



## **Program Executive Office for Simulation, Training & Instrumentation**

# The Digital Long Tail of Military Simulation Systems

Roger Smith  
US Army PEO STRI  
[roger.smith@peostri.army.mil](mailto:roger.smith@peostri.army.mil)

**MITRE**

Serious Games: Tech Trends and Applications  
MITRE Technical Exchange Meeting II  
25 April 2007, McLean, VA



# Long Tail Abstract

The high power and low cost of computer games has the potential to enable the emergence of a “Long Tail” in military simulation systems. They will allow us to create and deploy hundreds of different training systems, rather than focusing all of our energy and funding on a few systems that represent combat vehicle operations and command and staff activities.

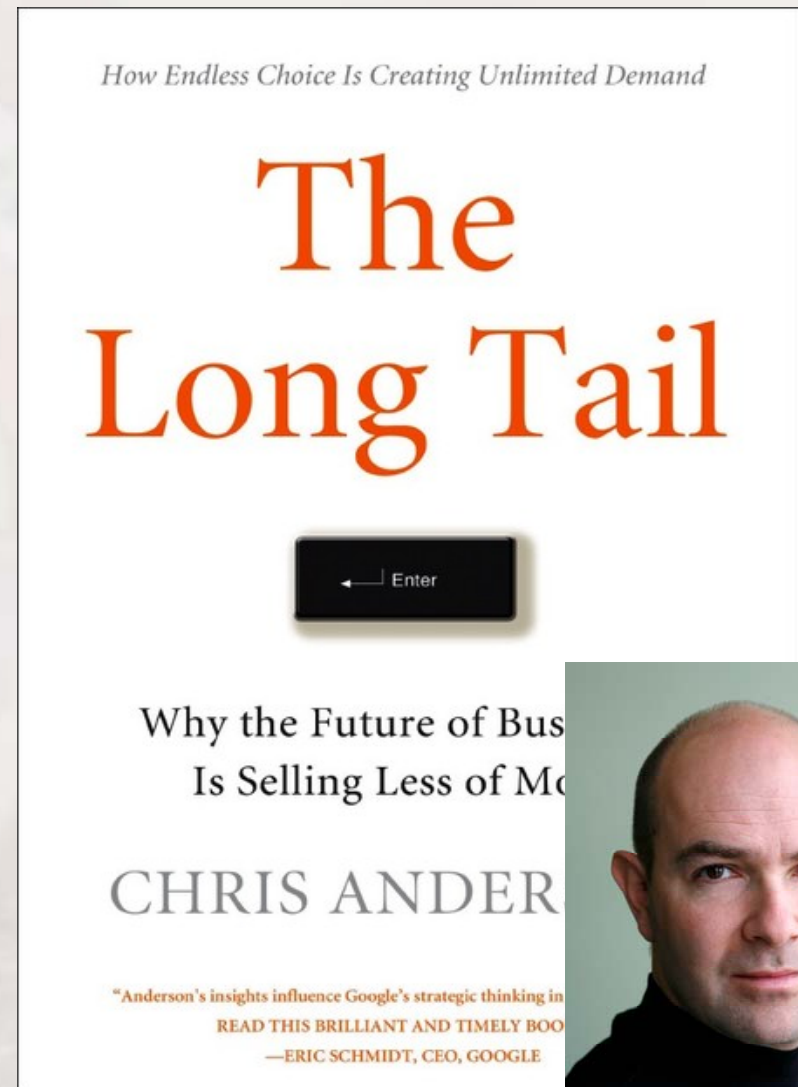
The concept of the Long Tail was introduced by Chris Anderson in his 2004 *Wired* magazine article and expanded in his 2006 book of the same name. Anderson describes how the Internet changed the market forces for delivering information products like music, movies, and software. Once the cost barriers of creating, delivering, stocking, and selling physical products was broken by digital delivery, it became very profitable to sell digital songs that fall far below the “Top 40” titles. His research indicates that there is a very robust market for songs all the way down to the 100,00th most popular song – the long tail of the curve of popularity and consumption. Digital storage and delivery makes it profitable to “stock” and sell all of these titles through services like iTunes, Rhapsody, and Napster.

Computer games enable the same transformation in military training systems. The relatively low cost and high quality of commercial game engines and tools can make it possible to create custom simulations that focus on niche operations and do so at significantly lower costs by comparison with traditional training simulation projects. Rather than a simulation project costing \$100 million to create a system, game technologies may allow us to create training environments at various scales from \$10 million to \$10 thousand.

Potentially, the future of games in simulations is the creation of several hundred niche training systems to serve hundreds of military occupational specialties (MOS's), rather than just cost reductions and visual enhancements to established simulation training applications. This is a potential future that is being explored by technology and management leaders at Army PEO-STRI.

# The Long Tail

- Local Markets
- Physical products, delivery, and stocking
- Requires concentration into the “Top 100” products.
  
- Global Markets
- Digital products, instant delivery, and free stocking
- Allows diversification into the “Top 100,000” products.





# The Long Tail of Digital Music

## ANATOMY OF THE LONG TAIL

Online services carry far more inventory than traditional retailers. Rhapsody, for example, offers 19 times as many songs as Wal-Mart's stock of 39,000 tunes. The appetite for Rhapsody's more obscure tunes (charted below in yellow) makes up the so-called Long Tail. Meanwhile, even as consumers flock to mainstream books, music, and films (right), there is real demand for niche fare found only online.

### RHAPSODY

TOTAL INVENTORY:  
735,000 songs



### AMAZON.COM

TOTAL INVENTORY:  
2.3 million books



### NETFLIX

TOTAL INVENTORY:  
25,000 DVDs



## THE NEW GROWTH MARKET: OBSCURE PRODUCTS YOU CAN'T GET ANYWHERE BUT ONLINE





# The Long Tail in Internet Search

## Understanding the Tail

### 1 The Head

- The mainstream, e.g. obvious terms, choices, etc.
- Generally the highest volume individually
- The only choices in a non-fragmented world

### 2 The Tail

- The bottom portion of the iceberg
- Not always obvious, individually often low volume
- Opportunity for aggregation





# iTunes Long Tail of Sales

In 2004 Apple iTunes contained about 1 million songs.

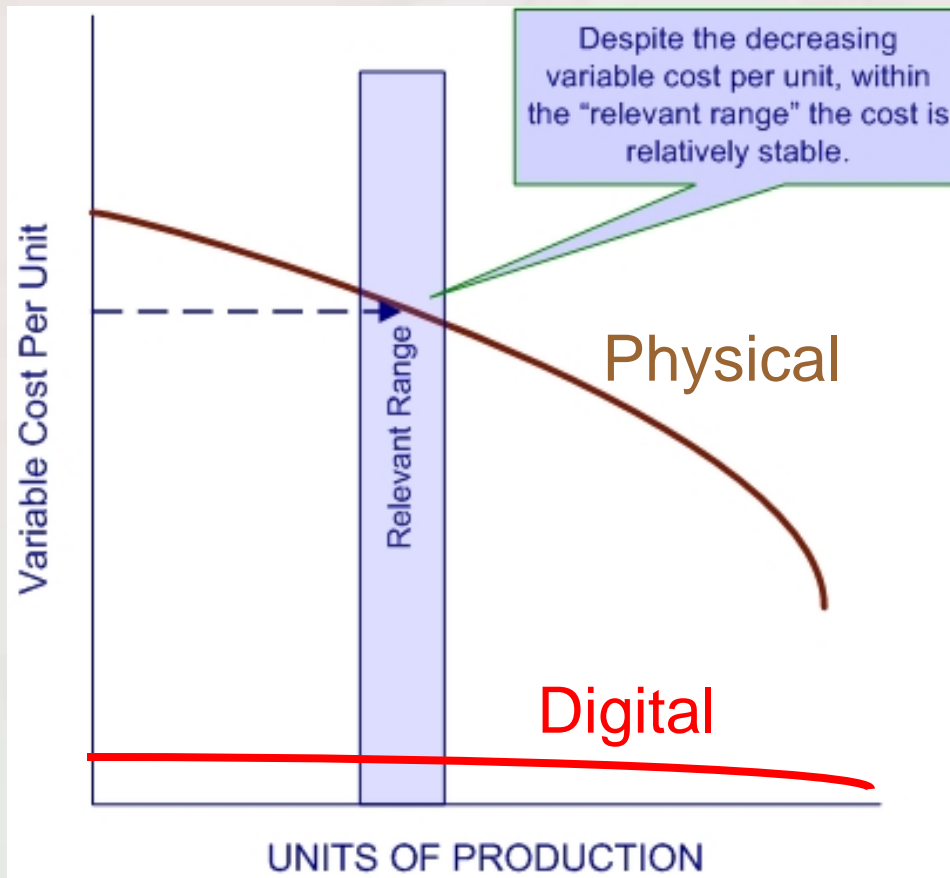


Question:  
What percentage of those sold at least 1 copy per business quarter?

**Answer: 100%**



# Important Cost Enabler



- Product Development = \$\$\$ (fixed)
- Duplication Costs = ~ \$0 (variable)
- Stocking Costs = ~ \$0 (variable)
- Delivery Costs = ~ \$0 (variable)

- Product Cost = Fixed Costs + Variable Costs
- Since variable costs are almost zero, a product must only return a one-time fixed cost to be profitable

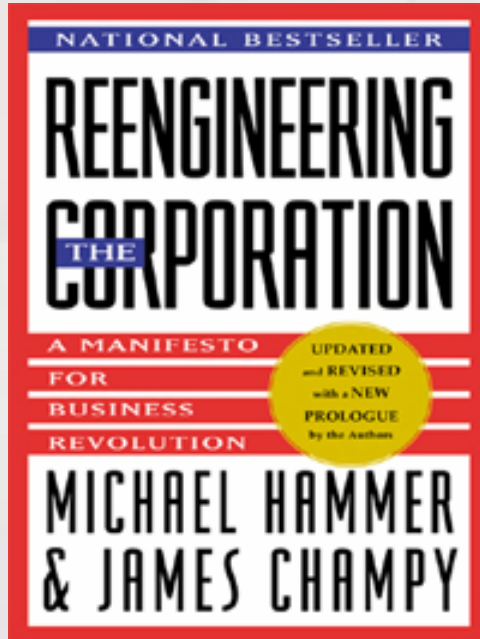


# Simulation's Short Tail





# The Enabling Role of IT



(Hammer & Champy, 1993)

“The power of the Xerox copier did not lie in its capability to replace carbon paper and other existing copying technologies, but in its ability to perform services beyond the reach of these technologies. The 914 [copier] created a market for convenience copies that had previously not existed.”

This is the power of game technologies. They create or enable a new need and then satisfy it.



# Simulation's Long Tail

Trigger Pullers  
Combat Missions  
Life Threatening

\$50M project



Medical  
Logistics  
Intelligence

\$1M project



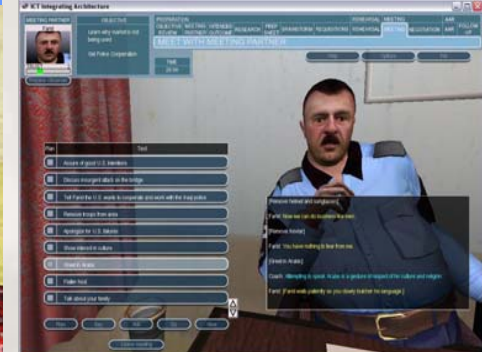
Signal/IT  
Linguist  
Interrogation

\$100K project



Ethics  
Culture  
Public Affairs

\$10K project





# Simulation Long Tail Enablers

## IT Infrastructure

- Computer for Every Soldier
- Decent Network to Every Unit

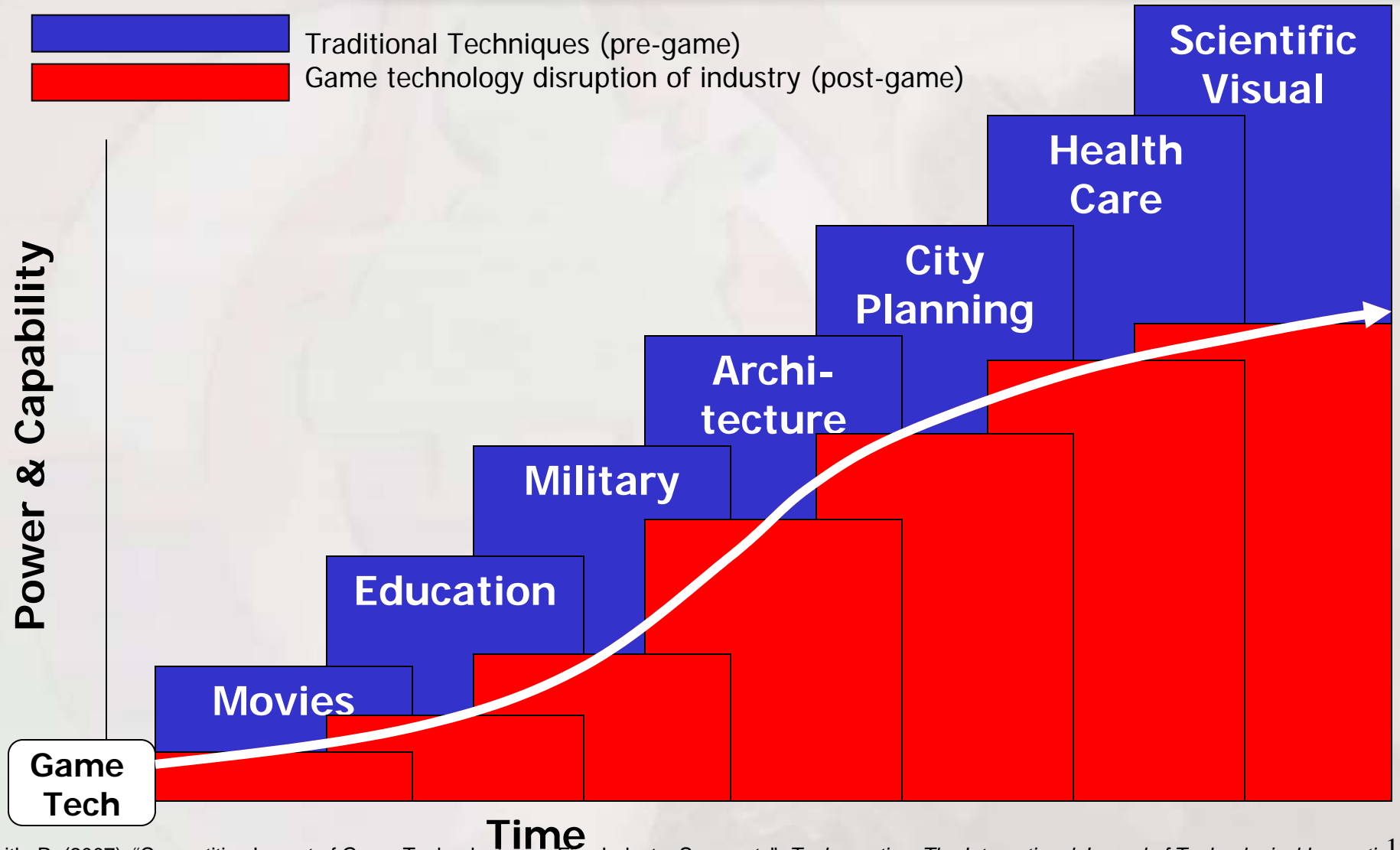
- 24/7 Simulation Server Farms
- Downloadable Simulation Clients

- Scenario Building Tools and Services
- Self Explanatory User Interface

## Game Technology



# Entering Multiple Industries





# U.S. Army Military Occupational Specialties

## Enlisted MOS

### Infantry Branch

11B Infantryman  
11C Indirect Fire Infantryman  
11X Infantryman (ambiguous; turns into 11B, 11C, or 11M)  
11Z Infantry Senior Sergeant  
11H Infantry Anti-Armor Specialist  
11M Mechanized Infantryman

### Field Artillery Branch

13B Cannon Crewmember  
13C TAC Fire Operations Specialist  
13D Field Artillery Tactical Data Systems Specialist  
13E Cannon Fire Direction Specialist  
13F Fire Support Specialist  
13M Multiple Launch Rocket System Crewmember  
13P MLRS/LANCE Operations Fire Directions Specialist  
13R Field Artillery Firefinder Radar Operator  
13S Field Artillery Surveyor  
13W Field Artillery Meteorological Crewmember  
13X Field Artillery Enlistment Option  
13Z Field Artillery Senior Sergeant

### Air Defense Artillery Branch

14E Patriot Fire Control Enhanced Operator/Maintainer  
14J Early Warning System Operator  
14M Man Portable Air Defense System Crewmember  
14R Bradley Linebacker Crewmember  
14S Avenger Crewmember  
14T PATRIOT Launching Station Enhanced Operator/Maintainer

14Z Air Defense Artillery (ADA) Senior Sergeant

### Aviation Branch

15B Aircraft Powerplant Repairer  
15D Aircraft Powertrain Repairer  
15F Aircraft Electrician  
15G Aircraft Structural Repairer  
15H Aircraft Pneumatic Repairer  
15J OH-58D Armament/Electrical/Avionics Systems Repairer  
15K Aircraft Components Repair Supervisor  
15M UH-1 Helicopter Repairer  
15N Avionics Mechanic  
15P Aviation Operations Specialist  
15Q Air Traffic Control Operator  
15R AH-64 Attack Helicopter Repairer  
15S OH-58D Helicopter Repairer  
15T UH-60 Helicopter Repairer  
15U Medium Helicopter Repairer  
15V Observation/Scout Helicopter Repairer  
15X AH-64 Armament/Electrical Systems Repairer  
15Y AH-64D Armament/ Electrical Systems Repairer  
15Z Aircraft Maintenance Senior Sergeant

### Special Forces Branch

18B Special Forces Weapons Sergeant  
18C Special Forces Engineer Sergeant  
18D Special Forces Medical Sergeant  
18E Special Forces Communications Sergeant  
18F Special Forces Assistant Operations & Intelligence Sergeant  
18X Special Forces Candidate  
18Z Special Forces Operations Sergeant

### Armor Branch

19D Cavalry Scout  
19K Armor Crewmember  
19Z Armor Senior Sergeant  
**Corps of Engineers Branch**  
21B Combat Engineer (Formally 12B)  
21C Bridge Crewmember  
21D Diver  
21E Heavy Construction Equipment Operator  
21G Quarrying Specialist  
21H Construction Engineer  
21J General Construction Equipment Operator  
21K Plumber  
21L Lithographer  
21M Firefighter  
21N Construction Equipment Supervisor  
21P Prime Power Production Specialist  
21Q Transmission and Distribution Specialist  
21R Interior Electrician  
21S Topographic Surveyor  
21T Technical Engineering Specialist  
21U Topographic Analyst  
21V Concrete and Asphalt Equipment Operator  
21W Carpentry and Masonry Specialist  
21X General Engineering Supervisor  
21Y Topographic Engineering Supervisor  
21Z Combat Engineering Senior Sergeant

**Signal Corps Branch**  
25B Information Systems Operator Analyst (*to be renamed Information Technology Specialist in Oct'07*)  
25C Radio Operator Maintainer  
25D Telecommunications Operator/Maintainer (*to be deleted in Oct'07*)  
25F Network Switching Systems Operator/Maintainer  
25L Wire Systems Installer  
25M Multimedia Illustrator  
25N Nodal Network Systems Operator/Maintainer  
25P Microwave Systems Operator/Maintainer  
25Q Multichannel Transmission Systems Operator  
25R Visual Information/Audio Equipment Repairer  
25S Satellite Communication Systems Operator/Maintainer

25T Satellite/Microwave Systems Chief  
25U Signal Support Systems Specialist  
25V Combat Documentation & Production Specialist  
25W Telecommunications Operations Chief  
25X Senior Signal Sergeant  
25Y Information Systems Chief (*to be deleted in Oct'07*)  
25Z Visual Information Operations Chief

**Judge Advocate General Branch**  
27D Paralegal Specialist

**Military Police Corps Branch**  
31B Military Police  
31D CID Special Agent  
31E Internment/Resettlement Specialist

**Military Intelligence Branch**  
33W (35T) MI Systems Maintainer/Integrator  
96B (35F) Intelligence Analyst  
96D (35G) Imagery Analyst  
96H (35H) Imagery Ground Station Operator  
96R (35H) Ground Surveillance Systems Operator  
96U (35K) Unmanned Aerial Vehicle Operator  
96Z (35X) Intelligence Senior Sergeant  
97B (35L) Counterintelligence Agent  
97E (35M) Human Intelligence Collector  
97L (35Q) Translator/Interpreter  
97Z (35Y) Counterintelligence/Human Intelligence Senior Sergeant  
98C (35N) Signal Intelligence Analyst (Linguist)  
98G (35P) Cryptologic Linguist  
98P (35U) Multi-Sensor Operator  
98Y (35K) Signals Collector/Analyst  
98Z (35Z) Signals Intelligence Senior Sergeant  
09L (35V) Translator Aide  
05h EW/SIGINT Morse Intercept Operator

**Psychological Operations Corps Branch**  
09L (35V) Translator Aide  
05h EW/SIGINT Morse Intercept Operator

**Civil Affairs Branch**  
38B Civil Affairs Specialist  
**Adjutant General Branch**  
42A Human Resource Specialist  
42F Human Resource Systems Information Specialist  
42L Administration Specialist (*to be deleted*)  
42R9B Trumpet Player  
42R9C Baritone or Euphonium Player  
42R9D French Horn Player  
42R9E Trombone Player  
42R9F Tuba Player  
42R9G Flute or Piccolo Player  
42R9H Oboe Player  
42R9J Clarinet Player  
42R9K Bassoon Player  
42R9L Saxophone Player  
42R9M Percussion Player  
42R9N Piano Player  
42R9T Guitar Player  
42R9U Electric Bass Guitar Player  
42S Special Band member

### Military Intelligence Branch

**Finance Branch**  
44C Finance Specialist/Accounting Specialist  
**Public Affairs Branch**  
46Q Public Affairs Specialist  
46R Broadcast Journalist  
46Z Public Affairs Chief  
**Chaplain Branch**  
56M Chaplain Assistant

**CMF 63 - Mechanical Maintenance**  
44B Metal Worker  
44E Machinist  
45B Small Arms/Artillery Repairer  
45G Fire Control Repairer  
45K Armament Repairer  
52C Utilities Equipment Repairer  
52D Power Generation Equipment Repairer  
62B Construction Equipment Repairer  
63A M1 Abrams Tank Turret Mechanic/M1 Abrams Tank System Mechanic  
63B Light-Wheel Vehicle Mechanic/Heavy Wheel Vehicle Mechanic/Wheel Vehicle Repairer  
63D Artillery Mechanic  
63H Fuel and Electrical Repairer/Track Vehicle Mechanic  
63J Quartermaster and Chemical Equipment Repairer  
63M M2-3 Bradley Fighting Vehicle System Mechanic/Bradley Fighting Vehicle Systems Turret Mechanic  
63X Track Vehicle Repairer  
63W All Wheel Vehicle Repairer  
63Z Mechanical Maintenance Supervisor

**Medical Department Branches**  
68A Medical Equipment Repairer  
68D Operating Room Specialist  
68E Dental Specialist  
68G Patient Administration Specialist  
68H Optical Laboratory Specialist  
68J Medical Logistic Specialist  
68K Medical Laboratory Specialist  
68M Hospital Food Specialist  
68P Radiology Specialist  
68Q Pharmacy Specialist  
68R Veterinary Food Inspection Specialist  
68S Preventive Medicine Specialist  
68T Animal Care Specialist  
68V Respiratory Specialist  
68W Health Care Specialist (aka Combat Medic)  
68X Mental Health Specialist  
68Z Chief Medical NCO

**Chemical Branch**  
74D Chemical Operations Specialist (formerly 54B)  
**CMF 79 - Recruiting and Retention**  
79R Recruiter Noncommissioned Officer  
79S Career Counselor  
79T Recruiting and Retention NCO  
79V Retention and Transition Noncommissioned Officer

**Transportation Branch**  
88H Cargo Specialist  
88K Watercraft Operator  
88L Watercraft Engineer  
88M Motor Transport Operator  
88N Traffic Management Coordinator  
88P Railway Equipment Repairer  
88T Railway Section Repairer  
88U Railway Operations Crewmember  
88Z Transportation Senior Sergeant

**Ordnance Branch**  
89B Ammunition Specialist  
89D Explosive Ordnance Disposal Specialist  
**Quartermaster Corps Branch**  
92A Automated Logistical Specialist  
92F Petroleum Supply Specialist  
92G Food Service Specialist  
92L Petroleum Laboratory Specialist  
92M Mortuary Affairs Specialist  
92R Parachute Rigger  
92S Shower/Laundry and Clothing Repair Specialist  
92W Water Treatment Specialist  
92Y Unit Supply Specialist  
92Z Senior Noncommissioned Logistician

**CMF 94 - Electronic Maintenance**  
94A Land Combat Electronic Missile System Repairer  
94D Air Traffic Control Equipment Repairer  
94E Radio and Communications Security Repairer  
94F Special Electronics Devices Repairer  
94H Test, Measurement & Diagnostic Equipment Support Specialist  
94K Automatic Test Equipment Operator/Maintainer  
94L Avionics Communications Equipment Repairer  
94M Radar Repairer  
94P Multiple Launch Rocket System Repairer  
94R Avionics System Repairer  
94S Patriot System Repairer  
94T Avenger System Repairer  
94W Electronic Maintenance Chief  
94Y Integrated Family of Test Equipment  
94Z Senior Electronic Maintenance Chief

**Branch Immaterial (not oriented to a branch)**  
00Z Command Sergeant Major  
**Commissioned Officer & Warrant Officer MOS**  
Officer MOS's are usually two numerical digits plus a letter (most of the time "alpha"). Letterless MOS's are ambiguous and have several specific MOS's within the E.g. 62 contains 62A (Emergency Physician) and 62B (Field Surgeon).  
Warrant Officer MOS's (known as WOMOS) are three numerical digits plus a letter, except 09W who is not y WO.

**Officer Candidates**  
09R Cadet  
09S Officer Candidate  
09W Warrant Officer Candidate  
**Infantry Branch**  
11A Infantry Officer  
**Field Artillery Branch**  
13A Field Artillery Officer  
131A Field Artillery Targeting Technician  
**Air Defense Artillery Branch**  
14 Air Defense Artillery Officer  
140A Command and Control Systems Technician  
140E Air and Missile Defense (AMD) Tactician/Technician (Patriot Systems Technician)  
140X Air Defense Artillery (ADA) Immaterial



# U.S. Army Military Occupational Specialties

## Aviation Branch

15 Aviation Officer  
150A Air Traffic and Air Space Management Technician  
150U Tactical Unmanned Aerial Vehicle (TUAV)  
Operations Technician (still classified at 350K until  
official transfer to Aviation Branch)  
151A Aviation Maintenance Technician  
152C OH-6 Pilot  
152B OH-58A/C Pilot  
152D OH-58D Pilot  
152F AH-64A Pilot  
152H AH-64D Pilot  
153A Rotary Wing Aviator (Aircraft Nonspecific)  
153B UH-1 Pilot  
153D UH-60 Pilot  
153DD UH-60 MEDEVAC Pilot  
153E MH-60 Pilot  
154C CH-47D Pilot  
154E MH-47 Pilot  
155A Fixed Wing Aviator (Aircraft Nonspecific)  
155E C-12 Pilot  
155F Jet Aircraft Pilot  
155G O-5A/EO-5B/RC-7 Pilot

## Special Forces Branch

18A Special Forces Officer  
180A Special Forces Warrant Officer

## Armor Branch

19A Armor, General  
19B Armor  
19C Cavalry

## Corps of Engineers Branch

21A Engineer Officer  
210A Utilities Operation and Maintenance Technician  
215D Geospatial Information Technician (Old - Terrain  
Analysis Technician)

## Signal Corps Branch

25A Signal Officer  
250N Network Management Technician  
251A Information Systems Technician  
254A Signal Systems Support Technician  
255Z Senior Signal Systems Technician

## Judge Advocate General Branch

27A JAG Corps Attorney  
27B Military Judge  
270A Legal Administrator

## Military Police Corps Branch

31A Military Police Officer  
311A CID Special Agent

## Military Intelligence Branch

35D Military Intelligence Officer  
350F All Source Intelligence Technician  
350G Imagery Intelligence Technician  
350Z Attaché Technician  
350K (150U) Tactical Unmanned Aerial Vehicle  
Operations (*transferring to Aviation Branch in Summer  
07*)  
351L Counterintelligence Technician  
351M Human Intelligence Collection Technician  
351Y Area Intelligence Technician  
352N Traffic Analysis Technician  
352P Voice Intercept Technician  
352Q Morse Intercept Technician  
352R Emanations Analysis Technician  
352S Non Morse Intercept Technician  
353T Intelligence and Electronic Warfare Technician

## Psychological Operations Corps Branch

37A Psychological Operations Officer  
37X Psychological Operations Officer, Designated

## Civil Affairs Branch

38A Civil Affairs Officer  
38X Civil Affairs Officer, Designated

## Adjutant General Branch

42B Personnel Systems Management Officer  
42C Band Officer  
420A Military Personnel Technician  
420C Bandmaster

## Finance Branch

44A Finance Officer

## Chaplain Branch

56 Chaplain  
56A Command and Unit Chaplain  
56D Clinical Pastoral Educator

## Medical Department Branches

60A OPERATIONAL MEDICINE  
60B NUCLEAR MEDICINE OFFICER  
60C PREVENTIVE MEDICINE OFFICER  
60D OCCUPATIONAL MEDICINE OFFICER  
60F PULMONARY DISEASE/CRITICAL CARE  
OFFICER  
60G GASTROENTEROLOGIST  
60H CARDIOLOGIST  
60J OBSTETRICIAN AND GYNECOLOGIST  
60K UROLOGIST  
60L DERMATOLOGIST  
60M ALLERGIST, CLINICAL IMMUNOLOGIST  
60N ANESTHESIOLOGIST  
60P PEDIATRICIAN  
60Q PEDIATRIC SUB-SPECIALIST  
60R CHILD NEUROLOGIST  
60S OPHTHALMOLOGIST  
60T OTOLARYNGOLOGIST  
60U CHILD PSYCHIATRIST  
60V NEUROLOGIST  
60W PSYCHIATRIST

61A NEPHROLOGIST

61B MEDICAL ONCOLOGIST/HEMATOLOGIST

61C ENDOCRINOLOGIST

61D RHEUMATOLOGIST

61E CLINICAL PHARMACOLOGIST

61F INTERNIST

61G INFECTIOUS DISEASE OFFICER

61H FAMILY MEDICINE

61J GENERAL SURGEON

61K THORACIC SURGEON

61L PLASTIC SURGEON

61M ORTHOPEDIC SURGEON

61N FLIGHT SURGEON

61P PHYSIATRIST

61Q RADIATION ONCOLOGIST

61R DIAGNOSTIC RADIOLOGIST

61U PATHOLOGIST

61W PERIPHERAL VASCULAR SURGEON

61Z NEUROSURGEON

62 Medical Corps Officer

62A Emergency Physician

62B Field Surgeon

63 Dental Corps Officer

63A General Dentist

63B Comprehensive Dentist

63D Periodontist

63E Endodontist

63F Prosthodontist

63H Public Health Dentist

63K Pediatric Dentist

63M Orthodontist

63N Oral and Maxillofacial Surgeon

63P Oral Pathologist

63R Executive Dentist

64A Veterinary Corps Officer

640A Veterinary Services Food Safety Technician

65 Medical Specialist Corps Officer

65A Occupational Therapy

65B Physical Therapy

65C Dietitian

65D Physician Assistant

65X Specialist Allied Operations

66 Nurse Corps Officer

66B Community Health Nurse

66C Psychiatric/Mental Health Nurse

66E Perioperative Nurse

66F Nurse Anesthetist

66G Obstetrics and Gyneco

66H Medical-Surgical Nurse

66N Generalist Nurse

66P Family Nurse Practitioner

67 Medical Service Corps Officer

67A Health Services

67B Laboratory Sciences

67C Preventive Medicine Sciences

67D Behavioral Sciences

67E Pharmacy

67F Optometry

67G Podiatry

67J Aeromedical Evacuation

670A Health Services Maintenance Technician

70A Healthcare Administrator

70B Health Services Officer

70C Comptroller

70D Information Systems Manager

70E Patient Administrator

70F Human Resources Manager

70H Plans, Operations, Intelligence Training, and Security

70K Medical Logistics

70K9I Health Facilities Management

**Chemical Branch**

74A Chemical, General

74B Chemical Operations and Training

74C Chemical Munitions and Materiel Management

**Transportation Branch**

88A Transportation Officer

88D Transportation Officer - Motor/Rail

880A Marine Deck Officer

881A Marine Engineering Officer

882A Mobility Officer

**Ordnance Branch**

91A Ordnance Officer

890A Ammunition Technician

913A Armament Systems Maintenance Technician

914A Allied Trades Technician

915A Automotive Maintenance Technician

915E Senior Automotive Maintenance/Senior Ordnance

Logistics Officer

919A Engineer Equipment Maintenance Technician

**Quartermaster Corps Branch**

92A Quartermaster Officer

920A Property Accounting Technician

920B Supply Systems Technician

921A Airdrop Systems Technician

922A Food Service Technician

923A Petroleum Systems Technician

**CME 94 - Electronic Maintenance**

948B Electronic Systems Maintenance Technician

948D Electronic Missile Systems Maintenance Technician

948E Senior Electronics Maintenance Technician



# A Simulation for Every MOS?

- 316 unique MOS' listed
- For how many of these might a simulation/game be an effective training tool?
- Previously cost per simulator has limited the number of MOS' that the simulation community could serve.
- Digital product delivery may remove this limitation and allow us to serve all MOS' for which simulation products can be effective.



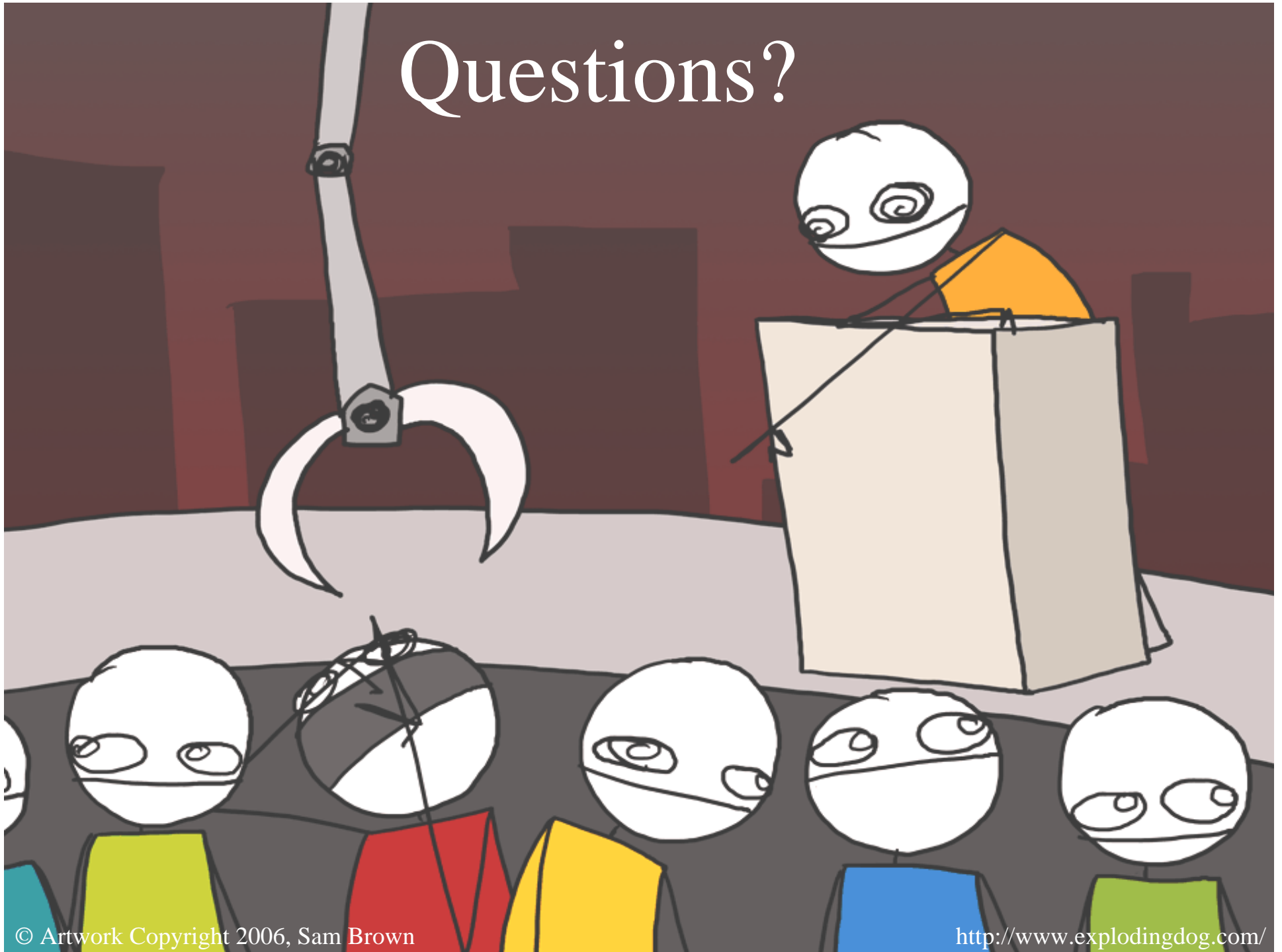


# Simulation's Long Tail

The future of simulation is creating unique trainers for smaller niches of users.

Small is Beautiful ... Projects, Systems, Communities

# Questions?





# References

- Anderson, C. (October 2004). "The Long tail". *Wired Magazine*, 12(10).  
<http://www.wired.com/wired/archive/12.10/tail.html>
- Anderson, C. (2006). *The Long tail: Why the future of business is selling less of more*. New York: Hyperion Books.
- Elmaghraby, S.E. (June 1968). "The role of modeling in IE design". *Industrial Engineering*, 6, pp. 292-305.
- Smith, R. (January 2006). "Technology disruption in the simulation industry". *Journal of Defense Modeling and Simulation*.  
<http://www.scs.org/pubs/jdms/vol3num1/JDMSvol3no1Smith3-10.pdf>
- Smith, R. (2007). "Game impact theory: Five forces that are driving the adoption of game technologies within multiple established industries". *Games and Society Yearbook*.  
[http://www.modelbenders.com/papers/Smith\\_Game\\_Impact\\_Theory.pdf](http://www.modelbenders.com/papers/Smith_Game_Impact_Theory.pdf)
- Smith, R. (2007). "Competitive Impact of Game Technologies on Five Industry Segments". *Technovation: The International Journal of Technological Innovation, Entrepreneurship and Technology Management*
- Wikipedia. (2007). "List of United States Army MOS".  
[http://en.wikipedia.org/wiki/List\\_of\\_United\\_States\\_Army\\_MOS](http://en.wikipedia.org/wiki/List_of_United_States_Army_MOS)