



Chesapeake Chapter
INCOSE

International Council on Systems Engineering

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Feature Article

Systems Engineering in the Roman Empire

by George Anderson



The leadership in the Roman Empire was generally known to have paid a lot of attention to efficiency and good governance.

Almost everything we know about this is documented in surviving details from contemporary

writings and corroborated by archaeological examinations of sites and period artifacts.

At various times in history subsequent to the end of the Roman era, historians have admired the wisdom that was revealed in these writings and some have tried to apply it to their own contemporary problems. It is somewhat uncanny how each generation including those currently alive become energized by discovering parallels from the past and our present circumstances. Some have glibly dismissed this as just the satisfaction of knowing “how the movie ended” but it is far more, as we shall see.

One such surviving document was the work of a Roman citizen named Flavius Vegetius Rhenatus. He lived between 300 and 400AD and wrote what today could be considered a process improvement proposal for the Emperor Valentinian. At some point after 378AD, Valentinian was just a little bit concerned with military readiness levels. His Legions had been deteriorating in various evaluations and he suspected that he needed to consider some type of reorganization and process reengineering.

Vegetius would have done well working for Booz Allen in 2010 AD because it appears that he thoroughly understood how to approach the Emperor’s consulting problem and use documented data to substantiate his recommendations. While there is some evidence that Vegetius’ work may have become Roman shelf-ware shortly after its delivery, the wisdom

[Return to
Newsletter](#)



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**NASA's
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**Date: Aug 3, 2010,
1:00 pm**

**Presentation: *The Need
for Systems Engineering
in Technology***

revealed in it bears a brief examination as it appears frequently in European writings dating from the 10th century onwards.

The Roman Army then consisted of numbered legions each consisting of approximately 8000 men. While the number of legions varied based on the need, a legion was the basic unit of deployment. Legions were self-contained with their own life cycle support. They were capable of deploying and operating independently for years. The stories of earlier Roman military exploits such as those of Caesar's X (10th) legion in Gaul have fascinated generations of American college students until military history disappeared from college curriculums in the early 1990s. Now, one has to download that military history from the free book section on a Kindle.

Vegetius decomposed the problem down into three areas: Training, Organization, and Deployment strategy. His intent was to describe an acceptable baseline of performance that could be validated and vouched for by other experts. There was only one source for his data since he had no personal military record. This source was almost certainly the body of knowledge created by earlier Roman writers who had written of past victories and the details of military science as it was practiced. Today, we might imagine these were the forerunners of today's journalists along with a few philosophers and a very few scientists or natural philosophers.

Vegetius was a focused researcher with modern qualities in that he described processes and the desired outcomes. He had the normal politically correct overlay of his day and would be very savvy if he could see some of today's technical reports that insert mantra-like paragraphs on green power, sustainable growth or empowering the work force. He would also find Scott Adams' DILBERT relevant but not reportable to Valentinian.

A summary in modern terms of his basic message to the Emperor was: "If you return to practices followed by the earlier Emperors in the way you train, organize and equip your legions, you will have a superior military force. You will also have to work on the leadership thing and make sure you have Roman citizens running the show. Those Gauls are good soldiers but many of them are still sending money back to their families across the Danube every month and we need to worry about their loyalties."

Vegetius, Part I. Training the Legion

The Roman Army training process consisted of just 15 areas of performance. This was further divided into what we today would term:

Human resources and recruiting
Basic Training
Continuation Training.

Development Programs

Speaker:

John Thomas; President Elect, INCOSE; Senior Vice President at Booz Allen Hamilton

Also:

Presentation: [Overview of INCOSE and the Chesapeake Chapter](#)

Speaker:

George W. Anderson
President; Chesapeake INCOSE Chapter;
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Date: 15 September 2010

Presentation:

Cybersecurity - Just Another 'Y2K'?

Speaker: J.O. McFalls;
Point One

[>>download Sept flyer HERE<<](#)

Date: 20 October 2010

Presentation: *Human Systems Integration*

Speaker: John Winters, CHFP; Basic Commerce and Industries, Inc.

Date: 17 November 2010

Presentation: *Panel: Cyber-Security*

Speakers: Various

It is interesting to note that the Roman soldiers training and currency records included very few items but ones that clearly resonate across the centuries.

- Small unit Drill
- Sword practice
- Bow Sling and Javelin
- Vaulting and proper ways to lift heavy loads
- Entrenching Camps
- Marches

Vegetius, Part II. Legion Organization

This section covers the organization chart, the job descriptions and duties of each member of a Roman Legion. The operation of an 8000, man organization was very dependent on strict adherence to clearly promulgated and carefully followed processes. While this concept resonates with today's process improvement experts, the means that were used to achieve it are not as welcome. Flogging as a disciplinary measure faded somewhere in the early 19th Century and the jury is still out on what modern incentive should take its place. Discipline, regardless of its distasteful history in the Roman Army, overwhelmingly accounted for success on the battlefield and Vegetius repeatedly drove this point home. We cannot escape facing up to and mastering this challenge today in every complex organizational system we create or reengineer.

Vegetius, Part III. Deploying the Legion

This section is the largest of Vegetius' work. There was a lot of what the Romans would probably call technical issues involved in deploying a Legion for combat. Leadership had to be concerned with all the timeless factors. These included: health, logistics, terrain, weather, order of battle, intelligence, mutiny, and so on. What was not a timeless factor was a discussion of fighting with or against chariots and elephants. Not useful for us today, but hard to resist a quick look.

Strategy and tactics would have been classified secrets and perhaps only provided to those with a need to know. The combination of good strategy, repeatable and executable tactical maneuvers and strong discipline created the baseline for Vegetius' key recommendations on deployment.

It is really interesting to speculate about what Vegetius might have left out of his study. Were there other items that he should have addressed? If he had possessed a modern process improvement framework, would it have helped him to be more complete? Was research and development a cost item in the Emperor's annual defense budgets? Were joint operations (navy and army) a bridge too far? What were the positive supporting elements of

Roman culture, law and societal customs?

Why were the Romans able to maintain their superiority for such a long time even though their enemies in many cases represented cultured and highly developed states?

These are questions that will not be answered here but will undoubtedly be addressed in the future if the interest in Vegetius continues its 16 plus century run.

I have done my part to remind you of his significance to the (military) history of process improvement and I will provide links for those systems engineers that want to learn more about chariots and elephants.

Further reading:

[Epitome of military science](#)

<http://www.pvv.ntnu.no/~madsb/home/war/vegetius/>

http://en.wikipedia.org/wiki/Publius_Flavius_Vegetius_Renatus

http://penelope.uchicago.edu/~grout/encyclopaedia_romana/gladiators/vegetius.html

<http://www.livius.org/caa-can/caesar/legions.html>

[Return to Newsletter.](#)



This article is from the monthly newsletter for INCOSE Chesapeake, a local chapter of INCOSE International. We are a not-for-profit organization dedicated to providing a forum for professionals practicing the art and science of Systems Engineering in the Northern & Central Maryland & Southern Pennsylvania area.

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