organization, composition, etc., can be advanced in the next 4 weeks; (3) deciding which measures we must and can advance in a time frame of 4 months; and finally (4) agreeing on our goals for the next 4 years.

The unique and dynamic nature of the 4 x 4 tool matches the dynamic nature of the mission because these 4 different aspects are reviewed every week, at the end of which we re-examine all the stages: what we completed in the previous 4 days and what we need to do in the next 4 days; how we should progress on the tasks that were set for the next 4 weeks; and what is the updated status of the outputs we are committed to complete in the next 4 months. The end of this weekly 4 x 4 is a review of what we learned, as well as an update of our goals for the next 4 years. Imagine the power this tool has – to incrementally

accomplish a difficult, complex mission. The pace of change in the DE requires this type of management tool.

Moreover, in an era in which the amount of data increases every moment, the best way to learn and carry out revolutions is through friction. The 4 x 4 method makes it both possible and necessary to encounter friction all the way to the big revolution. Furthermore, this method allows one to celebrate the small successes during the journey – the kind that give strength to continue the challenging work. One cannot tarry too long at the dreaming stage; the operational outputs have to be shown very quickly, through intelligence and operational practice. Thus, already in the beginning stages, there is a need to select significant issues that can be addressed differently, with the capabilities developed as part of digital transformation. These successes will generate the energy (internal and external) to continue the challenging work. The system to lead this revolution is the innovation ecosystem.¹⁹⁰

Required Leadership

Defense leadership in the DE is changing. Leaders today need to lead their nations and organizations to digital transformation. They need to address new challenges that are developing as a result of DE. Defense leaders are required to deal with structural and cultural challenges to digital transformation; in addition, they must use the new potential of The Human-Machine Team to understand, influence, and empower life experience, and to mitigate risks and take advantage of opportunities

by using digital bits. Leaders have the responsibility to solve, or at least confront, problems that human beings did not know how to solve in the past. Digital transformation requires a substantial investment of time – specifically, managers' time. A realistic estimate is that no less than 40% of a manager's time should focus on digital transformation.¹⁹¹

Leaders also need to formulate strategy on how to deal with rivals and enemies who are also in the middle of their Digital Revolutions. Security leaders need intelligence about the digital transformation of their enemies and rivals as a basis for their strategy on how to act against them. They also need to ask themselves how they can influence the transformations that their rivals and enemies are going through due to the Digital Revolution. It is not your imagination that you can influence your enemies' and rivals' DE Revolution.

Leadership is based on the competition of learning. Security leaders deal with enemies and rivals who are changing all the time, which is why the leaders are required to be constantly learning. The difference between a mediocre and great leader is the ability to impact big issues based on this process of constant learning. The struggle between hostile states, and between leaders, is not only a "power struggle;" victory is not based only on superior aircraft, tanks, or financial resources. Victory, and the ability to be a successful strategic leader, is also based on winning the learning competition. The strategic leader who studies all the time will be the leader who wins the competition. He will be the one who is best able to face complex challenges. The leaders who guide their nations and organizations to win

the AI competition will be the ones who shape the future and will, in fact, "control" it. Defense organizations that lag behind in the AI Revolution and do not succeed in transforming themselves towards the concept of The Human-Machine Team will fall behind and lose the competition.

As we discussed, the AI Revolution is a new, high-level paradigm. During the transition period between paradigms, the previous paradigm will always try to hang on and beat the new high-level one. Since we are just at the cusp of this revolution, the previous paradigm is still relevant; however, the future belongs to leaders and organizations that will restructure themselves toward the concept of The Human-Machine Team. For the foreseeable future, security leaders need to hold on to the previous paradigm, and at the same time reach for the new one. *There is no choice.* Security leaders are required to transform their organizations for the future of AI while maintaining the traditional capabilities at the same time. Organizations that succeed in combining The Human-Machine Team and the capabilities of the previous paradigm will have the potential to win during the transition period.

The first and most critical factor is understanding the importance of creating a strategy for the DE. Leaders must formulate a vision for their organizations for the DE; they must have basic knowledge about digital, cyber, and AI. They also need to have the ability to explain their digital system. They cannot just say, "Digital is important" and have someone else explain the strategic vision for digital transformation in their organizations; they must have basic knowledge and the ability

to do it by themselves.

Artificial intelligence is a new concept that is relevant for all fields and for various subjects; therefore, we need AI education to enable more and more AI scientists and analysts. Moreover, we need education for leaders and managers. In our generation, they are required to have the ability to lead their nations and organizations to the era in which human and artificial intelligence are merging. In addition, in order to develop the relevant knowledge, they need to understand the current status of the AI of their rivals and enemies. For example, due to the situation today (how China and Russia view AI), we need to acquire a profound understanding about AI in those countries (strategy, plans, people, etc.). Therefore, one of the first places to deal with AI and to educate AI analysts is in governmental research divisions.

One of the ways to think about the future is the concept of scenarios. Keens Van der Heijden, in his book *Scenarios: The Art of Strategic Conversation*, develops scenarios as alternative ways to make sense of what is happening in the environment, and using them to become more secure about the future. He also discusses how to do all of this as an organizational process to impact the thinking of the organization as a whole and prepare it for action. Van der Heijden explains:

“...strategy is about winning in this process...strategy is a highly dynamic area, full of fads and fashions that come and go...success can only be based on being different from (existing or potential) competitors...today's best strategy may be tomorrow's

disaster... the practice of scenarios-based planning process... we will base this discussion on the premise that the ultimate purpose of the scenario planner is to create a more adaptable organization, which first recognizes change and more uncertainty, and second uses it creatively to its advantage”¹⁹²

Security leaders are required to build scenarios for the security challenges due to the DE Revolution. They should practice scenarios of risks and opportunities as a result of the concept of The Human-Machine Team. These leaders must formulate scenarios for the AI Revolution as a basis for their planning processes.

The Culture of Sharing and Culture of Entrepreneurship

“Culture eats strategy for breakfast.”¹⁹³ It is very difficult to change a culture, and it takes years to accomplish. However, when you want to be in a process of changing, your culture needs to support the change. The DE Revolution is a new, high-level paradigm. The Human-Machine Team is a novel concept of thinking and acting together. Therefore, for an organization to succeed in leading transformation, it is also necessary to examine the need for cultural changes.

Sharing

First, let's examine how a culture of sharing aids transformation. In the DE, people are used to sharing with each other all of the time. For example, if you see something interesting, the first thing you do is take a picture of it and share it with friends and family. If you have new information, or new knowledge, you share it through social media, the internet, or some other way. AI builds on data and experiences, and the more data and experiences, and the more variety, the better. Therefore, departments, units, and organizations that participate with other organizations or sections have greater potential to build their Human-Machine Team.

Normally, national organizations share information up and down to the managers and back to the employees, but not sideways to the full breadth of the organization. Security organizations typically relate to their information and their knowledge as power and as classified, and they try to share the least amount required. However, to build a merger between human intelligence and artificial intelligence, organizations must also become comfortable with the culture of sharing. Organizations should build their information infrastructure in a simple way to share information both within and outside the organization. This culture will create better conditions to realize the transformation and take the organizations to the future. In addition, national security organizations need to create AI networks among all the agencies and to share ways and efforts to fulfill the concept of The Human-Machine Team.

In other words: The world belongs to those who share. People have always sought to connect information with information. For example, in the margins of the pages of the Jewish Codes of Law (the Talmud), the reader is offered references that connect the text on the page with other texts in the Talmud as well as with other related texts from additional Jewish sources. These links constitute knowledge in itself. The internet era has developed, refined, and expanded on this approach. The ability to wander among the pages of the internet and connect between one item of information and another has enhanced the understanding that the "links" constitute knowledge in and of themselves.

In the DE, collaboration in information, knowledge, and operative activity based on data constitutes a condition for success. The deeper the collaboration, the greater the ability to provide a better intelligence response. When it comes to information and knowledge, the challenge of collaboration is, unfortunately, not simple. Many people and organizations believe they must safeguard the information they have solely for their own or for their organization's benefit. In the DE, the world belongs to those who manage to overcome the challenge of collaboration, to those who share with others, and with whom the others share. One must understand the critical need and invest in the critical ability to share information back and forth. This is first and foremost a systemic-conceptual challenge, but it also entails a complexity of architecture that enables the sharing of information. The consent of different organizations is required, as is an architecture that makes it possible to

implement the agreements regarding sharing information in a simple fashion. However, it is understandable that both aspects are complex and daunting.

More Women in High-level Positions

Today our reality is still one in which most high-level positions are held by men. In security establishments, the reality is more extreme. The ratio between men and women in such positions differs among countries and organizations; nevertheless, in all countries, most security and military leaders are men. Female leadership and management naturally bring more of a culture of sharing. Women usually possess more of a style and culture of managing together with a bit less competition. Security establishments need to increase the percentage of women in senior management and leadership roles; the target should be 51% women. Nations and organizations that increase their percentage of women leaders will be more relevant in the DE and better able to realize the concept of The Human-Machine Team.¹⁹⁴

Internal Entrepreneurship and Trusting Your People

National security organizations typically have a culture organized by hierarchy and a culture of testing output. To lead these organizations into the future, their leaders and managers should support the internal culture of entrepreneurship. For example, they can implement concepts such as "a week out of

the box," in which a group of people is taken out of their usual units and missions and tasked for a short time to create ideas for the next AI innovations. In addition, it is important to have internal startups in the national security establishments that focus on AI. This means supporting small groups within the organization that function like internal entrepreneurs (given the freedom and the resources to develop new ideas for taking advantage of AI).

Trust and believe in your people, and know that they know what they can and need to do. Use the hierarchy as little as you can, and give them as much space as possible. In addition, keep your organization in near-chaos. This does not mean that all organizations are required to be in such a state, without any organizational hierarchy, and with the trust that their people know what they need to do. It depends on your expectations for your organization. When you know the end state, and you just want to improve productivity, you can use the tools that have been developed during the Industrial Revolution, and build your organization like a machine. When you want a culture of innovation, when you want to build new capabilities and be in the process of changing, give up the requirement to be in control and give your people the space to act in their own ways.

An interesting example of this is the Future Command that the U.S. Army established. The unit's purpose is to lead its organization to reach future capabilities and then share the advances with all divisions of the Army. The culture in the Future Command is not like that in normal Army divisions, with interaction based on traditional hierarchical organization

and seeking to function like a machine. When you want to lead these types of innovations, you must use hierarchy as little as possible and give your people as much space and flexibility as you can. This is why it is so important to build unique departments or units that focus on innovation, and to make sure that a different culture will be a main characteristic inside these units. It is common to imagine cultures of organizations with different metaphors.¹⁹⁵ During the Industrial Revolution, many organizations were built like machines – to improve productivity in the organization. A main metaphor for organizations in the DE should be “flux and transformation”¹⁹⁶ – flux as one of the main drivers to take the organization successfully into the future, and transformation to successfully realize the new dreams.

EPILOGUE AND PERSONAL NOTES

“Too good to be true.” This is the answer that I gave thousands of times when I was asked how my year in Washington, D.C. was going. I had arrived with a few goals, but couldn’t have imagined that this year would change my life and be a kind of tipping point for the rest of it. The first mission for the year was to improve my English. After two weeks I decided that my American Dream was to work to make my English as good as my Hebrew. I knew that it was unrealistic, but in the U.S., everyone has his or her own American Dream, and a main pillar of American culture is that you can achieve your dreams if you work hard enough. To try to make this dream a reality, I shifted all of my life to English. I bought a laptop without Hebrew characters, changed the settings in my smartphone to English, and started to talk with my wife and my Israeli friends in English. I still have a long way to go. This book began as part of the dream, but after a few weeks the book took on a life of its own.

The National Defense University is really an amazing place that gives one the ability and the facilities to learn and build