10TH INTERNATIONAL COMMAND AND CONTROL RESEARCH AND TECHNOLOGY SYMPOSIUM

The Future of C2

"Are DoD Network Centric Policies, Processes and Edge Organizations Sufficiently Adaptable to Adequately Respond to The Impact of Globalization?"

Topic: Policy
Date: June 2004

Presenter & Author: Jack Lenahan
Imagine-One Corporation
Office of The Chief Engineer
Space and NAVAL Warfare Systems Center
Charleston, South Carolina
Contact Information
Email – John.Lenahan@Navy.mil
Phone – 843-218-6080

Agenda

- The Issues
- Relevant Research – The AF Rand Study
- What is globalization?
- Supply Chain Vulnerability
- Nano Weapons – “Gray Goo” - Risk or Myth
- Access to Advanced Computational and other Technology Assets
- Business Architecture Models (BAM)
- Value Production Unit Models of Asset Transfer
- Conclusion and Assessment Tool Recommendations

The Issues

- **Are Supply Chain Integrity and U.S. Military Capability Advantages Threatened by Globalization?**
- **Force multiplication, increased awareness, better quality of data, improved decision making are all well known aspects of the benefits of net centricity. But does not increased globalization threaten to permit adversaries to exploit their own Network Centric Warfare (NCW) capabilities and also use more accessible GRID super-computational capabilities to accelerate advanced weapons systems development countering the U.S. advantage?**
- **Can the DoD adapt quickly enough to ensure that its current military edge is not eroded by globalization?**
- **Does unchecked globalization threaten to enable the mass proliferation of capability and weaponry including nano super weapons at the expense of the American warfighter?**

Relevant Research

- **In similar research related to this discussion, the Air Force has identified several globalization concerns in the definitive RAND Study. Particularly: "How are legitimate security of supply, technology transfer, and other technology security issues being handled, particularly in the new multipolar, multinational business environment?"**
- **The RAND study makes several key points:**
  - **"A review of DoD and Air Force policy documents identifies three overarching objectives that motivate Air Force concerns about globalization of the defense aerospace industrial base:**
    - **The need to equip aerospace forces with affordable yet highly capable weapon systems, both today and in the future (the economic and technological dimension);**
    - **The need to prepare the United States, its allies, and other friends to fight future wars as coalitions (the political-military dimension); and**
    - **The need to protect U.S. national security (the national security dimension)".**

Supply Chain Vulnerability

The continual outsourcing of critical systems development to firms with no loyalty to the US is a direct threat to our security. There must be boundaries established which make sense in terms of defending the key economic infrastructure segments from continual business architecture decomposition, the risk being that the supply chain will become so complex and delicate, that terrorist interruption of that supply chain is made easier, not more difficult.

Nano Weapons & The “Gray Goo” Problem

- **“The problem, though, is what if a nano-assembler's programming went awry! Instead of building what we wanted it to build and then shutting down or going into maintenance mode, suppose that it and its progeny continued savaging the atomic material around them to build an unchecked swarm of nano-assemblers, which in turn build more nano-assemblers, ad nauseam. Consider that if these nano-assemblers have the ability to build nano-things, then they must necessarily also have the ability to UN-build the things around them as they mine atomic resources to feed their now out-of-control project! “**
  - **“This is the "gray goo" scenario previously popularized by Bill Joy**
  - **A weapon placed in the water near a passing carrier could attach itself to the structure and begin UN-Assembly & Reproduction - JL**
- **“In 1959, Richard Feynman pointed out that nanometre-scale machines could be built and operated, and that the precision inherent in molecular construction would make it easy to build multiple identical copies. This raised the possibility of exponential manufacturing, in which production systems could rapidly and cheaply increase their productive capacity, which in turn suggested the possibility of destructive runaway self-replication. Early proposals for artificial nanomachinery focused on small self-replicating machines, discussing their potential productivity and their potential destructiveness if abused. In the light of controversy regarding scenarios based on runaway replication (so-called 'gray goo'), a review of current thinking regarding nanotechnology-based manufacturing is in order. “**
  - **Source: Drexler & Pheonix**

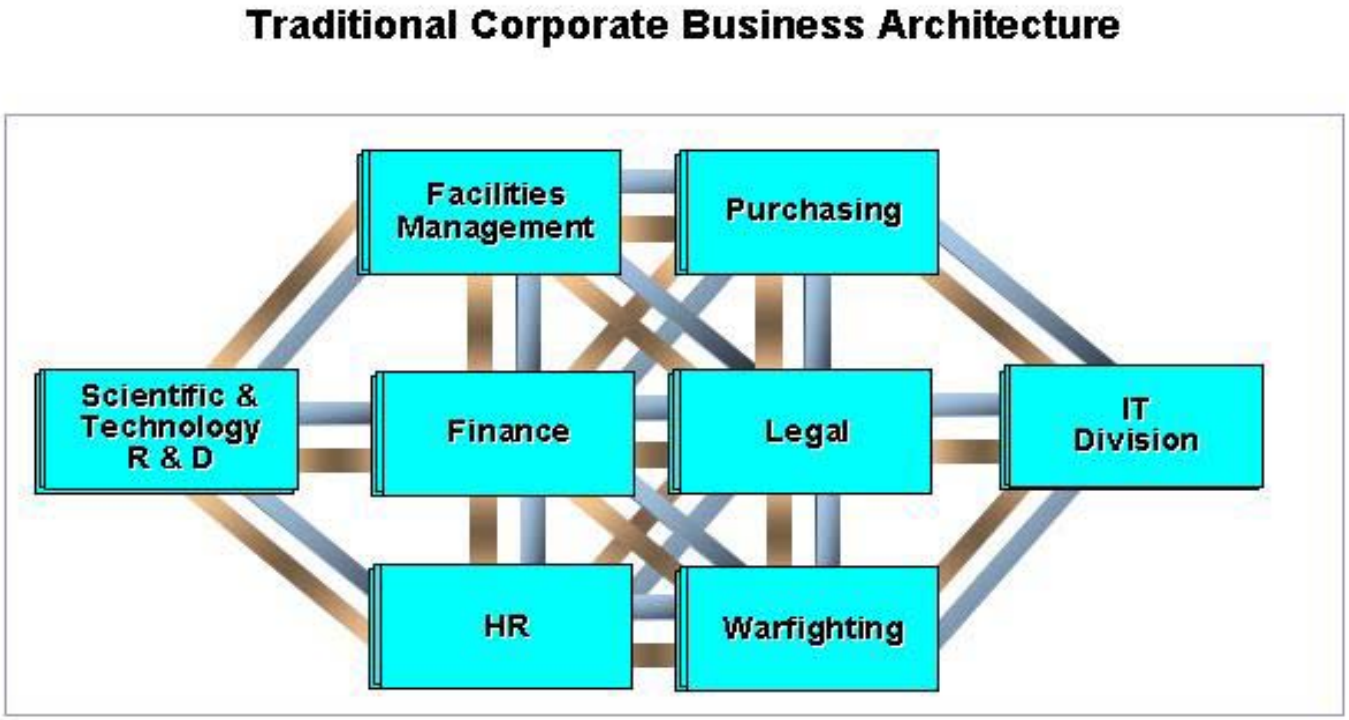
Adversary Network Centric Capabilities

- **One of the RAND studies major conclusions is "With respect to national security, ongoing economic integration may make it harder to control the spread of weapons and technology beyond our borders and those of our allies."**
- **I concur wholeheartedly with this research. It follows logically that "NCW like" capabilities can be quickly assembled by potential adversaries with the continued access to network and GRID computing resources made available by globalization. Globalized network assets and capabilities will permit adversaries to exploit much of the work being accomplished by DoD transformation efforts. Thus a potential adversary may have situational awareness, data access, and decentralization capabilities equivalent or close to the U.S. forces' capabilities.**

Adversarial Exploitation of U.S. Assets Particularly through the use of Brokered Services in the form of GRID Computational Resources

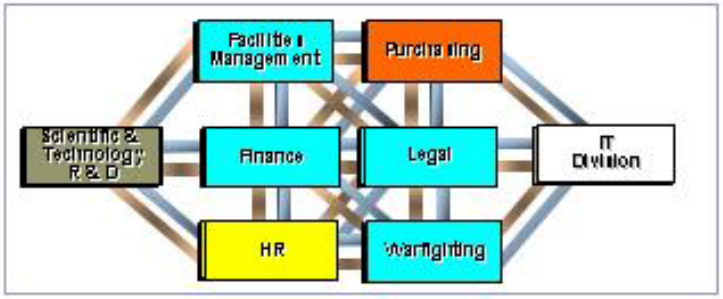
The other component that I would like to emphasize concerning globalization is the ease of access to super computing assets primarily enmeshed in GRIDS. The ability to submit complex and computationally intensive tasks (missile dynamics analysis, bio weapons design, molecular models needed for nano weapons research, aircraft aerodynamic design and analysis tasks for example), circumvents older trade policies which used to block sales of CRAY supercomputers and other high end technology assets to potential adversaries. The reason for those earlier trade policies was to slow down development of adversarial capabilities which may put our Armed Forces at risk. Globalization enabled, publicly available composeable GRID computation services, seem to put an end to the ability of the U.S. military to stay technically superior to any adversary very long. Longer delivery times of adversary aircraft and other high tech war fighting capabilities can now be reduced by globalization enabled web service based access to sophisticated computational capabilities, provided as brokered services by major U.S. technology companies.

Simple Business Architecture Model
Please note the well defined interfaces



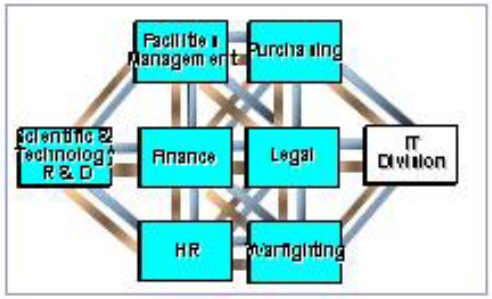
Simple Business Outsource Architecture Model

Business Units Partially Outsourced but Connected to Original Corporate Parent & Each Other–
Parent's Original Country Loyalties, Capability, Knowledge, Capital Not Lost or Transferred to Outsourced Units

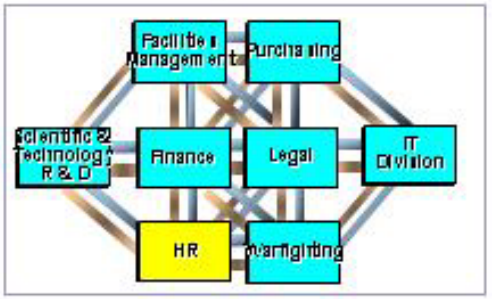


American Parent Still Local to U.S.

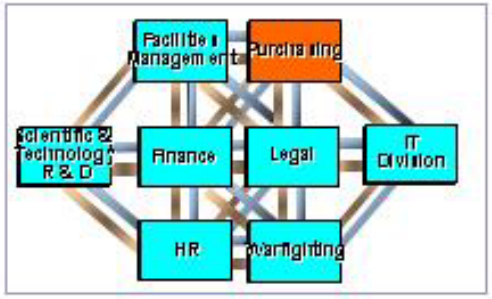
Country A Business Units



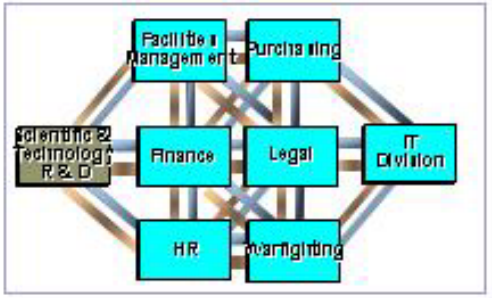
Country B Business Units



Country C Business Units

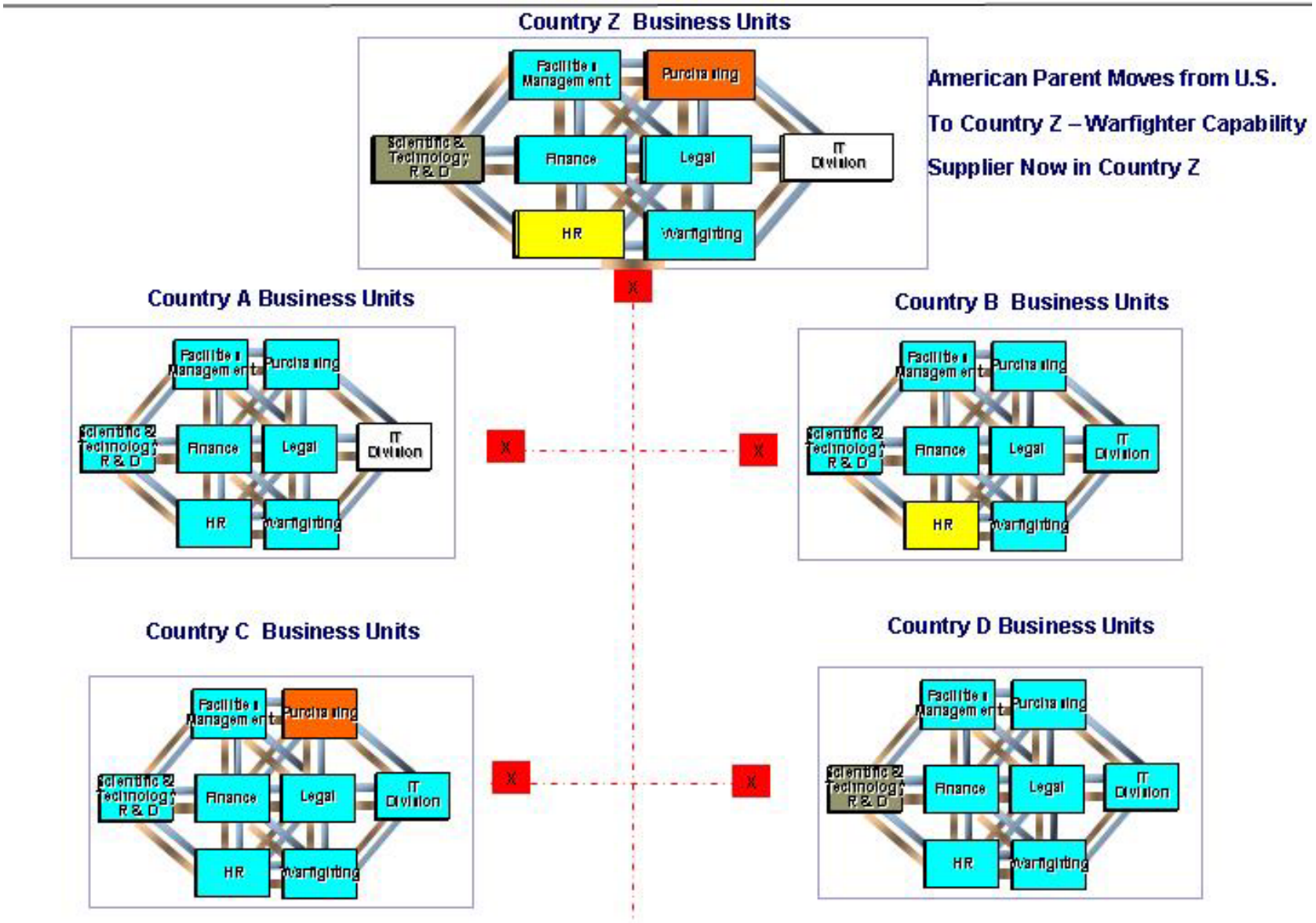


Country D Business Units



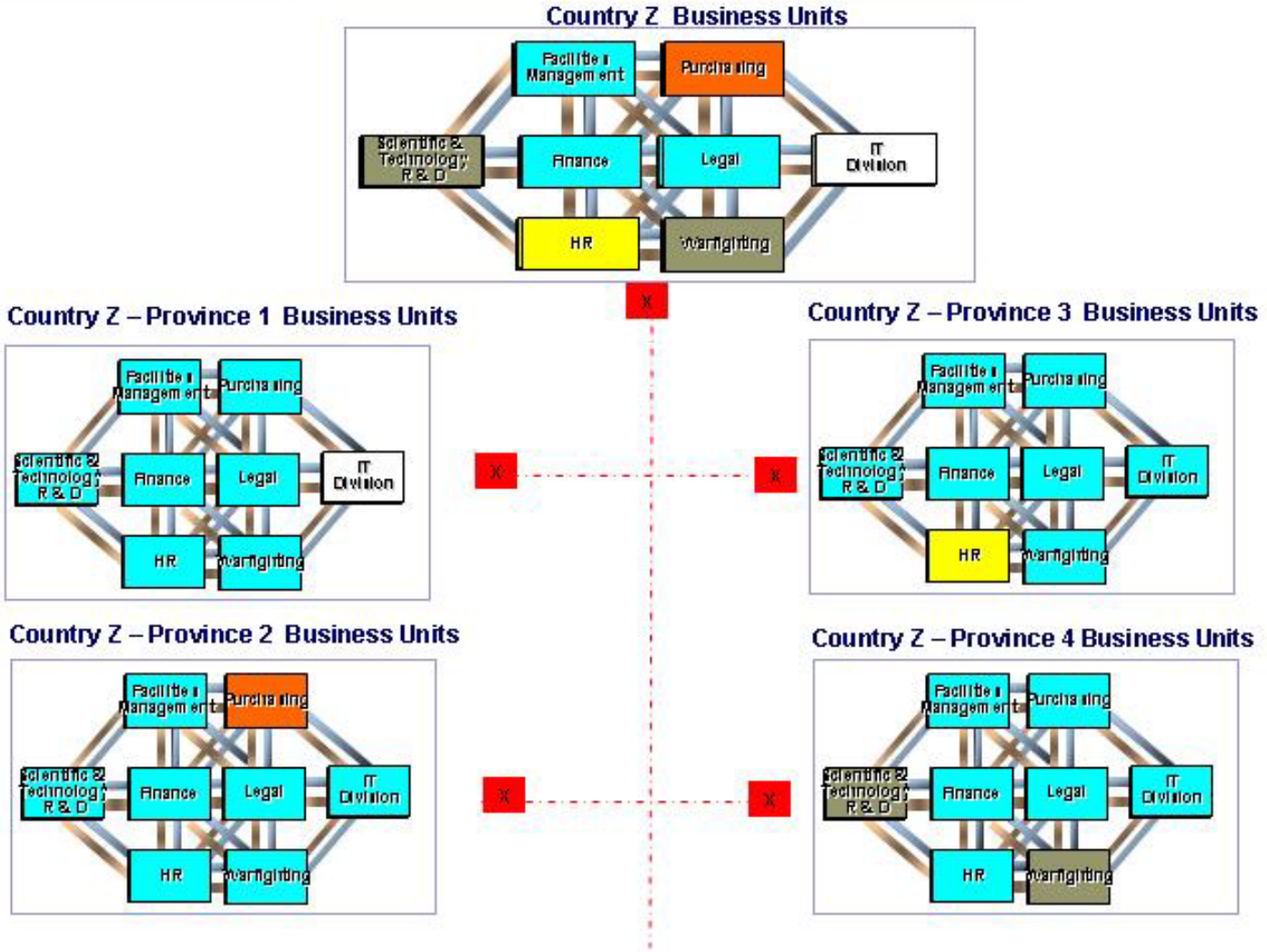
Decentralized Business Outsource Architecture Model

Business Units Totally Outsourced & Disconnected from Original Corporate Parent & Each Other–
Parent's Original Country Loyalties, Capability, Knowledge, Capital Lost or Transferred to Outsourced Units

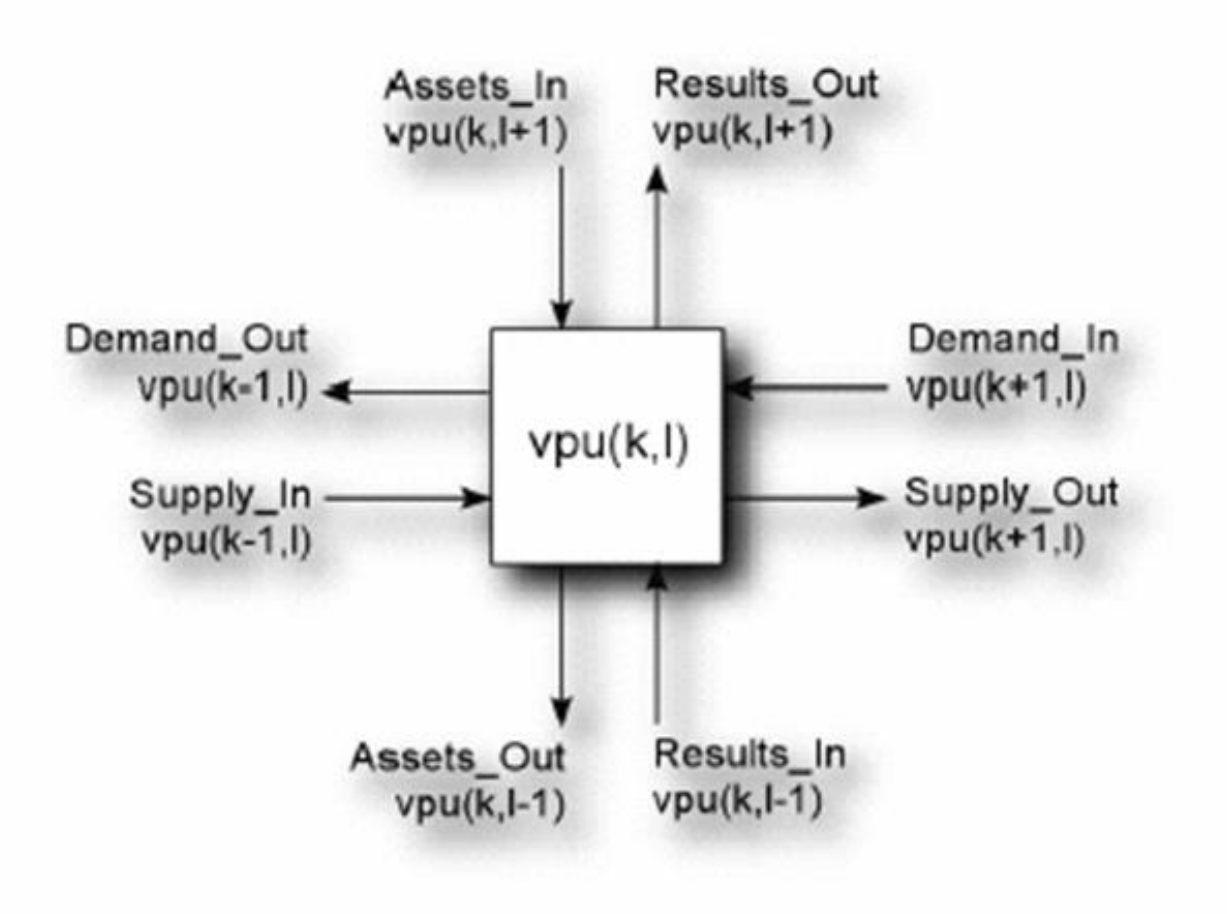


Rise of Small Independent States or City States
Disappearance of Borders and Nations

Original Outsourced Business Units Initiate Secondary Outsourcing. Eventually Disconnecting from the Secondary Parent & Each Other– Internal Nation State Dissolves Into Multiple Provincial Independent Political & Military Entities – Old Borders Begin To Effectively Disappear and Their Alliances With Them



The Value Production Unit as an Assessment & Simulation Structure to Model the Impacts of Globalization of Various Companies

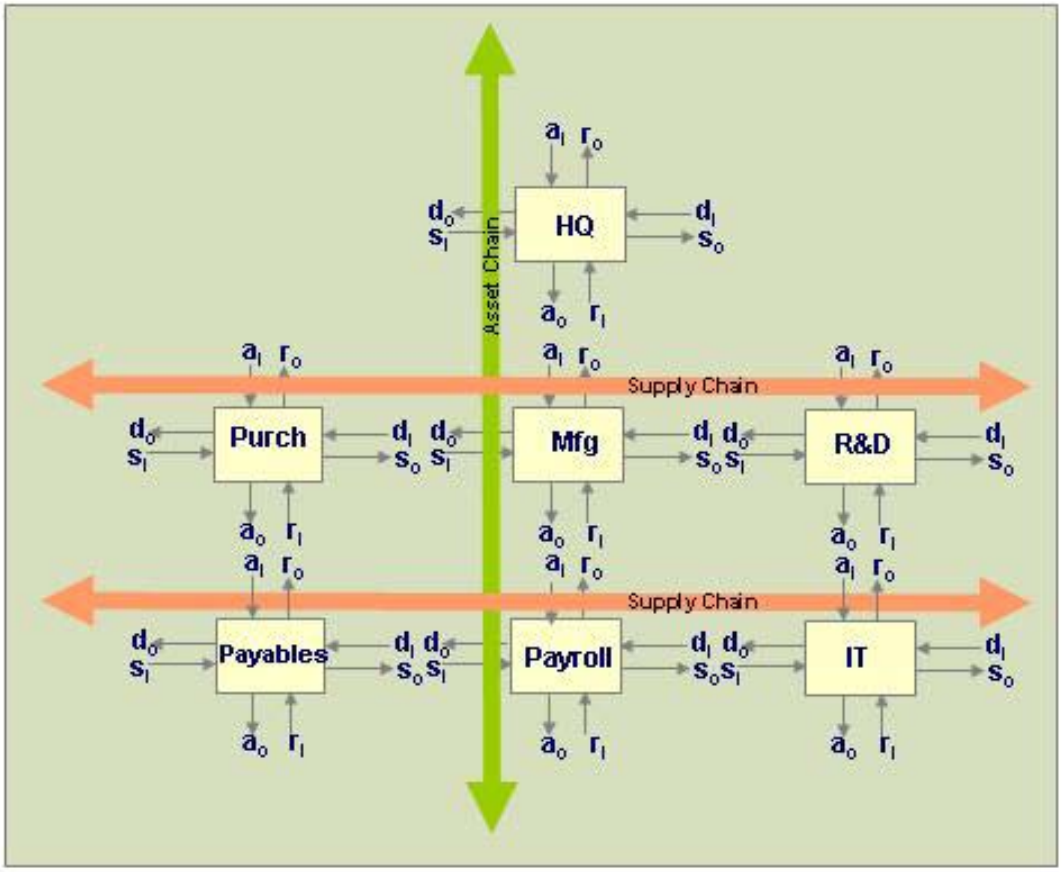


Value Production Unit Terminology

Value Chain	Port ID	Port Name	Port Function
Asset Chain	a_i	Assets In	Acceptance and assimilation, according to a service-level agreement (SLA), of allocated assets from superior VPUs
	r_o	Returns Out	Production of returns on value produced by previously allocated assets; requests for allocation of additional assets
	a_o	Assets Out	Allocation, based on a SLA, of assets to subordinate VPUs with expectations for a minimum time-specific return of value for the allocation
	r_i	Returns In	Acceptance and assimilation of returns and evaluation of requests for asset allocations from subordinate VPUs
Supply Chain	d_i	Demand In	Acceptance of demands (orders) for goods or services from upstream consumer (client) VPUs
	s_o	Supply Out	Fulfillment of demand (orders) in the form of goods or services to downstream consumer (client) VPUs
	d_o	Demand Out	Issuance of demands (orders) for goods or services to upstream producer (server) VPUs
	s_i	Supply In	Acceptance of fulfilled orders for goods or services from downstream producer (server) VPUs

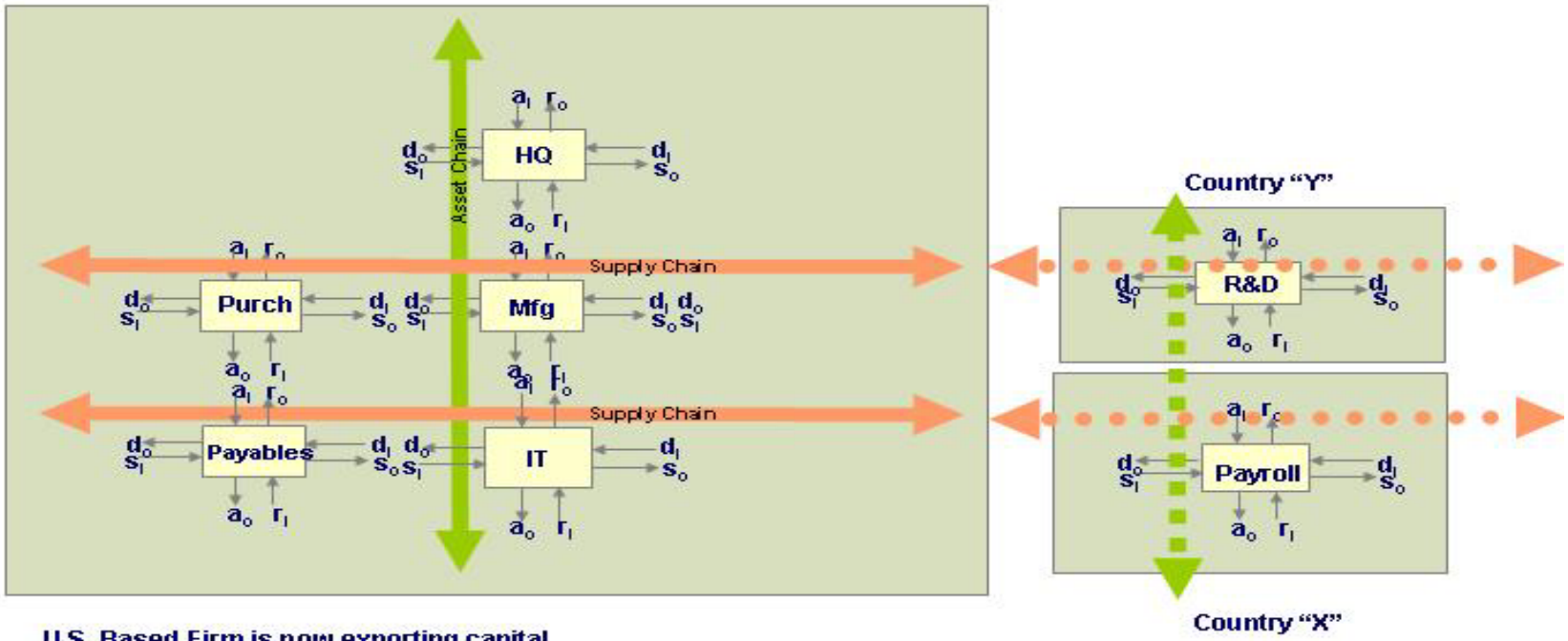
The Value Production Unit Corporate Model

US based Manufacturing Company - All Assets & All Departments in One Building, in One Physical Location – But with well defined interfaces between each departmental unit



What is outsourced and to what country? Whom does it hurt??

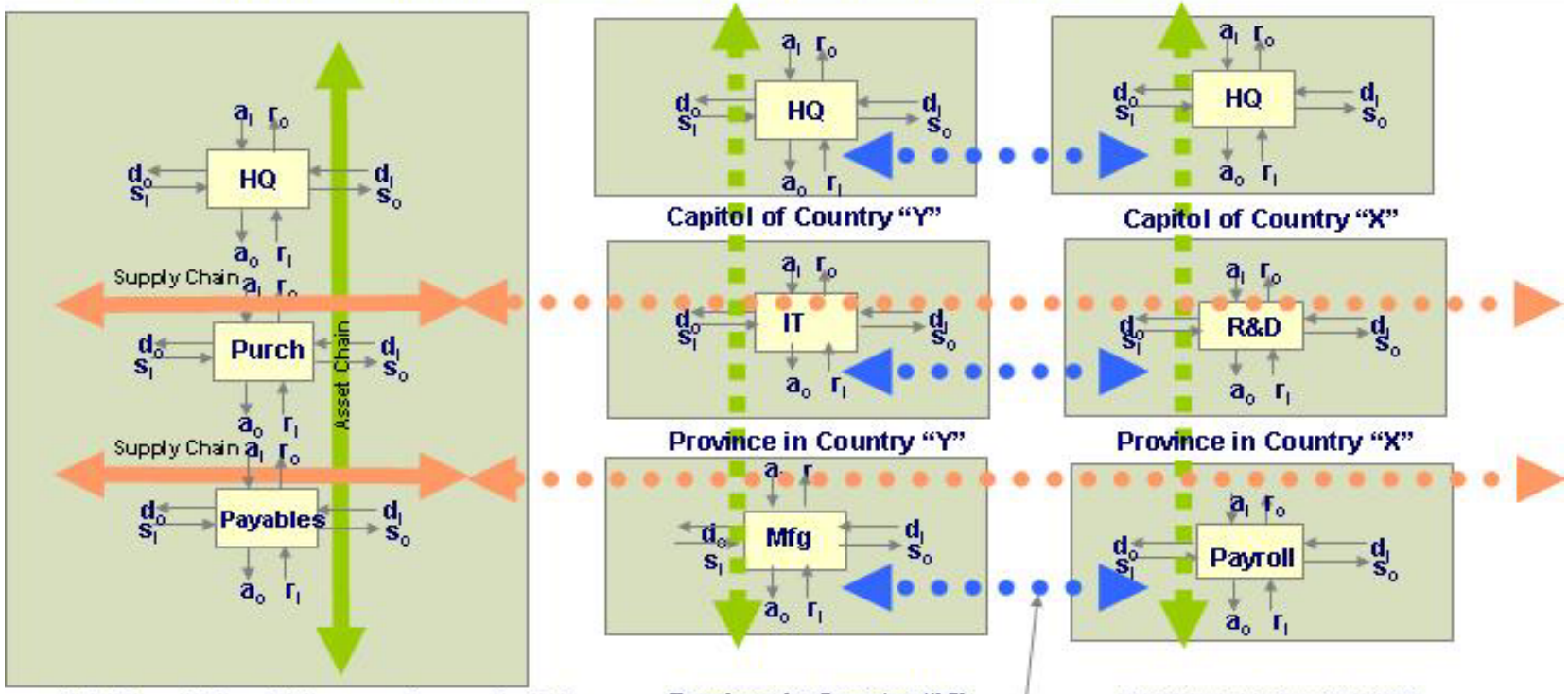
U.S. Manufacturing Company - With well defined interfaces between each departmental unit but with Payroll & R&D outsourced to a cheaper companies outside the U.S. This improves cost performance but company has lost payroll capability & R&D Knowledge Control . If outsource companies are in foreign countries "X" & "Y", then "X" & "Y" enjoy new asset flows plus "Y" gains scientific knowledge and access to parents IT infrastructure.



U.S. Based Firm is now exporting capital and knowledge to Countries "X" & "Y"

Another Look at Outsourced Asset Transfers
Knowledge – Skills & Financial Assets are Moved

U.S. Manufacturing Company reduces costs drastically by outsourcing all unprofitable business units, maximizing profits. Countries "X" & "Y" now have won sufficient outsourcing contracts to form their own large corporations which in turn outsource to internal provinces. Being closed, undemocratic states they form closed mutual knowledge transfer partnerships to benefit each other's weapons development programs with the profits from the outsourced initiatives. Work & Capital are now dispersed to previously poor provinces enabling them to merge rapidly as internally competing economic units which may eventually request autonomy.



U.S. Based Firm, little more than a shell, is now exporting capital, manufacturing, IT, R&D, and proprietary knowledge to Countries "X" & "Y" which are not democracies and use protectionist policies

Closed and proprietary knowledge sharing partnerships

Assessment Services & Tools Recommendation

I am proposing a multi-layered, meta agent based architecture enabled by an SOA, to provide the following services:

- Predictive Capability Agents
  - Scientific Capability by Country
  - Technological Capability By Country
  - New Weapons Deployment by Country
  - Terrorist exploitation of existing and predicted U.S. corporate globalization initiatives
- Globalization Impact Predictive Agents
  - Supply Chain fragility analysis due to outsourced capability
  - Treaty Adherence probability due to a potential disappearing border
- Continuous Data Mining with results & discoveries published by COI

Conclusions

This research concludes that the U.S. DoD needs the ability to rapidly create polices in response to globalization created changes. Thus, in order to provide these capabilities, I recommend the rapid development of composeable policy frameworks, policy semantics models, composeable data warehouses, and intelligent policy analysis agents, in order to provide the policy assessment tools needed to support the adaptability and superior decisions required to succeed in a Post-international, globalist environment. Specifically the paper recommends policy assessment and simulation composeable services targeting: Technical & Scientific Knowledge Base Maintenance, Globalization Impact Analysis for Mutual Defense Treaties, and Nano Weapon Defense Tactics Assessments and Simulations.