

Gordon Housworth
Intellectual Capital Group LLC
phone: +1 248.626.1310
email: ghidra@icgpartners.com
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**Collapsing US supply chains
preclude independent US action:
The intersection of loss of supply
chain control and emerging,
reemerging threats**

Current reality

- ❑ The People's Republic of China can prevent the US from commencing or maintaining the ops tempo of a future Desert Storm or Operation Iraqi Freedom.
- ❑ If the PRC is the adversary, it can preclude our ability to conclude combat operations.
- ❑ PRC has the ability to induce trap-doors into HW and embedded SW assemblies.

Emerging and reemerging adversaries

- ❑ China has been an emerging competitor for a decade plus.
- ❑ The Russian Federation has reemerged as a global competitor.
- ❑ Both can constrain US diplomatic, military and economic action.
- ❑ US “hyperpower” omnipotence was fleeting.

Hollowing out the supply chain

- ❑ US and Europe have lost control of their defense and commercial industrial supply chains.
- ❑ Exporting capability rather than capacity, the US has increasingly retained only a top tier or integrator role while exporting its *tier 2-tier n* base.

Hollowing out the supply chain

- ❑ US cannot realistically define discrete and net risk as supply chains are too opaque for identification.
- ❑ Decreasing ability to direct sourcing to less risky tiers.
- ❑ Loss has not come without warning:
 - Seminal analyses of mid-1980s to early 90s.
 - Near-disaster supply chain bottlenecks during Desert Storm (1990-91).

Staggering loss in US manufacturing

- ❑ **Technology** (Research Testing Development and Evaluation - RTD&E).
- ❑ **Industrial base** (tier base capability, knowledge gaining, performance curve and price/volume).
- ❑ **Volume** (capacity).
- ❑ **Availability** (conversely product *unavailability*, product as hostage, withheld or not surged in time of national need).

Staggering loss, cont'd

- ❑ **Supply chain** (chain complexity masks risky sourcing and possible interdiction).
- ❑ **Forensics** (undocumented/latent/hostile firmware and/or software additions).
- ❑ **Education** (learning citadels clustered to engineering and production centers).

Everyone is guessing about risk

- ❑ Virtually no actionable metrics of sufficient robustness to pass the test of falsifiability.
- ❑ Actionable information about a specific chain condition and greatest risk at component at tier in the chain is fuzzy at best.
- ❑ Defense and commercial sides of the house share the same problem: insufficient granularity of analysis & timely data.

Before globalization there was “NATO-azation”

- ❑ Dependence on foreign sources, NATO allies included, for defense material and technology was a concern by 1985.
 - ❑ Three options identified:
 1. All defense equipment built in US from US-sourced components; all necessary industries sustained in US.
 2. Market dictates which industries will be healthy in US; seek best deals globally.
 3. Choose some industries to be located in US; let others go to global market.
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Today's supply globalization is direct result of option 2

- ❑ US chose option 2 by combination of default and design, augmented by partial regulation.
- ❑ Commercial suppliers sought performance, lower costs, higher margins offshore.
- ❑ Firms did reap instances of best-of-breed integration with foreign firms.
- ❑ Foreign dependencies soared as DoD fretted.
- ❑ Low cost was not low risk.

From foreign source to dependency to vulnerability

- As early as 1987, US had defined three elements of foreign sourcing:
 - Foreign source - source of supply, manufacture, or technology located outside US or Canada.
 - Foreign dependency - source of supply for which there is no immediate available alternative in US or Canada.
 - Foreign vulnerability - source of supply whose lack of availability jeopardizes national security by precluding or reducing production capability.
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Impact of shifting production from Japan to China

- ❑ Were the US to incur the ops tempo of a second Desert Storm or OIF not to Chinese favor, the issue of shortages would not be 'if' but 'how many and how soon.'
- ❑ Polite expressions of regret coupled with 'work to rule' responses and the "need to service current customers" would attenuate/terminate supplies of many critical parts and assemblies.

Tunable Just-in-time Disruption

- JIT Disruption has already emerged in Mexico as operational reality:
 - PEMEX has been sole primary target to date.
 - Commercial firms have been collateral damage.
- China is able to affect Tunable Just-in-time Disruption of US/EU electronics inventory.

PRC presence as source or influencer is overwhelming

- Electronic/electrical chains:
 - Many are PRC at tier 2 to tier 5, others are Taiwanese ODMs which means PRC for almost all tiers save design.
 - Japanese chains have PRC, Korean and Singaporean tiers.
 - OEM or top tier believe that a part comes in at *tier x*, but the reality is that a goodly portion comes in POA down to *tier x+3*.

Losing supply chain control has its price

- ❑ While US has yet to suffer a sustained foreign supplier cutoff “either in peacetime or war,” the military and economic balance has now shifted against the US.
- ❑ Increasingly plausible that the PRC or Russian Federation could directly or indirectly influence ‘just-in-time’ availability.

PRC will dwarf USSR in terms of supply chain interruption

- ❑ USSR pressed Japan over its commercial and military partnership with the US.
 - ❑ Unlike China, USSR never had control of US supply chains.
 - ❑ China can:
 - Direct its domestic suppliers to comply.
 - Press Taiwan, Japan and Singapore when any of those states significantly work against Chinese Interests.
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The Richter 15 to 30 event

- Taiwan sits astride a major fault:
 - September 1999 Chi-Chi Taiwan earthquake, (Richter 7.6).
 - December 2006 Hengchun Taiwan earthquake, (Richter 6.7).
 - China can interrupt the Taiwanese supply chain at will.
 - Impact of Taiwanese disruption is enormous.
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Vertical dis-integration of semi-conductor value chain

- Taiwanese firms with Chinese plants are now low cost center for semiconductor products.
 - Taiwan originated vertical dis-integration of the semi-conductor value chain:
 - 1987: TSMC founded as first professional wafer foundry.
 - 1990s: birth and subsequent of Taiwan's electronics ODM/OEM clusters and fabless IC design clusters.
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Taiwanese ODM (Original Design Manufacturing)

- Taiwan extended research, design and manufacturing to reinvent itself as global electronics manufacturing hub.
 - ODMs moved from motherboard design and manufacturing to notebooks, handsets, PDAs, MP3 players, servers and printers.
 - ODMs provide OEMs with:
 - Access to design resources, acting as remote R&D teams. (OEMs typically do not pay for ODM design services).
 - Enhanced product roadmap support and product lifecycle management (“Go-shopping” or “Design it”).
 - Lower cost via direct access to low-cost design and manufacturing facilities in China, Korea, Malaysia, Philippines.
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Taiwan ODM (Original Design Manufacturing)

- Recruit lower-cost development teams in Taiwan (and China) to speed commoditization & industrialization.
- ODM-cluster channelization through sales, marketing, tech support with ODM/OEMs in Taiwan.
- Local Marketing & Partnerships:
 - Global and local component development.
 - Manufacturing in China.
 - Continuous technology enhancement through localization of system and IC technologies.
- Co-localized R&D Team: high innovation in Taiwan with low-cost, fast implementation in Greater China.

Suppliers in the ODM network

- ODMs (original design manufacturers) provide design and manufacturing services to OEMs, and/or sell products under their own name:
 - Quanta, BenQ, Compal and Lite-On.
- OEMs (original equipment manufacturers) designed and manufactured products under their own brands. OEMs cut costs by ceding design and manufacture to firms geographically located in low-cost regions, selling them under OEM brands:
 - Hewlett-Packard, Dell and Sony.

ODM suppliers, cont'd

- EMS (electronic manufacturing service) contract manufacturers provide manufacturing services to OEMs, producing products based on OEM-designs, and sold by OEMs under OEM brand name:
 - Flextronics, Foxconn and Solectron.
- Fabless semiconductor firms design their hardware devices but outsource fabrication to “fabs”.
- Fabs (semiconductor foundries) produce chips designed by fabless semiconductor design houses:
 - TSMC, UMC and Chartered.

Chinese intentions are clear

- Senior Chinese have, in small groups, stated intent to:
 - Absorb Western technology through joint venture (JV) and partnering strategies.
 - Slowly make JVs less attractive by progressive tariff and currency policies.
 - Force Western partners from Chinese market.

Multinational offshoring

- Twofold offshoring goals:
 - Cost reduction, short to medium term.
 - Access to markets, long term.

- Risks are well known but not discussed:
 - Trade issues.
 - Local political backlash.

Predict a new “Chinese Exclusion Act”

- Chinese will contain multinational access to interior markets.
- Initial access to about 1/3 of market.
- Declining as China reclaims the maturing market.

Strategic use of standards

- Strategic use of standards, notably indigenous standards:
 - Free China of foreign royalties.
 - Create standards which Chinese products can meet but foreign products cannot.
 - Reverse the royalty stream.
 - Create price/volume advantage for global Chinese goods that overwhelm local production.
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Missing systemic resilience

- ❑ Commercial systems are designed for commercial efficiency, not security.
- ❑ Building systemic resilience must become a national and international priority.
- ❑ Resilience requires redundancies and increased adaptive capacities.
- ❑ Critical infrastructure industries are increasingly private-sector entities. (Who will pay, how?).
- ❑ Resilience is expensive and disruptive; won't be attempted until too late.

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INTELLECTUAL CAPITAL GROUP LLC

26775 Crestwood

Franklin MI 48025

phone: +1 248.626.1310

email: ghidra@icgpartners.com

website: <http://www.icgpartners.com>

weblog: <http://spaces.icgpartners.com>