

Standardization for Adaptability

Standardization of equipment, actions, and responses enable predictability in behavior of others in the same organization at sites distant in time or location from the event. This standardization contributes to predictability and gives the organization the ability to plan for contingencies.

When an event becomes less predictable or more dynamic members who respond can continue to expect certain actions from colleagues without the maintenance of direct and constant communication. As members adapt to changing requirements they continue to know what their colleagues will do which allows them to incorporate distant likely events into their own adaptability.

Standardization, then, contributes to the adaptability of an organization to changing events and environments. (*Note: This is standardization and predictability in the actions of others rather than their response to the event or the response of the event or environment to their actions.*) This may lead to the mistaken understanding that standardization is the goal and deviation is undesired.

This paper discusses how Maurice of Nassau used standardization in the Dutch Army to make it more mobile, flexible, and effective when fighting the larger Spanish Army.

Medieval War

Because the large size of medieval armies (up to 10,000 men) made them difficult to maneuver they fought against each other on a small front, sometimes of only a thousand yards, commanded by few officers. The infantry relied on the officers for orders, without which, and sometimes in spite of, the men would act in a random fashion, neither relying on the other soldiers nor knowing what they might do. Without the commander the army would fall into disarray. Sharpshooters, light infantry who did not target common soldiers, would shoot officers in an effort to leave the infantry without leadership.

For training purposes, to instill discipline, and develop physical fitness generals used drill and exercise. Once prepared, soldiers no longer practiced drill. The will to fight came from loyalty to one's captain with a deeper commitment from religious belief or the possibility of ransom from captured soldiers and officers. Alcohol and physical pressure also contributed and may have had been used to encourage the infantry to advance at the Battle of Agincourt (1415) (Keegan).

Infantry formations were unwieldy and had limited effectiveness. The pike, used in defense from cavalry, required the soldiers to keep a proper formation and required complex operations to move about on the battlefield. Firearms had limited accuracy and took more time to reload which reduced the number of volleys compared to an archer. Arrows were faster but it took longer to train an archer in the use of the longbow, the principal weapon for distant attacks. The length of time for training an archer in the longbow limited the size of an army and its ability for rapid expansion.

The construction of a medieval firearm also had great variance which decreased its effectiveness in battle. Medieval weapons making was a craft with the form of the weapon deliberately unique to that artisan. This contributed to difficulties in training and use of the firearm during battle.

A common formation in medieval war was the 3,000-man *Tercio* (“one third”), also called the *Tercio Español* or Spanish Square. The Spanish made great use of randomly placed infantry, cavalry, pikeman, swordsmen, and firearms (arquebusiers) to form this mutually supportive formation. This dominated warfare for several hundred years until Dutch innovations led by Maurice of Nassau.

Maurice of Nassau

Maurice of Nassau, a mathematician, had studied *Politicorum Libri Sex*, written by Justus Lipsius at the University of Leiden. This book was a theoretical foundation to reform the military with a focus on fostering values of will, reason and discipline along Roman ideals. Along with a cousin, Louis of Nassau, Maurice studied the Roman General Aelian’s *Tactics* which described repeated drilling and the use of the phalanx with interchangeable javelin and sling-shot throwers, and soldiers forming and reforming ranks.

Prince Maurice, along with William and John of Nassau, applied these studies, mathematics, and engineering to the study of warfare with their innovations achieving military success without high casualties against larger forces.

Maurice developed a 43-step drill for firing the musket which was written into an illustrated manual by Jacob de Gheyn between 1596-1598 under the supervision of Prince John in 1607 (*Exercise of Arms*). This became known as the “Dutch Drill.”

By standardizing warfare they could study it. Through study warfare became a science and military education now could take place in the academic setting beyond the experience of the battlefield. Simon Stevin, one of their colleagues, became the chair for Fortification (combat engineering) at the University of Leiden in 1600 where he also developed the engineering school. Later, Count John founded the *Schola Militaris*, the first military academy, in his capital of Siegen (1616), in western Germany. The first director of the academy, Jonan Jakob von Wallhausen, published manuals on the practice of Dutch warfare.

Curiously, Rene Descartes joined the Dutch Army at this time to study the art of warfare. He would later ponder that, by thinking, he is.

Innovations of Maurice of Nassau

To some extent *early modern warfare* describes the change from medieval warfare with large numbers of soldiers on a narrow front closely commanded by a general to modern warfare with the use of firearms along wide battlefronts. Because the most visible change comes from firearms and gunpowder one can easily see this early modern warfare as technology change, associated with gunpowder.

However, early modern warfare also developed from Dutch social change in warfare, from fortifications, use of drill for coordinated use of firearms, and the social hierarchy of command. These changes created *early modern warfare*.

Standardized weapons For consistent firing results in the weapon Maurice called for standardized weapons manufacturing. With these new, more reliable weapons Dutch troops were drilled on how to maneuver with them.

Countermarch With his use of drill to he could use the concept of interchangeable soldiers to develop the “volley” technique of firing a volley then marching counter to those moving forward with loaded firearms, a maneuver called the “countermarch”. This could maintain a rapid steady fire against the *tercio*. He demonstrated this at the Battle of Nieuwpoort (1600) where a smaller more adaptive military force could battle the larger *tercio* on an even basis. This counter march enabled Maurice to place men in smaller formations with an increase in maneuverability.

Drill Maneuverability at several levels came from drills. Individual musketeers drilled in the steps to load their firearm. Groups of musketeers drilled in the countermarch. Groups of pikeman drilled in deployment and redeployment during battle. Then groups of infantry, musketeers, and pikeman drilled in group movement. Count John developed the illustrated drill manual to standardize the drills and improve training. Not only did this require continuous drill but also the discipline to perform this maneuver during battle.

Group behavior Maurice integrated men into functioning units then into larger groups. Individual heroism faded from battle as success depended on each soldier performing as drilled. If someone fell in battle, his replacement would step in joining the unified actions of the group. Though soldiers became interchangeable in a maneuverable military machine Maurice integrated them into a unit rather than the random placement in the *tercio*. This required Maurice to break existing social relations to meet the needs of the unit over standard, accepted warrior relationships.

Tactics Maurice studied the tactics of the Roman legion which used small units to make a longer, though shallower, front. He believed that a longer front could bring more firepower against the stronger, more compact, *tercio*.

Leadership Officers no longer led because of their birth but because they had the ability to implement defined, rational rules. Authority came from what the officer knew rather than who he was. With better leadership Maurice could decrease the size of the infantry unit for better responsiveness. Smaller units allowed officers to give more specific orders in battle when adapting to changing circumstances. This now required the average soldier to have more intelligence and use more initiative. The customary hierarchies of royalty leading large bodies of men into combat gave way to well-drilled platoons with leadership that could adapt to changing events during battle.

Results

Armies grew more mobile, flexible, and effective and a smaller army could now attack a larger army with success.

Universal rules coordinated movements on the battlefield and were carried out by leadership authority made legitimate from institutional knowledge rather than personal or social rank. Standardized rules were now universal across time and location on the battlefield which produced soldiers who worked as a unit making them capable of complex maneuvers.

Command developed based on time and placement of the soldier or unit rather than from a hierarchical social network. Generalizable laws could be interchanged to coordinate individual movements for attack and adaptation to changing events. Rational authority gave legitimacy to leadership based on knowledge rather than social position or social rank.

Commanders now had control of individuals across a battlefield. Soldiers now had the obedience and discipline to move together as a unit rather than the former freedom to act as will, including the freedom to flee at will.

The quality of a soldier came from his ability to follow the instructions of his supervisor rather than his social position or individual qualities. Individuals could be taught the rules which produced the desirable qualities of a soldier rather than the character of the man. The soldier was not born, he could be made.

George Yardly, governor of Virginia, brought it to the New World in 1616. He had been a volunteer in the Dutch army.

King Gustavus Adolphus of Sweden was the first commander to demonstrate the success of this model at the Battle of Breitenfeld in 1631.

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Rene Descartes joined the Dutch Army in 1618 to learn the art of war from Prince Maurice, William, and John of Nassau. The Dutchmen applied mathematical innovations to the art of war producing military successes without high casualties. While in the Dutch Army he learned military engineering and the use of the Dutch Drill, the method used to teach maneuvering with the new weapons such as firearms. Executed well it makes the soldiers appear to function as automata, or machines, in a mechanistic manner.

This may have inspired Descartes to view animals and humans as mechanisms like any machine without a mind or soul. In his later work he would describe the body as a machine with motion that follows the laws of physics. If this were true, the mind, or soul, was not a material part of the animal's actions nor did the mind follow the laws of physics. While the mind and body interacted with each other it was bidirectional through the pineal gland.

Simon Stevin (1549 – 1620) was a Flemish engineer and mathematician who worked with Maurice in the development of fortification design. He introduced the decimal system to Europe in his book *Disme, The Arts of Tenths or Decimal Arithmetike* which inspired Thomas Jefferson to propose the decimal system for currency in the United States.

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