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Revolutionary technological change on an exponentially growing scale is already here and mandates that the Army institute a continuous transformation process that includes all areas of doctrine, training, leadership, organization, and technology. The continuing wave of technological change is different from even the information technology revolution of the 1990s in two ways. First, it is a vastly more profound transformation due to the synergy of three emerging technologies: bio-engineering, nano-engineering, and robotics and artificial intelligence. Second, it is a revolution that will occur at a speed never seen before. In only the past couple of decades has society begun to comprehend and contemplate the implications of the apparent accelerating pace of change. This progress is not without its costs. Technological innovation is the primary cause of a growing stress in society, where the basic human desire for the comfort of permanence is in direct opposition to a deep need to control and transform the environment in the service of humanity. Technological innovation continually remakes the world and is central to the economic process and cultural beliefs—commonly labeled progress—that drive modern civilization. Yet, it is this need for progress that is the source of the relentless destabilization and disorder experienced by individuals, institutions, governments, and societies.[1]

The purpose of this article is to investigate three questions that are critical to the future of the US Army. First, what can be anticipated regarding the nature and pace of future technological change? Second, why is it important for the Army to continuously transform itself in response to increasingly rapid change?

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Finally, how could the Army respond to this change to manage the growing stress and to balance the need for organizational continuity against the requirement for the constant improvement of effectiveness to assure national security? Broad recommendations to create a continuous transformation process and to link technological innovation to desired institutional outcomes will be offered.

Very little effort has been made to understand the interactions between the technological innovations required for progress and the institutional responses ensuing from these innovations. Bear in mind, the sole purpose of technological progress should be the advancement of society in general or, in the case of military technology, the strengthening of total military effectiveness. Therefore, the design of technological innovations must not be merely aimed at the enhancement of technological performance; rather, the technology must be purposefully created to produce a desired overall outcome in the Army and the nation when combined with social, political, and economic factors.

What are the technologies driving much of the change in today's globally connected world, and how fast is this change occurring? The current rate of technological change will be briefly examined by observing the speed of change in several different coarse measures of progress. Next, the logic of exponential change will be considered, and why this characteristic of change is only now being recognized. The implications of the accelerating pace of technological progress are far-reaching for all organizations, and the Army cannot escape the dire consequences of failing to adapt.

Emerging Technologies

My intention is not to predict the particular innovations that will power social and military change for the next 15 to 20 years. However, brief descriptions of the technologies currently thought to have the greatest potential to produce the innovations that will change the world are necessary to consider their links to Army transformation. At present, broad agreement exists among experts about the general direction of the evolution of technology, and it involves three central areas: bio-engineering, nanoscale engineering, and robotics and artificial intelligence.[2]

Thanks to the sequencing of the human genome, we now have access to the blueprints for constructing a biological entity. Therefore we are at the early stages of learning how to make constructive modifications to that entity. This

knowledge paves the way for individualized drug therapies, noninvasive surgery, tissue and organ engineering, neural and sensory implants, and countless currently inconceivable possibilities. It is clear that the quality and length of human life will be significantly increased, and the unmistakable potential exists to improve all areas of human performance.[3]

The suddenly emerging field of nanoscale engineering, or nanotechnology, is also a rapidly expanding arena which deals with structures and machines on the atomic and molecular scale. These nano-structures include electrical, mechanical, mechanical-electrical, and quantum devices with the promise to revolutionize the ways we develop and manufacture technology and interact with the environment.[4] Potential capabilities include the proliferation of sensors and actuators leading to “clothes that respond to the weather, interface with information systems, monitor vital signs, deliver medicines, and automatically protect wounds; airfoils that respond to airflow; buildings that adjust to the weather; bridges and roads that sense and repair cracks” and so on.[5]

The concept of molecular manufacturing requires the solution of several key technical problems, but it offers immense potential to transform manufacturing and resolve environmental problems at the same time. The idea is to build structures and machines from the inside out, atom by atom, or molecule by molecule. Practically no manufacturing waste is generated and almost anything, including a diamond rocket engine, is seemingly possible. This manufacturing task would require molecular-scale assemblers to first replicate themselves and create a critical mass of assemblers that would permit complete fabrication of any desired part or entire assembly within a reasonable period of time.[6]

Microelectromechanical systems, the next size up from nanotechnology, are currently used in a variety of applications, including triggering auto airbags, switching data moving over fiber-optic cables, and directly integrating with analog and digital circuits on silicon chips as in a cellular telephone. As published recently in *Physics Today*, “the field of micromechanics will change the paradigm of what machines are, how and where we use them, what they cost, and how we design them. It may not be an exaggeration to say that we are on the verge of a new industrial revolution driven by a new and completely different class of machines.”[7]

The steady shrinkage of electronic components will persist into the era of nanoelectronics and permit the processing power of computers to increase beyond that of the human brain. Computers already indirectly augment the processing capability of the human brain today, just as a word processing program helps to correct a writer’s spelling errors. For many years, technology has provided replacements for bones and joints, reinforcement of sight and hearing, and the support of damaged organs. Direct augmentation of human memory and mental processing through implanted connections to a computer will be just a natural extension of current trends.[8] Extreme miniaturization will enable people and machines to interact in ways that cannot even be imagined now, except in the minds of inspired futurists.[9]

In this age of accelerating technological advances, it is difficult to stay abreast of the myriad of recent developments. Some of the major and minor current innovations include noninvasive surgery, quantum computing, cochlear “bionic ear” implants that allow deaf people to hear, micro-turbines, single-electron circuits, computers that can learn, search and rescue robots, cells manipulated by micro-machines, proteins engineered for computer memory, bio-engineered agriculture, autonomous aerial vehicles, and atomic force microscopes. And this list only scratches the surface.

Unfortunately, technology is always a double-edged sword. As it becomes more capable of providing positive benefits for society, technology also acquires more potential for injury and destruction. In the wake of the September 2001 terrorist attacks, the consideration of public safety in the innovation of new technologies has become a higher priority because the assumptions have changed. In some cases, public safety will demand a benign destruct mode for the technology. In other cases, access to the technology may be severely restricted, and prudent ethical standards for design engineers must be well thought-out and rigorously adopted.

How Fast is Technology Advancing?

Observations of change over the past century indicate that technology is evolving exponentially, which means change is accelerating or the rate of change is increasing. As will be shown, exponential change does not provide individuals or institutions a great deal of time to react, and therefore can be substantially disruptive to the unprepared. What is exponential change and how does it differ from the commonly held view that the rate of change stays reasonably constant?

Exponential growth represents the same model of change as the concept of compound interest in understanding the time value of money. Many investors probably recall that money invested at a seven percent rate of return will double every ten years, and ten percent compound interest doubles money in seven years. It is often convenient to describe exponential change in terms of the doubling period. Consider starting with one dollar and investing it at 70 percent interest versus adding $1,000 to the initial dollar every year for 20 years. Which option would you select? In the linear case of adding $1,000 each year, one would have $20,001 after 20 years, while with exponential growth the initial one dollar account doubles every year and after just 20 years has grown to more than one million dollars.

In the case of technological progress, the history of the growth of several different indicators in this century has been observed to discern the mode of change. If we examine the mode of change of key measures over time, all demonstrate roughly exponential growth at different rates. Since 1950 manufacturing productivity has increased at a rate of 2.84 percent, but since 1982 the rate of growth has averaged 3.62 percent per year, and since 1992, when information technology began to affect the economy, productivity has increased at a rate of 4.27 percent yearly.[10] Another strong measure of technological innovation is the

number of patents granted per year by the US Patent Office.[11] Since 1790, the number has grown at an astonishing rate of 5.15 percent, and although the rate from 1950 to 2000 slowed to 2.54 percent, it has once again averaged 5.27 percent since 1982. The US gross domestic product (GDP) has also grown at approximately an exponential rate, with a 6.33 percent rate of increase since 1929, and this rate has held steady over the last 71 years.[12] Even if population growth[13] is accounted for by considering the change in per capita US GDP, the growth rate is still a very strong 5.2 percent. Notwithstanding that these growth rates are not precisely exponential, in all cases they are clearly not linear. The highest exponential growth has been in the increase of computers connected to the internet, which has grown at a rate of close to 70 percent per year for more than 30 years.[14]

This very high accelerated growth can be seen in numerous other individual technologies, particularly in the information technology field, but can we use the data to estimate the aggregate growth of technology in the 21st century? Exponential growth is clearly a credible model of the change in these metrics, and if further metrics were examined, as others such as Ray Kurzweil have done, exponential growth would be commonly observed in the change of many more measures of technological evolution.[15]

Then again, one might ask at this point about such technologies as automobiles, airplanes, bicycles, the can opener, the mouse trap, and many others that have appeared to advance little over the last few years, much less exponentially. The history of technological advance is the story of countless diverse technologies erupting exponentially on the scene and then leveling off in growth or improvement in what is classically known as an S-shaped or logistic curve of growth.[16] However, it is the summation of all technologies that is of interest here, and that summation presents an overall picture of accelerating change. This aggregate of technologies is probably best represented by the change in America's GDP, which has been doubling every 11 years since 1929. Consequently, exponential change appears to be a compelling model for understanding and possibly even forecasting the accelerating advance of technology.

Why Do We Perceive Change as Linear?

Why at this point in human history are we only now perceiving this exponential nature of technological change, and what is the approximate rate of progress of the totality of technology? With regard to the first part of the question, exponential change processes tend to sneak up on and surprise the unsuspecting observer. If the doubling period of change is very long, especially in comparison to the human life span, it is extremely difficult to notice any change at all. Biological evolution is a good example, where the doubling period of biological complexity is probably measured in millions of years. Only by careful study of the fossil record has it been possible to comprehend the unmistakable exponential nature of biological evolution. Before the Industrial Revolution, technological change over a normal human life span of about 40 years was almost nonexistent. Due to the long

doubling periods, or slow growth rates of most change processes, exponential change in the past has not been easily discerned through experience.

Even today, our awareness of change will naturally tend to be averaged over the doubling period of the change and, therefore, cause it to appear to be approximately linear. Additionally, during the first few doubling periods of any exponential change process, it is difficult to sense rapid change. To return to the example noted earlier, the first six doubling periods of a one dollar investment earning 70 percent interest would produce only $64, not a very noteworthy sum, especially compared to the linear process result of $6,001. Ray Kurzweil estimates the doubling period of overall technological progress during the 20th century to be about ten years, equivalent to a seven percent rate of growth.[17] This seems like a reasonable rate of progress and is only slightly below the historical long-term average growth rate of the stock market during the past century.[18] Accordingly, the technological changes in the first six or seven decades of the 20th century, although substantial, did not seem to be occurring at an accelerating rate, because the total change was still relatively minor. However, in the last decade of the 20th century, more technological progress occurred than was experienced in the entire first nine decades of the century, and now many began to take notice.

Why is technological change exponential? All evolutionary change is roughly exponential because the change builds upon what has come before it. Population growth may be a helpful analogy: the more rabbits that are born, the more rabbits exist to produce other offspring, which in turn will create more rabbits, and without any constraint on the reproductive process the population increases exponentially. The creation of technology by engineers implies the creation of tools and the discovery of knowledge that can be used to produce ever more complex and capable tools upon which to create ever more advanced technology. As information technology provides greater and faster access to knowledge, it also provides an easier and faster means to acquire the information needed to design further technologies. Today, sophisticated computer software running on the latest computer hardware actually designs the next generation of ever more capable and complex computer hardware. New innovations build on old innovations exponentially.

Technological Progress: Past and Future

Consider the extent of technological progress that occurred in the 20th century and compare that to the technological progress that will be achieved in the 21st century if exponential change continues. As cited earlier, the doubling period for technological evolution during the 20th century is considered to be about ten years. In the first half of the last century, technology evolved over five doubling periods to become 32 times more advanced, or more complex, or more important in the life of humans in 1950 than it was in 1900. Now continue the doubling of progress every ten years during the later half of the century, and by the year 2000 technology had become about 1,000 times more advanced, or more important in our lives, than in 1900.

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What will technological evolution be like in the 21st century? By 2010, technology will have doubled again to become 2,000 times more advanced than in 1900, which means that we will experience the same level of technological change in the first decade of the 21st century that we experienced in all of the 20th century! That's a staggering thought. When this exponential evolution is extrapolated to the end of the 21st century, one can project that in 2100, technology will have progressed to become a million times more advanced than the technology that existed in 1900. In other words, during the 21st century we will experience a thousand times the technological progress achieved in the 20th century. Some experts believe that technological progress is even faster than exponential and that the doubling time of technological growth is getting smaller, thus the prediction of a thousand times the progress of the last century in the next may actually be an underestimation.[19]

Two important lessons can be drawn from this discussion of exponential change. First, change is not going to stop, and second it is going to come at society— and at the Army—at a faster and faster rate. If the Army is not prepared, we will only be able to react, and by the time we have responded we will be even further behind the next wave of change and very quickly left in the dust of accelerating change. The key to successful adaptation to change will be a continuous transformation process that constantly redesigns the Army to be a near optimum force under any circumstances. To understand how this might be accomplished, it will be helpful to look at how past military technological innovations have been accommodated.

Studies of the interwar period of the 1920s and 1930s show that new technological innovations will be successful when they produce corresponding innovations in the synthesis of doctrine, training, leadership, and organization with new technology. The creation of an all-encompassing integrated process for military innovation in the 21st century will demand extensive cultural changes in how the Army does business and even in the moral factors of our world view. As Williamson Murray and Allan Millett have noted: "Sheer technical innovation . . . does not win wars. Instead, the interaction of technical change and organizational adaptation within a realistic strategic assessment determines whether good ideas turn into real military capabilities."[20]

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As defined by MacGregor Knox and Williamson Murray, military revolutions in the past, as opposed to revolutions in military affairs, have transformed with startling speed and force all aspects of war, from policy and strategy to tactics, and they predict that change of this magnitude is likely in the 21st century.[21] All the signs of accelerating technological change point toward a recasting of society and a military revolution rather than a more incremental "revolution in military affairs."[22] Although Knox and Murray imply that the direction, consequences, and implications of a military revolution are largely unpredictable, it is the professional duty of military leaders to design and implement a change process as well as a fresh military culture that will produce a superior Army relative to any prospective challengers to US national security.

Applying this to Army Transformation

Change is coming, it is coming faster than nearly everyone expects, and nothing can be done to stop it. The only sensible response is to enthusiastically embrace change and use it to our advantage to improve overall organizational effectiveness better and faster than the competition. This is considerably easier said than done, but the scale and speed of change that we are facing require an entirely new process to wring from it the most organizational improvement possible. Thankfully, the Army already has recent experience with innovative changes driven by information technology and the Army Transformation initiative. The change process has not been smooth, timely, or innovative, however. Consequently, Army Transformation, while a step in the right direction, is not yet the defining icon of the future Army that it should become. Why do we need to prepare any differently than we have in the past? Because the speed and magnitude of 21st-century technological change are very different from past engines of change, requiring inventive, inclusive, and significantly more effective transformation processes.

The world economy is beginning to adjust to a climate of incessant change, which is reflected in the revolutionary ways in which business organizations and the entire business culture have evolved over the past two decades. Of course, the Army has also been adjusting not only to the evolution of technology but also to a vastly altered national security environment. However, the time pressures have not been nearly as imposing, and the stimulus, without a credible threat to national security, not nearly as compelling as in the business marketplace. The terrorists attacks of 11 September have gone a long way to resolve the stimulus problem, but on the other hand, they may further constrain and confound the Army Transformation process. At the same time, American society is changing at an increasing pace, and the Army that safeguards that society must change in parallel to avoid becoming irrelevant to the citizens it is pledged to defend.

A major consequence of an inadequate transformation process would be the inability to protect against advanced technology in an opponent's hands that could be brought to bear against the nation, even if in just a single narrow

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technical domain such as bio-engineered weapons. Only by making the effort to remain at the cutting edge of science and technology advances across all fields can the Army understand what is currently possible and what the near future may hold in terms of weapons that can threaten US national security. As technologies are being adapted for military use, the protections or counters to the employment of these technologies have to be developed in parallel. In other words, the design of any military technology is not complete until a defense against it or a way to neutralize it has also been created.

The terrorist attacks of 9/11 also brought home the stark realization that even nonmilitary technology can be turned into devastating weapons in ways that were never considered during the design of that technology. A fundamental assumption for designing safe technology has always been that the operators of these tools would not do anything to knowingly jeopardize their own existence. That assumption no longer applies. Large airliners must now be designed to prevent a hijacker from intentionally turning one into a piloted cruise missile. The design of all future technology must consider the possibility of deliberate attempts to convert the new tools into impromptu weapons. The dark side of these new technologies almost certainly offers the greatest uneasiness for the Army's ability to provide for national security.

Since the quality of our military force is only as good as the quality of the leaders and soldiers who are attracted to the organization, the Army should be seen as a breeding ground for leaders and citizens who can thrive in an era of rapid change and thus can assure the future of this nation and the global community. High-quality young men and women should envision an assignment with the Army as an opportunity to serve with a world-class organization that can handle the ambiguity and chaos of the future, an organization that gives them the opportunity to develop themselves into the valuable leaders sorely needed both in and out of the military.

A further consequence of inadequate transformation would be the loss of the genuine dissuasive power ensuing from the knowledge that the US Army is the world's most technologically advanced and powerful military force. Conventional wars normally occur only between nations or entities that have comparable military capabilities, and a potential opponent would be very hesitant to trigger military action with the sure knowledge that it is inferior to the United States in terms of military effectiveness. Of course, this embodies all areas of technology, because potential opponents cannot be allowed to discern any asymmetric Achilles' heel in our military capabilities.

Continuous Transformation Is Not Optional

The essence of the military profession is preparedness. Since only a small portion of a soldier's career might be spent in actual combat, for the vast majority of the time soldiers are engaged in preparation for war. Consequently, military leaders should be the most capable of all professionals in preparing their

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organization for the incredible future ahead. However, since soldiers may be called to war unpredictably, and because the fate of the nation may hinge on their abilities, it is very difficult and risky to make revolutionary or even evolutionary change with the certainty that military effectiveness will be improved. Today, the fast-approaching future requires continuous change and the greater risk would be in not changing. But, it is not entirely clear that the Army can successfully adjust to this new imperative.

The defining characteristic of the best organizations over the next 20 years will be the capacity to transform themselves faster than their competition, so they might take advantage of the unrelenting acceleration of technological progress. The challenge of the military transformation process is to respond to change in such a way as to enhance the overall effectiveness of the military to perform all assigned missions. This does not imply that the military performance of technological innovations will be maximized. It means that overall military effectiveness will be improved by the successful integration of the innovation with all aspects of military effectiveness: doctrine, training, leadership, organization, and technology.

What might the design of an Army Continuous Transformation program for the incorporation of technological innovations to produce improved overall military effectiveness look like? Consider a process based on a structure labeled “Real-Time Technology Assessment,” originally conceived to enhance the societal value of research-based innovation.[23] Army Continuous Transformation would integrate science and engineering research with studies of doctrine, training, leadership, and organization to appreciably enhance the overall military value of technological innovations. The major components of this Army Continuous Transformation model include the following.

- *Historical studies* of past transformational innovations to create models for predicting the interactions of all components of military effectiveness.

- *Research program mapping* to monitor and assess current research and development activities at the Army, Defense Department, national, and international levels.[24]

- *Communication and early warning* to address and enhance the quality of the communication of scientific, technical, and military developments; to facilitate the identification of Army priorities; to foster greater knowledge and more effective communications between all the military effectiveness components; and to encourage the development of a more open process of technological integration.

- *Technology assessment and decisionmaking* to assess the potential military effectiveness impacts and outcomes of technical innovation; to develop a scenario-based, methodical process for identifying potential beneficial and undesirable effects of a specific technology and for planning options to enhance desirable impacts and mitigate undesirable ones; to make informed decisions; to reflectively assess Army Continuous Transformation for the purpose of process improvement.

Such a continuous transformation process requires an entirely new approach to thinking about and improving the military effectiveness of the Army. The biggest challenge is to reorient the technology design process for the Army so that all components of military effectiveness are synergistically blended into an integrated design methodology to produce the greatest overall increase in effectiveness. This process would involve tradeoffs among the elements of doctrine, training, leadership, organization, and technology to optimize the full integration of capabilities to produce the greatest military force.

Several major obstacles would have to be overcome to implement this Army Continuous Transformation process. I know of no large-scale, integrated process, cutting across all parts of the Army and seeking input from all Army commands and staffs, that has been implemented in the past. The Army’s authoritarian command culture, while indispensable in combat, can be an impediment to open discussion of fundamental issues at all levels of the organization. All Army soldiers and the US public will be stakeholders in this most fundamental and vital organizational process, and they should be given the opportunity to contribute to the discussion in a systematic manner.

More formal transformation working groups would need to be organized from each of the major military communities, such as the Training and Doctrine Command, Army Materiel Command, Forces Command, and others. Any implementation plan would necessitate a pilot continuous transformation project that tackled a technical innovation issue with great potential for success, and would also have the charter to scrutinize and improve the process.

The one indispensable aspect of a continuous process that will also be the most difficult to achieve is the close collaboration of scientists, engineers, strategists, historians, national security experts, operators, doctrine creators, trainers, logisticians, soldiers, and the public. If each community brings its own particular community goals and objectives to the process in a defensive manner, the collaboration and thus continuous transformation will fail. On the other hand, if all participants earnestly agree that the clear vision and goals of the Army are preeminent, not their personal or individual community goals, then serious constructive collaboration is not out of the question.

Tradeoff analyses among competing design factors are difficult to conduct without some common measures of effectiveness. Recently there have been some efforts to develop metrics for analyzing information operations, and this work could be expanded to provide high-quality, validated metrics for assessing military effectiveness in a variety of operations and environments.[25] Metrics only help to inform the decisionmakers; they do not make the decisions. However, it is impossible to move an organization in a desired direction without a rough knowledge of where it currently is, what is the desired direction of movement, and how far along the desired path the organization has moved at any point in time.

One particular advantage currently exists to speed the implementation of an Army Continuous Transformation, and that is the current Army Objective

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Force Task Force. This office could be the predecessor of a small permanent organization working directly for the Army Chief of Staff to coordinate the process. Since the Army leadership recognizes the need for transformation to a future force, the leap to a continuous transformation process is smaller than it otherwise might have been. However, two serious obstacles must be overcome before the Army can become the world's preeminent institution at adapting to change. The first hurdle is the capacity to develop the culture of a true learning organization that values intellectual curiosity and innovation at all levels. To surmount the second barrier, Army leaders must learn to use new skills and concepts to lead in an increasingly complex world.

Leading in a Complex World

At the beginning of the 21st century, we find that our technologies, economy, and society are so complex that it is impossible for any single individual to fully understand them. Yet even with this limitation, the leaders of the military, government, and business communities can still effectively function, compete, and improve their abilities to achieve objectives. How is this possible? The principal reason for their success is organizational networks that can blend the diverse knowledge of their distinct members into skillful solutions and, just as importantly, continuously adapt to changing knowledge requirements. Networks are not located on the traditional organizational chart, and they blur the boundaries between the normally unconnected public and private sectors. Therefore, management at every level of complex organizations is increasingly accomplished on a daily basis "by self organizing systems that both defy centralized management and have changed the meaning of individual accountability."[26]

Today and in the future, innovation in complex organizations derives from "the ability to routinely produce new and enhanced technological processes and products by combining components and knowledge in ways that deliver synergism."[27] This evolving ability to innovate at a different level has contributed to the current era of powerful change, characterized by both increasing complexity and rate of change.

What are the implications of increasing complexity for the Army? First, it must be recognized that networks are the innovators of complex technologies because of their ability to connect the diverse individuals, groups, and organizations—both public and private—with the abilities and knowledge required for innovation. Only networks can provide access to the wide-ranging knowledge domains required, and only self-organizing networks can provide the intimate interactions among the organizational participants that permit the synthesis of this knowledge. This is not the rigid, hierarchical, traditional military organizational structure. Dynamic, self-organizing networks not accounted for on the wiring diagrams must be cultivated and nurtured if military innovation is to flourish. These types of networks are not entirely new to the Army. As a result of our personnel rotation policies, many extensive networks of individuals within and out-

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side the military are created. Boundaries are more blurred than ever, and our policies must recognize the dysfunctional nature of traditional barriers that separate organizations and roles. Complexity has generated many new ways to consider how organizations operate and how innovation is developed. The most successful future policies will be those that pursue adaptation and innovation through trial and error.[28] Can the military culture adapt?

Further Thoughts

More elemental than just implementing a quality process for continuously transforming the Army is the cultural conversion that must accompany this change process for it to become genuinely valued by the profession. This cultural conversion is best exemplified by the concept of a “learning organization,” recently heralded by the business community. According to David Garvin of the Harvard Business School, “A learning organization is an organization skilled at creating, acquiring, interpreting, transferring, and retaining knowledge, and at purposefully modifying its behavior to reflect new knowledge and insights.”[29] Army Continuous Transformation could be a process for developing the Army into a preeminent learning organization that puts great value in the pursuit and application of knowledge across all disciplines. Professional education is the best means to effect a cultural change. As General Hugh Shelton, retired Chairman of the Joint Chiefs of Staff, wrote recently, “Transformation is first and foremost an intellectual exercise, requiring the brightest minds actively engaged in taking our armed forces to new and higher levels of effectiveness. Therefore, the road to transformation begins with a strong program of education and leader development.”[30]

The professional military culture places great value on action and generally disdains process. Only comfortable when acting, we feel guilty if valuable time is given over to reflection. Rather, we are focused almost totally on the end result, the final product. If we are to progress successfully, the balance between product and process needs to shift in the future toward process, and we need to trust that a high-quality process will produce a high-quality product or performance.

As military professionals, all Army leaders are committed to the continuous improvement of the entire Army to achieve the commonly recognized goals associated with the Army Vision. With this responsibility in mind, only some form of an Army Continuous Transformation process has the capability to deliver that vision. The bare outline of a candidate process has been presented. Continual transformation is the key to maintaining the world’s best military force in the face of accelerating technological change. Developing an unsurpassed process of unending transformation of our military forces will be the single most important factor in protecting the nation for the foreseeable future.

NOTES

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