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MASTER OF OPERATIONAL STUDIES

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# FUTURE WAR PAPER

## INFORMATION AND DECISION SUPERIORITY: RIGHT CONCEPT, RIGHT TOOLS, RIGHT TRAINING

SUBMITTED IN PARTIAL FULFILLMENT
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## Executive Summary

**Title**: Information and Decision Superiority: Right Concept, Right Tools, Right Training

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**Thesis**: The Department of Defense, combatant commanders, and military services must anticipate how expanding technologies and the resultant increase in information will affect the warfighter and design a holistic approach for how the information is managed and more effectively prepare those who must manage it.

**Discussion**: For the better part of a decade, the Department of Defense, several individual services, and numerous defense contractors have spoken of "information dominance" and "information superiority." Both, particularly the former, espouse a belief that in modern conflicts, as one senior officer put it, "if you see the battlefield, you win the war." Certainly, some technologies will offer an unimaginable level of information to decision makers and operators. Ideas of information dominance, however, are fundamentally flawed. Uncertainty will always be part of the nature of war. Additionally, information is of little use unless it has – or is given – meaning.

**Conclusion**: In order to sustain success on the battlefield, the Marine Corps must incorporate information gathering technologies into a cohesive system of mission command and control. Appropriate systems, effective doctrine, and leaders trained and educated in processing information are essential in achieving decision superiority over future adversaries.

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THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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## *Preface*

In researching the subject, I drew primarily from three sources: writings on information and information hierarchy by authors such as Russell Ackoff; the ideas of senior military officers – Lieutenant General Van Riper, for one – on the role and potential of information and technology in military command and control; and Marine Corps command and control doctrine. Additionally, I interviewed several Marine officers who are, or were formerly, action officers at the Marine Corps Warfighting Lab or similar organizations. The latter were instrumental in my understanding of current Marine Corps programs in the field of information technologies and their impact on decision making on the battlefield.

My intent in writing this paper is to discuss effective integration of information gathering technologies into the system of Marine Corps command and control. Training future leaders to process information is critical in attaining the decision superiority that will ensure the sustained success of Marines in future conflict; this training is of equal, if not greater, importance as the technologies and doctrine that guide their integration. One might dedicate a separate paper exclusively to a discussion of the training that allows leaders to take information and use it to make more effective decisions. Though I discuss the concepts that will help enable this, the length and scope of this paper permit me to only scratch the surface.

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*Sergeant Striker moved back from the sand berm separating his squad from the small town. Overhead, he heard the buzz of the TACMAV (Tactical Mini UAV), which after being deployed by his squad, turned in slow circles above his objective, a two story house about 50 meters away. Striker turned and nodded to one of his riflemen; with this, the latter ran toward the house and hurled the Dragon Runner "throw-bot" into an open second story window. The squad listened as it crashed against what they assumed was a mirror and fell to the ground. A stream of exclamations in Arabic followed from the ground floor. Striker checked his universal receiver; he saw electronic SITREPS (situation reports) from adjacent squads, FRAGOS (fragmentary orders) and operations overlays for an upcoming operation, and imagery from several coalition assets operating in the area. No time for all that right now, he thought. Bringing himself to a high crouch, he saw one of his team leaders breaking down what the Marines called their "Clark Kent" – a portable x-ray sensor about the size of an old Javelin optic. The team leader confirmed to Striker that the target and several other insurgents were in the back corner room of the house. After a few suppressed words to his team leaders, Striker began pushing his squad over the berm and toward the target house.*

Technology, specifically that in the area of information and information-gathering, is growing at an unprecedented rate. Though some of the technologies discussed in the scenario are futuristic, several are already being developed in places such as the Marine Corps Warfighting Laboratory if not in initial use with the operating forces. As in the scenario above, expanding technologies will give the small unit leader ever increasing levels of information. They have the potential to dramatically shorten the temporal distance between the sensor and the individual that wishes to access the information it

gathers. Critical information that previously would not have made it into the hands of operators on the ground is now at their fingertips. Some of these technologies will provide information directly to the individual who will act on it. All of these will be both a blessing and a curse. In addition to fighting his unit, the small unit leader of the near future will have to manage this information and contend with higher headquarters' desire to influence him (and fight the battle for him) – all potentially limiting his ability to successfully execute missions on the ground.

For the better part of a decade, the Department of Defense, several individual services, and numerous defense contractors have spoken of "information dominance" and "information superiority." Both, particularly the former, espouse a belief that in modern conflicts, as one senior officer put it, "if you see the battlefield, you win the war."[1] Certainly, technologies in the areas of satellites, unmanned aerial and ground vehicles (UAV and UGV), and other futuristic sensors will offer an unimaginable level of information to decision makers and operators. Ideas of information dominance, however, are fundamentally flawed. First, no technology can now or will arguably ever allow us to see into the minds of enemy leaders and commanders; it is this very information which is likely most critical. Second, information by itself is of little value; it must be turned into knowledge to be of use, particularly for individuals who have to act on it in a timely fashion. With these two ideas in mind, it is therefore critical that the Department of Defense, combatant commanders, and military services anticipate how expanding technologies and the resultant increase in information will affect the warfighter and design a holistic approach for how the information is managed and more effectively prepare those who must manage it.

**Information Superiority**

*Information superiority: The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an enemy's ability to do the same.*[2]

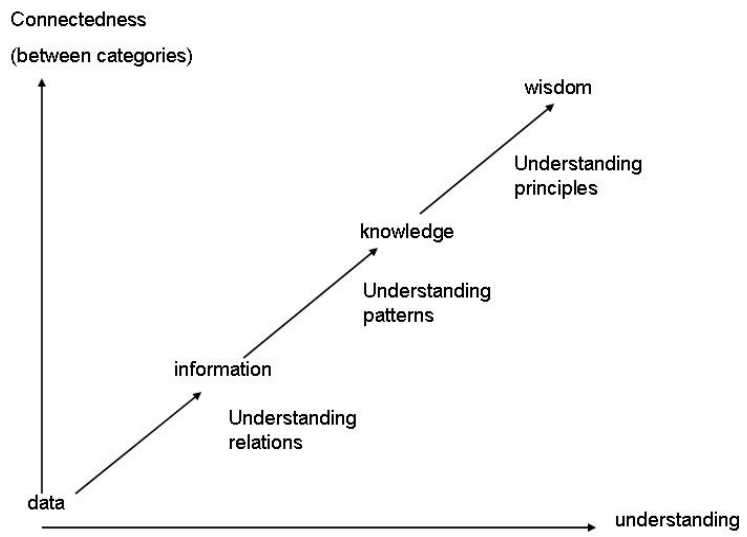
In May 2000, the Department of Defense published its *Joint Vision 2020 (JV 2020)*, the successor to *Joint Vision 2010* (published in 1996). At *JV 2020's* center is the idea of "full spectrum dominance" – that US forces in the future must be able to fight unilaterally or as part of a multinational force and be able to succeed across the full range of military operations. In order to do this, *JV 2020* describes the goal of achieving information superiority. While *JV 2010* defined information superiority precisely as did its successor, it drew greater criticism because of its focus on technology and on systems. In his March 1997 appearance before the House National Security Committee, then Lieutenant General Paul Van Riper spoke with concern over the belief among some in the defense community that the future would bring the ability to "find, fix, track and target – in real time – anything of consequence that moves and is located on the face of the earth."[3]

The flaw in the above statement – and the basic issue that Lieutenant General Van Riper and others take with the idea of information superiority as espoused by *JV 2010* is that data – that which we seek to "find, fix, track and target" – is just that; it does not give us true knowledge about our adversary or permit us to make effective decisions. *JV 2020* rightly points out that information superiority is not the goal; it is only of value when it can be placed in the hands of those who need it and translated into "superior knowledge and decisions."[4] To attempt an understanding of the difference between data and knowledge, a deeper look at information is useful.

**Information: The DIKW hierarchy**

Knowledge or information hierarchy is a term that has been used by knowledge managers or systems theorists, like Russell Ackoff or Milan Zeleny, for nearly twenty years. Though there are differing opinions concerning who first developed the term – one of which points to poet T.S. Eliot – Ackoff's work is most often cited.[5] Ackoff organizes the "content of the human mind" in five categories: data, information, knowledge, understanding, and wisdom. According to Ackoff, the first four categories are concerned with the past; the fifth category concerns the future. Achieving wisdom is difficult in that in order to arrive there, one must transition the information through the previous categories.

*Data* is a raw fact without relation to anything else; it has no significance beyond itself. *Information* is data that has meaning because of some cause and effect relationship; information is usually seen as the first category that has "meaning" in that it usually answers "five- W" questions. *Knowledge* is a collection of information that represents a pattern and allows the individual with it to make effective predictions; knowledge answers "how" questions. It is often based on memorization of information (that found in a field manual or doctrinal publication, for example) which does not necessarily have additional meaning or provide additional knowledge. *Understanding* is a cognitive, analytical process by which the individual takes new knowledge and synthesizes it with knowledge he or she already has; understanding, in essence, answers "why" questions. Finally, *wisdom* is systemic and generally represents an understanding of the fundamental principles within the knowledge that make it what it is.[6]




The above graph more clearly depicts movement along the information hierarchy; understanding, rather than being a separate category, occurs between each and supports the transition from one to the next.[7]

To illustrate how information transitions along the categories, one might use the following example:

- Data: An improvised explosive device (IED) struck a coalition convoy this morning.
- Information: A reliable informant indicated to coalition forces that the IED had been emplaced by two young men from a local village.
- Knowledge: There are no opportunities for employment in or around that village. Local insurgents exploit this fact by offering cash for those willing to emplace IEDs.

- Wisdom: A counterinsurgency (COIN) campaign can not simply target (militarily) the individuals that place the IEDs. Rather, it must "target" (holistically) the IED makers, those who emplace them, and generally the conditions which cause individuals to participate at all levels of the insurgency in the first place.

In this example, understanding occurs in discerning the relations between the IED and those who placed it, the patterns leading to why they placed it, and finally the principles and conditions (and the interplay between them) leading to the emplacing of IEDs and the insurgency in general.

Proceeding with this understanding of information, one can see that the ideas espoused in some theories of information dominance and superiority – "if you see the battlefield, you win the war" – are built on very shaky ground. Technologies oriented toward information gathering and the gaining of information superiority can not transition all the categories of information and provide commanders and small unit leaders with "readymade wisdom and understanding."[8]

*JV 2010* and *2020* critics generally point to an over reliance on and misplaced faith in technology – perceptually or otherwise – in the documents' ideas regarding information superiority. Some who share this opinion believe the United States, in trusting the current technology's "operational inadequacies, technical limitations, and fundamental institutional problems," is building the "Maginot Line of the 21st century."[9] Most critics are correct in identifying the danger in using technology as a "crutch" or panacea for all of the difficulties in visualizing the battlefield and deciding and acting upon what one

sees. However, critics also miss the value of some technologies, existing and emerging, in providing the types or categories of information that have meaning unto themselves and enable timely decision making – when made available at appropriate levels.

**Information superiority technologies: Existing, emerging and futuristic**

Satellites

Military satellites – so designated because of their payload, not the craft design itself – provide what the Department of Defense calls "force enhancement," defined as surveillance, reconnaissance, communications, navigation, and missile warning. Surveillance and reconnaissance satellites, such as the Lacrosse and Keyhole families, are generally divided into optical, infrared, radar or a combination of the three. Other types specifically detect (and intercept) radio, telephone and data transmissions or locate and identify ships at sea. Satellite communications (SATCOM) is supported by the MILSTAR family of satellites; these satellites enable encrypted, secure, worldwide communications between forces on the ground, in the air, and at sea. The NAVSTAR GPS (global positioning system) satellite constellation provides the same forces with the ability to locate themselves worldwide.[10] The future of US military satellites is the Wideband Gapfiller Satellite system. This system is designed to replace the MILSTAR family of satellites and provide the additional bandwidth for current systems as well as emerging ones.

UAVs and micro-UAVs

The Marine Corps divides its UAVs into three tiers: tier I (low altitude, long endurance); tier II (medium altitude, long endurance); and tier III (high altitude, long endurance, low-observable). Currently, the tier I UAV is the Dragon Eye; it operates for

one hour, at a range of five kilometers and altitude of 150 meters. The Marine Corps is currently looking at several options for its tier II UAV, one of which is the Scan Eagle with a range of 100 kilometers. The tier III UAV is the Pioneer with a range of 185 kilometers and five hours of endurance; the UAV planned to succeed it is the Eagle Eye Vertical Take-off and Landing UAV (VUAV) with a range of 200 kilometers and an ability to operate for eight hours. When placed in support of Marine forces, Air Force UAVs, such as the Predator and Global Hawk systems, can operate for up to 40 hours at ranges as great as 14,000 nautical miles.

In addition to the current families of UAVs, the Marine Corps is experimenting with several micro UAVs, also know as Micro Air Vehicles (MAV). The leading candidate for adoption by the Marine Corps is the Wasp MAV. The Wasp is small enough to fit in a Marine's pack. Flying either conventionally or in a hover, it has a range of four kilometers, an endurance of 90 minutes, and an operating altitude of approximately 30 meters – an altitude providing a level of detail that would best support operators at the company level or below. It is controlled with a simple ground station (the size of a handheld video game) that can direct and receive feedback from six Wasps at a time.[11]

Unmanned Ground Vehicles

The Marine Corps is currently experimenting with two UGVs: the Dragon Runner and the Gladiator. Weighing nine pounds and just over a foot long, the Dragon Runner is a throw-bot" – it can be thrown into windows, over fences, or from a vehicle moving at speeds up to 45 miles an hour. Once deployed and moving, it provides information to the Marines deploying it in real-time through a hand-held controller. Most importantly, it offers the possibility to send an unmanned observer into such places – around corners,

into rooms, and toward potential IEDs – instead of risking a Marine.

Similar in size to a foot-locker, the Gladiator UGV is designed to support a Marine infantry battalion. Equipped with a day and night sight, its primary role will be to conduct reconnaissance and surveillance. However, it can also be equipped with light and medium machine guns (M249 and M240) or an anti-personnel obstacle breaching system (APOBS) to provide fires or conduct limited obstacle clearing operations in support of maneuver units.[12]

Futuristic technologies

The "Clark Kent" sensor discussed in the opening scenario, though outside the realm of current possibility, will be possible in the near future, given the progress in x-ray technologies. Additionally, similar technologies using passive millimeter waves will, in the future, allow Marines to see into buildings before they deploy into them. Such capabilities, operating from airborne or ground platforms, could also be based on sound or bio-sensing technologies.[13] The potential impact of such systems extends beyond that of information gathering and into such other areas as fratricide avoidance and reduction in ammunition wastage (expending ordnance on unoccupied buildings or areas) .

Without question, current and future technologies possess unimaginable potential in increasing the amount of information available to future warfighters. However, as discussed, information is only of use when it heightens the situational awareness of those who have access to it and allows them to make effective decisions on the battlefield. Just as too little information prevents small unit leaders from correctly visualizing the battlefield, too much information has the potential to overload their ability to sift through it for that which is critical, process it, and make timely decisions. To ensure that leaders

can do the latter, information must fit properly into our doctrine of command and control.

**Information and Mission Command and Control**

According to *Marine Corps Doctrinal Publication (MCDP)* 6, command and control is composed of several elements: people – those who, among other things, gather the information, make decisions and take action; information, or the "representations of reality" we use to inform decisions or actions; and command and control support structure – the organizations, equipment, facilities and education, for instance, that aid the people who use information.[14]

Information, according to *MCDP* 6, ranges from the aforementioned data – an encrypted transmission, for instance – to that which has been evaluated and become knowledge – for example, an intelligence report. The ability to effectively command and control is not simply a matter of more information; it is a matter of getting *critical* information to the right people at the right time. With such information, they ideally increase their knowledge and wisdom; greater wisdom, in turn, enables them to make better and more timely decisions and act more decisively.

War, according to Clausewitz in *On War,* is the "realm of uncertainty."[15] Arguably, the reduction of uncertainty is at the center of command and control. In *Command in War,* Martin van Creveld comments that confronted with such uncertainty, organizations must choose between one of two courses: they must either increase the speed by which they process information or create organizations capable of operating with less information.[16] Van Creveld's first choice concerns the idea of time, which according to *MCDP 6*, is second only to uncertainty in importance in command and control. Essentially, if we seek greater certainty on the battlefield, we do so at the expense of

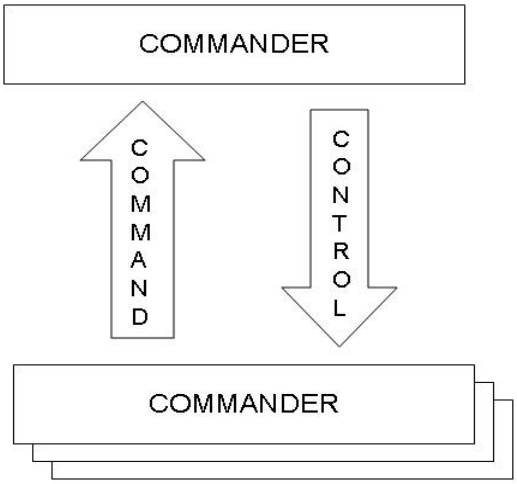
time. The converse is also true: if we seek to operate faster, we do so without the depth of information we may wish for.

The Marine Corps espouses what is called *mission command and control.* In mission command and control, leaders accept uncertainty, basing their decision and acting on the information – incomplete though it may be – that they have at that time. In so doing, they cause the enemy to react to them and generate greater relative speed of action. Mission command and control is dependent on mutual understanding between commanders and subordinates and implicit communication. Commanders provide their subordinates with tasks and intent; once the latter is "in the fight," the commander expects him to operate with initiative and without the constraint of requesting continuous instruction. Operating in this decentralized environment, local commanders are able to best confront the situation facing them and increase their tempo of operations over that of their enemy. Subordinates provide feedback in the form of information to their higher command, enabling that commander to make relevant decisions in the changing environment. What is ultimately desired of command and control is not information superiority, but decision superiority.[17] In balancing all three components of command and control – people, information, and support structure – we increase the speed and effectiveness with which we make decisions.

In the hierarchy of information, as discussed earlier, data is the lowest form of information. In order to develop data into knowledge and understanding – that is information that is useful – we must give it value and meaning. Currently, the majority of this occurs at higher levels: a battalion intelligence section, for instance, receives situation reports from subordinate units, data from some of the kinds of sensors discussed

earlier, and intelligence supplied by higher. Analyzing and synthesizing these components, they transition the information through the hierarchy – giving it meaning until it becomes something of value. It takes time to both process the information and communicate it to subordinates. As stated, Marine or mission command and control seeks to use such time more valuably in generating tempo through rapid decision and execution. However, by optimizing the process and balancing command and control components, we might permit small unit leaders to increase their level of knowledge while still making decisions at a pace quicker than their enemy.

**Right concept, right tools, right training**




The figure above depicts the Marine Corps' vision of the relationship between command and contro1.[18] Here, command is the initiation of action and control is feedback in the form of information from subordinates back to higher. Feedback

"controls" command actions by informing the commander on the changing situation, allowing him to adjust or modify his efforts. Feedback, the "difference between goals and the situation as it exists," may be a report of enemy actions or status of subordinate units. It is information that has been processed and has value; it has become knowledge and understanding.

The higher commander and his staff – with a wealth of information at their fingertips and the analysts to distill it into something meaningful – have the responsibility to assist subordinates in making sense of what they see. In many cases, the higher staff – given their placement – is able to give information greater context than the subordinate. However, the small unit leader is usually best able to assess and process information regarding his location and specific situation on the battlefield. The analyst or staff officer in a distant command post may only see figures walking along a road as provided by a UAV. The small unit leader can synthesize this data with his understanding of the current situation on the ground and achieve greater knowledge, understanding and ultimately wisdom. He can do this more quickly than the individuals who merely see data from the UAVs. It is therefore only sensible that we give him the ability to access this information at the same time or earlier than his higher headquarters. In this manner, he can evaluate the information, make a decision, and act instead of waiting for it to be processed by higher. The opening scenario and discussion of technologies listed several man-portable sensors that would provide such information to the small unit leader. Conceivably, a Marine rifle squad or platoon could each maintain a UAV, UGV and similar sensors on their table of equipment. However, such equipment does not come without cost in terms of time spent deploying, maintaining, and recovering it; the impact

on the unit's mobility is of additional concern. Ultimately, all that the small unit leader needs is the output of such sensors – the data that he can process and assign value.

One solution to this is the universal receiver. Such a device would likely come in the form of a ruggedized laptop, or Toughbook. It would operate through a wireless connection to access both the non-classified and secure internet protocol router networks (NIPR- and SIPRNETs). With it, the small unit leader would have the ability to access data from all external sensors operating in his area. Additionally, it would provide a common controller for all the sensors his unit personally carries. It would use GPS to enable him to locate his unit and those adjacent.[19] The information it could provide would enable him to make more informed decisions; it could also, however, encumber him through “information overload,” tempting him thus to forsake time for certainty. The means to mitigate this possibility is through properly "equipping Marines” – training, educating, and assigning them in an effective manner.[20] Our education and training programs for junior Marines, particular at the squad leader level, need to be on a par with those directed at our junior officers. Rather than concentrating solely on the military art and science, an education akin to Scharnhorst's *Bildung* – a broad, holistic one – is optimal.

The current Infantry Squad Leaders Course is 45 days long. The majority of the course is dedicated to developing technical and tactical proficiency – training the young noncommissioned officer (NCO) to employ his squad and their weapons. By comparison, an infantry lieutenant receives more than nine months of education and training to prepare him for his responsibilities. In addition to the training to develop his technical and tactical proficiency, he is educated in classical military theory and the

history of counterinsurgency. He participates in numerous discussions on ethical decision making. Though numerous exercises, he is trained to operate in an uncertain environment, forcing him to make decisions and act with little information or risk defeat at the hands of a more mentally agile enemy. The previous examples evidence in small part the depth of effort devoted to making Marines officers more skilled decision makers. In the current environment, in light of the great similarities in responsibilities of junior officers and their NCOs, the effort devoted to developing the former must be matched in educating and training the latter.

This would require a considerable investment in time. It would make sense, therefore, that assignment to a small unit leader position upon completion of such training and education would be considerably longer as well. Additionally, in light of the scope and gravity of their responsibilities, the age and rank of Marines executing these duties should likely be increased as well. However, if we are to develop and possess leaders capable of sifting understanding from lesser information and quickly deciding and acting on it, such an investment is warranted. The distributed operations (DO) concept requires such training and education to be feasible; the modem battlefield will demand it irrespective of how we organize for operations.

**Conclusion**

*Striker's radio operator handed him the handset. "Hold up Three-Alfa. I say again: hold up, over." The voice on the radio was that of Striker's platoon commander. Signaling his Marines to stop and take cover, Striker returned to the radio to discuss the situation. Battalion HUMINT sources and division reconnaissance indicated that the house was also occupied by the target's wife, child, and mother-in-law; the emergence of*

*a female from a cellar door at the base of the dwelling confirmed this to Striker. Not today at least, the sergeant thought to himself, as he quickly gave his squad the signal to move back to the objective rally point.*

Information and information superiority are not ends but means to achieve the true goal of Marine command and control which is decision superiority. In order to achieve decision superiority, we must ensure balance in all components of Marine command and control. Marine leaders must be trained and educated to gain knowledge and understanding from lesser forms of information; they must be provided technologies that aid them in accessing the latter. The Marine Corps must remain vigilant in protecting the balance between providing too much and too little information to subordinates. While a belief that technology can provide "readymade wisdom" is dangerous, a failure to properly integrate suitable ones into our concept of command and control is equally so. To continue to be successful across the spectrum of operations, the Marine Corps must maintain the doctrine, leaders, systems and support structure that will allow greater decision superiority through information superiority.

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