



2016 State of the VITA Technology Industry



May 2016

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by: Ray Alderman, Chairman of the Board, VITA

This report provides the reader with updates on the state of the VITA Technology industry in particular and of the board and system industry in general, from the perspective of Ray Alderman, the Chairman of the Board of VITA. VITA is the trade association dedicated to fostering American National Standards Institute (ANSI) accredited, open system architectures in critical embedded system applications. The complete series of reports can be found at [Market Reports](http://www.VITA.com/MarketReports). (www.VITA.com/MarketReports)

Introduction

Writing these reports every six months is starting to feel like I'm living in the movie "Groundhog Day". Not much difference between the last report and this one, except for many interesting details here and there. At the macro-level, what was sliding keeps sliding, and what was rising keeps rising. And, what seems like significant news on the surface is too sketchy to extrapolate into a trend (other than a new Cognitive Electronic Warfare initiative). It's hard to see what Intel's layoffs and fab closures say to us, other than PC demand is falling like a refrigerator down an elevator shaft. Supposedly, Cloud Computing is dead and "Fog Computing" is the next big thing (I'll deal with that in my next report). My best logical explanation about the last six months is that the earth is presently passing through some kind of cosmic recursive phantasmagorical time-loop, created by a rip in the space-time continuum from all the election season rhetoric, or my local liquor importer is watering-down my preferred single-malt scotch again. So, let's ignore the cosmological effects and my scotch importer for the moment, dig into what has happened in the last six months, and try to make some sense out of it!

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Business Conditions

U.S. GDP grew at 2.4% in 2015.¹ Europe grew at 1.5%.² China grew at 6.9%, if you believe the official numbers.³ And Japan grew at 0.7% for 2015, after seeing a decline of 1.4% in Q4.⁴ The world bank cut global growth again, down to 2.9%.⁵ Hungary joined Sweden, Japan, the Euro Zone, Switzerland, and Denmark with negative interest rates.⁶ So far, quantitative easing and currency devaluation are not creating significant growth anywhere. Since the beginning of 2015, forty-six central banks (countries) have lowered their interest rates.⁷

Let's look at the two primary factors in the world economic situation: China's consumption of oil and raw materials, and Chinese exports of finished products to the rest of the world. Both are declining. First, we need to look at China's imports. China has been the economic engine that has driven world GDP growth for many years, with their imports of raw materials (commodities). They have positively driven the GDP of natural resource exporting nations in the past (e.g., Canada, Venezuela, Argentina, Brazil, Nigeria, Saudi Arabia, Algeria, Australia, Libya and Iraq).⁸

Now, those natural resource exporting countries are in big financial trouble, due to significantly diminished demand from China. China GDP was growing at more than 7.5% and is now at 6.9%. According to some sources, their real GDP growth rate is 3-4% at best today.⁹

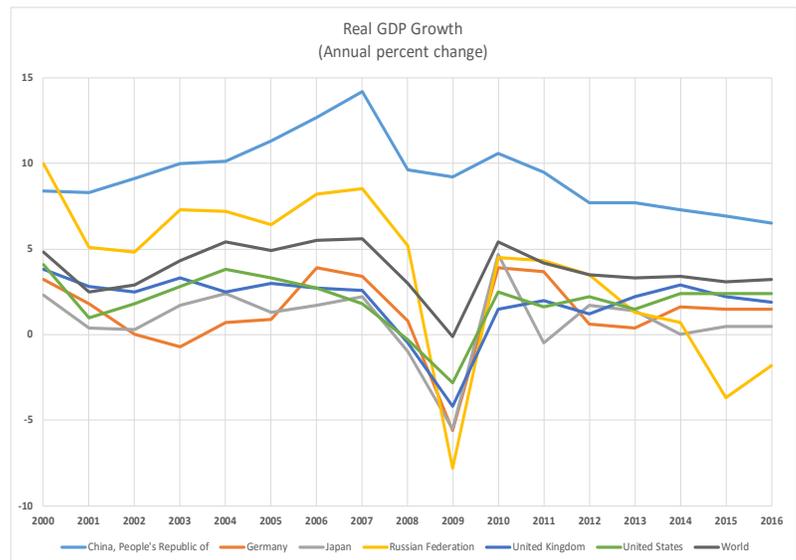
Second, China's reduced imports of raw materials leads to China's corresponding decline in exported finished products.¹⁰ Consumer and business spending in the U.S., Europe, Japan, and

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©IMF, 2016, Source: World Economic Outlook (April 2016)

- 1 Bureau of Economic Analysis, "Gross Domestic Product: First Quarter 2016 (Advance Estimate)", April 28, 2016, <http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm>
- 2 Angela Bouzanis, Focus Economics, "Economic Snapshot for the Euro Area", April 6, 2016, <http://www.focus-economics.com/regions/euro-area>
- 3 Mark Magnier, The Wall Street Journal, "China's Economic Growth in 2015 Is Slowest in 25 Years", January 19, 2016, <http://www.wsj.com/articles/china-economic-growth-slows-to-6-9-on-year-in-2015-1453169398>
- 4 Japan Macro Advisors, "Japan Gross Domestic Product", March 8, 2016, <http://www.japanmacroadvisors.com/page/category/economic-indicators/gdp-and-business-activity/gdp/>
- 5 Andrew Mayeda, Bloomberg, "World Bank Cuts Global Growth Forecasts", January 6, 2016, <http://www.bloomberg.com/news/articles/2016-01-06/world-bank-sees-global-growth-sputtering-along-amid-china-slump-ij392sat>
- 6 Mehreen Khan, The Telegraph, "Hungary's central bank is the latest to go negative", March 22, 2016, <http://www.telegraph.co.uk/business/2016/03/22/hungarys-central-bank-is-the-latest-to-go-negative/>
- 7 Jeremy Gaunt, Reuters, "ECB leads the big parade, Fed strolls the other way", March 24, 2016, <http://www.reuters.com/article/us-global-economy-weekahead-idUSKCN0WQ1MJ>
- 8 Henning Gloystein and A. Ananthakshmi, Reuters, "Ending of China's super-boom spells pain with no end seen yet", December 31, 2015, <http://www.reuters.com/article/us-markets-commodities-idUSKBN0UE1CU20151231>
- 9 Patrick Smith, The Fiscal Times, "Here's Why China's Not the Global Economy's Problem", March 7, 2016, <http://www.thefiscaltimes.com/Columns/2016/03/07/Here-s-Why-China-s-Not-Global-Economy-s-Problem>
- 10 Sophia Yan, CNN Money, "China exports shrink 20%, deepening worries over slowing growth", March 8, 2016, <http://money.cnn.com/2016/03/08/news/economy/china-february-trade-slump/>

Russia are much lower due to unique political, demographic, and economic problems in each country. The EU has been disintegrating over immigration policy, terrorism, sovereignty, and economic disparity between northern and southern regions.¹¹ Russia's GDP is declining by 4% to 17% per year, depending on the source of the figures, due to economic sanctions by other nations and the collapsing prices of oil and gas. Russia's ruble has declined by 50% in value. The U.S. economy, where 70% of GDP comes from consumer spending, is doing OK, but has not recovered from the recession of 2007-2012. Consumers in the U.S. have been paying-off debt and saving money rather than spending. So, developed nations are importing much less from China.

In Japan, people are taking their money out of the banks to protect themselves from negative interest rates. That has resulted in increased demand for 10,000 Yen notes, and a shortage of safes to store their money.¹²

The transition in China, from a finished goods export-driven economy to a consumer spending-driven economy, will take some time. As their economy slows, they will devalue their currency to soften the effects of the slowdown.¹³ The natural resource exporting countries are at the epicenter of the financial pain today. We could see oil exporters Venezuela, Argentina, and Russia go broke if oil stays below \$40 per barrel. The mining-based exporters-- Canada, Brazil, and Australia—could go into recession. There is no world economic engine on the horizon to replace China. The primary question is whether China crashes financially (a hard landing), or just muddles through the transition (a soft landing).

In spite of the world economic problems, the U.S. is still the best looking horse in the glue factory. How long this can last, as conditions erode in developed and emerging economies, is yet to be seen.

The macro-economic situation will continue to be dicey until a few things happen:

1. **The price of oil stabilizes.** *Most oil-exporting countries have a fiscal break-even point far above the present price (this means the price of oil needed for a country to balance their spending budgets).¹⁴ With Iranian oil coming to market after the sanctions are lifted, the Saudis pumping like crazy to maintain market share, South American countries pumping to stay alive, and Canada trying to sell oil to anyone at a discount, stabilizing prices will be more than difficult. Anything below about \$50/barrel suggests economic decline and social unrest in many oil producing countries.*
2. **The price of commodities stabilize** (metals, steel, iron ore, grains, natural gas, concrete, etc.). *This is not likely to happen either. We have an abundance of these commodities and supply will exceed demand while world economic growth is slowing.*
3. **The Middle East settles down.** *With the US, Russia, Turkey, Saudi Arabia, Iran, Pakistan, Jordan, Israel, Lebanon, Iraq, Afghanistan, ISIS, al Qaeda, Taliban, Hezbollah, and the Islamic Ladies Garden Club involved in the fights in Syria, Iraq, and Afghanistan, things will remain unstable*
4. **China's growth resumes and their stock and financial markets stabilize.** *With the rest of the world slowing in consumption and growth, this is unlikely.*
5. **The outcome of the U.S. elections is known.** *This is the only condition that will be met in 2016, but it doesn't mean that things will get any better.*
6. **The Federal Reserve and Central Banks quit playing games with the interest rates and their currencies.** *That's not going to happen, as the EU continues to devalue the Euro to spur exports with Quantitative Easing, Japan continues to devalue the Yen with quantitative easing to spur their exports, and negative interest rates*

11 Nouriel Roubini, Market Watch, "Opinion: Europe's disintegration could be biggest threat of 2016", January 4, 2016, <http://www.marketwatch.com/story/europes-disintegration-could-be-biggest-threat-of-2016-2016-01-04?dist=countdown>

12 Kyodo Jiji, The Japan Times, "Surge in safe sales, ¥10,000 notes reflects sagging faith in economy", February 28, 2016, <http://www.japantimes.co.jp/news/2016/02/28/business/surge-safe-sales-¥10000-notes-reflects-sagging-faith-economy/#.VvQ5BMeapE4>

13 Jamie McGeever, Reuters, "How pulling the Chinese yuan thread frays the fabric of global markets", January 7, 2016, <http://www.reuters.com/article/us-global-markets-china-idUSKBN0UL1VW20160107>

14 John Mauldin, Mauldin Economics, Business Insider, "This is what happens when oil-rich nations can't pay their bills", December 14, 2016, <http://www.businessinsider.com/what-happens-oil-rich-nations-cant-pay-2015-12>

remain in place. Financial engineering, rather than real growth in demand and profits, is the primary mechanism being used to prop-up the major world economies.

While the rest of the world continues to flounder, the U.S. Federal reserve is raising our interest rates as unemployment numbers improve (if you actually believe those numbers). So, the U.S. has decoupled itself from the rest of the world's economies. However, all indicators point to sluggish growth in the U.S. in the future.

Quantitative easing and negative interest rates can inspire horrible misallocations of capital and human resources. They perpetuate bad business models and flakey companies. They hide inept and incompetent management. And, they punish savers and reward the banks. Unfortunately, we need a recession to some degree, according to what Warren Buffet has stated: "It's only when the tide goes out that you learn who has been swimming naked."¹⁵

"Quantitative easing and negative interest rates can inspire horrible misallocations of capital and human resources."

Markets

Military and Aerospace

In spite of declining military budgets, we have seen new platforms come to the services and new contracts issued for new weapons and systems. This trend has not been without disappointment. In December, the USS Milwaukee, LCS-5 (Littoral Combat Ship) foundered at sea and had to be towed to port. The suspected cause of failure was "sand in the gears", so to speak. Then, in January, the USS Fort Worth (LCS-3) ground-up its gears off Singapore, due to a failure of the crew to follow procedures.¹⁶ Eleven of these brown-water ships have already been launched with another thirteen under construction. And the Navy is cutting the number of LCS boats in the original plan, since they seem to have serious problems.

Further concerns came with the Lockheed protest of the JLTV (Joint Light Tactical Vehicle) contract to Oshkosh.¹⁷ The Lockheed-Boeing team protested the award of the LRS-B (Long Range Strike Bomber) B-21 contract to Northrop Grumman.¹⁸ Just remember that the KC-46 tanker contracts, to replace the KC-135, started back in 2002 and went through years of protests, court trials, and push-backs. The first KC-46 flew in October 2015.

The Lockheed protest of the JLTV contract award to Oshkosh was dismissed by the Government Accounting Office (GAO) in December, and the Lockheed-Boeing protest of the B-21 bomber contract to Northrop Grumman was dismissed by the GAO in February.

In March, the GAO denied General Dynamic's protest of the Marine Corp Amphibious Vehicle contract to BAE and SAIC.¹⁹

15 Ronald-Peter Stöferle, Mises Institute, Business Insider, "A recession is 'healthy and necessary'", January 21, 2016, <http://www.businessinsider.com/a-recession-is-healthy-and-necessary-2016-1>

16 Brad Lendon and Zachary Cohen, CNN Politics, "Breakdowns leave 2 of Navy's newest ships stuck in port", January 26, 2016, <http://www.cnn.com/2016/01/25/politics/u-s-navy-littoral-combat-ship-problems/>

17 Jen Judson, Defense News, "Lockheed Martin Protests JLTV Contract Award to Oshkosh", September 8, 2015, <http://www.defensenews.com/story/defense/land/vehicles/2015/09/08/lockheed-martin-jltv-protest-army-oshkosh/71893762/>

18 Colin Clark and Sydney J. Freedberg Jr., Breaking Defense, "Tanker Fiasco Again? Boeing-Lockheed Protest Northrop's LRSB Win", November 6, 2015, <http://breakingdefense.com/2015/11/tanker-fiasco-again-boeing-lockheed-protest-northrops-lrsb-win/>

19 Jen Judson, Defense News, "GAO Denies General Dynamics' Amphibious Combat Vehicle Protest", March 15, 2016, <http://www.defensenews.com/story/breaking-news/2016/03/15/gao-denies-general-dynamics-amphibious-combat-vehicle-protest/81822238/>

The U.S. Navy awarded Northrop Grumman a contract for the next generation laser weapon (LWSD), a 150 kW laser that can shoot-down manned fighters and missiles a few miles afar.²⁰ Plans are underway to build 250kW to 500kW laser weapons by 2020.²¹

The most significant announcement is the appointment of General Joseph L. Votel as the new commander of CENTCOM (Central Command). Gen. Votel is steeped in elite secretive military operations with his history as the commander of JSOC (Joint Special Operations Command) and SOCOM (Special Operations Command).²² CENTCOM leadership has always been given to Marine or Army generals with conventional warfare experience (tanks and troops), so this move is a break from the norm.

Previous reports have mentioned that while the Army, Navy, and Marines are shrinking their headcounts, the special operations forces are increasing their numbers significantly.²³ Gen. Votel's approval is further indication that the U.S. intends to fight future conflicts with small numbers of elite forces on special assignments, while technology-based platforms like armed UAVs do the work of tanks, artillery, and battalions of infantry soldiers. Vogel will bring the U.S. into 5th Generation Warfare, better known as non-contact warfare, where the bulk of the fighting is done with technology, not soldiers, Marines, sailors, or in-the-cockpit pilots.

Threats to Peace

Let's look at the shenanigans of our present enemies:

China

China continues to militarize the disputed islands in the South China Sea, irritating the Filipino, Taiwanese, Japanese, and Vietnamese governments.²⁴ But so far, China has been putting only fighter jets, surface-to-air missile systems, and long range radar on the islands. These are defensive systems, but could present a threat to open shipping channels if things get tenuous in the future.

China has bigger problems, especially with their economy. They are reducing their military budget in 2016 and they are finally fed-up with the craziness from Kim Jong Un in North Korea (more on that to follow). The latest assessment of their military capabilities has just been documented in a recent report from the U.S. Congressional Research Service.²⁵

Russia

Aside from their involvement in Ukraine and Syria, the next red flag is that the Russians might be planning to invade the Baltic states of Estonia, Latvia, and Lithuania.²⁶ The fuse for such an explosive event could be a little piece of land called Kaliningrad (previously named Königsberg), wedged in between Lithuania and Poland, on the Baltic Sea. Kaliningrad is part of Russia, stemming from agreements after WWII. It's an important Atlantic sea port for the

20 Rich Smith, The Motley Fool, "Northrop Grumman Builds the Biggest Laser Gun Ever", http://www.fool.com/investing/general/2016/01/02/northrop-grumman-builds-the-biggest-laser-gun-ever.aspx?source=eogyholnk0000001&utm_source=yahoo&utm_medium=feed&utm_campaign=article

21 Next Big Future, "US Navy increasing combat lasers power to 500 kilowatt level by 2020 to counter ballistic missiles", April 6, 2016, <http://nextbigfuture.com/2016/04/us-navy-increasing-combat-lasers-power.html>

22 Andrew Tilghman, Military Times, "This general is about to take on the military's worst 4-star assignment", March 19, 2016, <http://www.militarytimes.com/story/military/2016/03/18/joseph-votel-centcom-islamic-state-afghanistan-iraq-syria-iran-russia/81874390/>

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25 Alex Lockie, Business Insider, "How the world's largest military stacks up to the US armed forces", March 30, 2016, <http://www.businessinsider.com/chinese-military-compared-to-us-2016-3>

26 Max Fisher, Vox World, "The risk of an unintended war with Russia in Europe, explained in one map", February 9, 2016, <http://www.vox.com/2016/2/9/10949894/russia-europe-war-map>

Russians. The only way they can get to it is by sea or by air. If they wanted to connect that exclave to their mainland, they would have to annex Latvia and Lithuania, like they did with Crimea.

Latvia, Lithuania, and Estonia have been members of NATO since 2004. If Russia invades any of these states, that would invoke Article 5 of the treaty, the “collective defense” clause. That means all NATO members must come to the military aid of the attacked member.

Putin seems to have his hands full right now as his economy tanks. His actions are straining his financial and military resources. Russia’s GDP is only \$2 trillion, about the size of Italy’s economy, and it declined by nearly 4% in 2015. Oil and gas are over 30% of Russia’s GDP, and the dramatic decline in energy prices is killing their revenues. You must have a healthy economy to start or fight a war, and Putin doesn’t have one. Just looking at the old Soviet Navy in 1990 (657 ships) versus the present Russian Navy (172 ships) shows the erosion of Russian military power.²⁷

Nevertheless, the U.S. will be sending tank and infantry divisions to the Baltic nations as a deterrent to any future Russian malfeasance.

Iran

Iran tested the West’s resolve in March by firing ballistic missiles in a test, with “Israel Must Be Wiped Out” painted on them in Hebrew.²⁸ They claim that such tests do not violate the recent nuclear agreement and that the markings on the rockets shouldn’t come as a surprise to the Israelis.

A “cessation of hostilities” agreement went into effect in Syria in March, bringing a little peace to the region. But as Thomas Jefferson is credited with saying, “Peace is that brief glorious moment in history when everybody stands around reloading.”

North Korea

It’s almost spring in North Korea, so it must be time for the annual U.S.-South Korean military exercises on the DMZ, and for Kim Jung Un to throw another fit like you read about in the medical journals. We are not being disappointed:

In January, North Korea exploded what they claimed to be their first hydrogen bomb. The intercepted seismic data suggests that the yield was too low for such a weapon, and U.S. aircraft scooping air samples for traces of xenon gas, a by-product of a hydrogen fusion explosion, have found nothing.²⁹ Experts state that North Korea does not yet have the technical ability to build hydrogen weapons, nor to miniaturize them to fit inside their new missile. They suspect it was just a “boosted” fission bomb, not a real fusion hydrogen bomb.

In early February, the North Koreans launched a satellite into space with an older-design long range missile, allegedly capable of delivering warheads to the U.S.³⁰ Elements of the booster were recovered after the launch and found to contain repurposed Soviet Scud missile parts and some off-the-shelf commercial electronics from old cellphones, DVD players, and “Chatty Kathy” dolls, soldered together with speaker wire (I’m being a bit facetious here, but the components were very antiquated).

The satellite did make it into orbit, but started tumbling and has not emitted any signals so far. What the North Koreans have proven is that they have some boosted fission bombs, and a missile capable of launching a box of rocks into orbit. However, their antics have inspired the U.S. to consider placing THAAD (Theater High Altitude Area Defense) interceptor missiles in South Korea. That, in turn, has irritated the Chinese, since those THAAD systems

27 Jeremy Bender, Business Insider, “*This graphic shows how tiny the Russian Navy is compared to the former Soviet fleet*”, March 2, 2016, <http://www.businessinsider.com/size-of-russian-navy-compared-to-soviet-fleet-2016-3>

28 Julian Robinson for MailOnline and Associated Press, “*Israel must be wiped out: Iran launches two missiles with threat written on them in Hebrew as the country ignores criticism of its ballistic weapon tests*”, March 9, 2016, <http://www.dailymail.co.uk/news/article-3483465/Iran-fires-2-missiles-marked-Israel-wiped-out.html>

29 Greg Botelho and Euan McKirdy, CNN, “*U.N. poised to act against North Korea after latest nuclear test*”, January 7, 2016, <http://www.cnn.com/2016/01/06/asia/north-korea-hydrogen-bomb-test>

30 Jack Kim and David Brunnstrom, Reuters, “*North Korea turns to ‘old workhorse’ rocket to repeat past success*”, February 9, 2016, <http://www.reuters.com/article/us-northkorea-satellite-technology-idUSKCN0VI0ML>

can also take out any missiles fired from China. A recent U.S. Office of the Secretary of the Defense report offers justification for missile defenses in South Korea.³¹

China, the U.S., and the UN have instituted sanctions against North Korea for their craziness. China has cut off the country's ability to exchange Won for other currencies. They have also banned all NK freighters from their ports (they just turned a few away in early March). The Philippines grabbed an NK freighter in Subic Bay to inspect it for banned cargo. Kim Jong Un responded by firing a few missiles into the Sea of Japan over several days, and he put his nuclear weapons forces on alert.³² Now he is biting the hand that feeds him by threatening to nuke China.³³

Before you get nervous, let's look at some previous claims by North Korea. Kim Jong il, Kim Jong Un's father, bowled a perfect 300 game at their new Peoples bowling alley and he made eleven holes-in-one on their new 7,700 yard peoples golf course, shooting a 38 under-par score of 34.³⁴ Remember these impossible sports accomplishments when you consider their claims of having a miniaturized hydrogen bomb and have a missile that can deliver it on a target.

Spain

Spain's foreign minister stated in early March that if the UK leaves the European Union, they will invade and take back Gibraltar by military force.³⁵ UK gained control of Gibraltar in 1704 and reaffirmed it as their territory in the 1713 Treaty of Utrecht. Gibraltarians have voted twice to stay with the UK and not rejoin Spain.

Middle East

The U.S. started bombing ISIS oil trucks and energy facilities, blowing up their banks where they keep their money, and running snatch-and-grab operations to catch some of their field commanders in Iraq and Syria. That, in turn, has caused ISIS to start moving their operations to other failed countries, like Tunisia and Libya.³⁶ ISIS is expanding their operations to Turkey and Belgium with suicide attacks.³⁷

Meanwhile, our forces have taken-out over 25 of their field commanders, their CFO, and other top commanders with UAV and bombing missions.³⁸

On a lighter note, the new leader of the Taliban, Mullah Monsieur, was severely wounded at an executive meeting of the top Taliban leadership when disagreements about who runs the show led to gunfire. Taliban has been disorganized since the death of their founding leader Mullah Mohammad Omar back in 2013, and there's a fight going on for the CEO spot.³⁹ If we just leave these guys alone, they may kill each other.

"If we just leave these guys alone, they may kill each other."

31 Jeremy Bender, Business Insider, "3 maps that outline North Korea's military might", February 23, 2016, <http://www.businessinsider.com/3-maps-that-outline-north-koreas-military-might-2016-2>

32 BBC, "North Korea 'fires short-range missiles'", March 10, 2016, <http://www.bbc.com/news/world-asia-35770198>

33 Rob Garver, The Fiscal Times, "North Korea Lashes Out at China, Threatens a 'Nuclear Storm'", April 1, 2016, <http://www.thefiscaltimes.com/2016/04/01/North-Korea-Lashes-Out-China-Threatens-Nuclear-Storm>

34 Linda Kinstler, New Republic, "Kim Jong Il Bowls a 300", January 26, 2014, <https://newrepublic.com/article/116303/great-moments-north-korean-sports-beyond-dennis-rodman>

35 Andre Walker, Townhall, "Spain: We'll Invade If Britain Leaves European Union", March 8, 2016, <http://townhall.com/tipsheet/andrewalker/2016/03/08/spain-well-invade-if-britain-leaves-european-union-n2130380>

36 Middle East News Agency, "ISIS Moves To Libya: Intelligence Official Says", February 4, 2016, <http://middleeastpress.com/english/isis-moves-to-libya-intelligence-official-says/>

37 George Friedman, Mauldin Economics. Business Insider, "Here's why ISIS chose Belgium and Turkey for its most recent terrorist attacks", March 23, 2016, <http://www.businessinsider.com/why-isis-chose-belgium-and-turkey-for-recent-terrorist-attacks-2016-3>

38 Yeganeh Torbati, Reuters, Business Insider, "Coalition airstrikes killed 10 ISIS leaders in December, including some with links to Paris attacks", December 29, 2015, <http://www.businessinsider.com/coalition-airstrikes-killed-10-isis-leaders-in-december-including-some-with-links-to-paris-attacks-2015-12>

39 Jibrán Ahmed, Reuters, "Taliban leader Mullah Mansour wounded in shootout: sources", December 2, 2015, <http://www.reuters.com/article/us-afghanistan-taliban-idUSKBN0TL1XV20151202>

What's next on the agenda? Well, Sunni Saudi Arabia executed a terrorist Shia cleric irritating Shia Iranians, who attacked and burned the Saudi embassy in Tehran. So, the Saudis cut off all trade, financial, and political ties to Iran. Bahrain and Sudan also cut ties with Iran, in Sunni sympathy.⁴⁰ There have been two proxy wars going on between Saudi Arabia and Iran: The Saudi support of the rebels fighting to oust Assad in Syria while the Iranians have been supporting Assad; and the Saudis have been supporting the Sunni government of Yemen while the Iranians have been supporting the Shia Houthis trying to take over the country.

While the Sunni-Saudi/Shia-Iran situation warms up, it looks like there could be a new war between Hamas and Israel. The leader of the Palestinian Authority, Mahmoud Abbas, is 80 years old with no successor in mind. When he shuffles off this mortal coil, which could be soon, Hamas will move in and take control just like they did in Gaza.⁴¹

This brings-up a really absurd potential alliance: can you imagine Saudi Arabia, Pakistan, Turkey, and other Sunni countries, along with Israel, in a coalition war against Iran? Stranger things have happened.

Technology

Some interesting developments are occurring in our technology world:

- *PC sales have fallen by 25% since 2011 and they continue to shrink.⁴² While PC chips have driven the embedded markets for a several decades, especially in the commodity telecom and industrial segments, that technology engine is now running out of steam. Some cellphone technologies have come to embedded, like ARM processors on SFF cards. But the likely driver for low-margin commodity market segments in the future will probably be the chips coming from the IoT (Internet of Things (Trash)).*

Add this information to the decline in smartphone sales.⁴³ And don't forget that tablet computer sales are also in decline.⁴⁴ That should give you a better understanding of the rampant consolidation in the semiconductor industry over the past year, mentioned in the last report.

- *LG showed off their 18-inch roll-up full-HD TV screen at CES in January. Yes, it rolls-up like a sheet of paper.⁴⁵ If this technology seems amazing, you should watch this Corning video from a few years ago, about all the possibilities with display screens in the future.⁴⁶*
- *Let's look at another example closer to home. DARPA has released a new ADC (Analog-to-Digital Converter) for military applications, that does conversions ten times faster than commercial ADC chips. Additionally, it can scan multiple channels of RF much faster than commercial technologies. Since the chip is so much faster than present DSP processor technology, DARPA is designing a new CPU that can handle*



40 Sam Wilkin, Reuters, "Saudi Arabia recruits Sunni allies in row with Iran", January 4, 2016, <http://www.reuters.com/article/us-saudi-security-iran-ministry-idUSKBN0UI0HZ20160104>

41 Jennifer Williams, Vox, "Israeli officials fear a looming disaster: the collapse of the Palestinian Authority", January 4, 2016, <http://www.vox.com/2016/1/4/10690270/collapse-palestinian-authority>

42 Matt Rosoff, Business Insider, "The PC market may finally have found its bottom", March 14, 2016, <http://www.businessinsider.com/idc-pc-market-predictions-through-2020-2016-3>

43 Matt Hamblen, Computerworld, "U.S. saw 6% overall drop in smartphone sales last quarter, research firm says", March 2, 2016, <http://www.computerworld.com/article/3040321/smartphones/us-saw-6-overall-drop-in-smartphone-sales-last-quarter-research-firm-says.html>

44 Matt Rosoff, Business Insider, "It's not just the iPad — the entire tablet market is in decline", October 29, 2015, <http://www.businessinsider.com/tablet-sales-down-in-addition-to-ipad-2015-10>

45 David Lee, BBC, "CES 2016: Hands-on with LG's roll-up flexible screen", January 5, 2016, <http://www.bbc.com/news/technology-35230043>

46 "A Day Made of Glass... Made possible by Corning", https://www.youtube.com/watch?v=6Cf7IL_eZ38

the data output of the ADC without choking. What will this technology be used for? Consider Cognitive Electronic Warfare (CEW).⁴⁷

- Other areas of interest in the semiconductor segment are the development of optical processors,⁴⁸ neuromorphic processing chips,⁴⁹ and quantum computing.⁵⁰ Why, you ask, do we need entirely new processing schemes? When the von Neumann architecture was created in the 1940's, computers were CPU-bound: the interconnect buses of the day could deliver more data than the CPU could process. Starting about 1993, with GHz processors, we became I/O-bound: the CPU can handle more data than the I/O links can deliver. In the data centers, they are only getting about 10% processor utilization today, as they wait for data (I suspect that our high-end embedded systems in critical military applications are only getting 40-50% CPU utilization for the same reason).⁵¹ With VPX, we have already burned-through 300 pins on the connector creating multiple links (x4, x8, x16) to keep the CPUs fed, and we are still horribly I/O-bound. I have written a paper about this,⁵² and some other aspects of our embedded board industry, that covers some of our problems and some potential solutions (optical links!). von Neumann architectures worked well when we were CPU-bound but, they suck when we are I/O-bound. So, we have to start looking for a new architecture for future systems.⁵³
- The intrepid wannabe astronaut-lawyers of Luxembourg have decided that it's time to write-up the laws for mining the precious minerals from asteroids floating around in our solar system.⁵⁴ International treaties establish that no country, individual, or company owns any celestial body, so there's considerable confusion about who would own the minerals mined from an asteroid and brought back to earth, not to mention what to do about claim-jumpers. These new extraterrestrial laws would establish the requirements for assay of the mineral ore, and a legal process for filing a "claim of ownership". I suspect this paperwork will need to be accomplished through assay offices and galactic attorney firms in Luxembourg, for a fee of course. No mention at this time about whether those minerals would be subject to Luxembourg import taxes the moment they enter the earth's atmosphere.
- You may have heard of mini, micro, nano, pico and femto satellites (commonly known as cube satellites, or CubeSats). Here's your first view of the latest nano-satellites: the SMDC-one.⁵⁵ Five are already in space, with three more in the queue. These satellites are doing communications and imaging work. They were created and launched by the U.S. Army. Notice that they are called "3U CubeSats" because that's the size of the PCBs inside them. Now you know why VSO working groups at VITA have been diligent in finishing the Space VPX standards. I can assure you, with absolute certainty, that the Luxembourg lawyers were not involved in the creation of the Space VPX standard.
- The U.S. Navy installed a 30kW laser weapon onboard the USS Ponce, an amphibious transport dock ship, back in 2014. These weapons were basically designed to blast small boats packed with explosives out of the water, in incidents like the USS Cole. Now, the Navy is moving up to 100kW to 150kW lasers, with the capability to shoot-down incoming anti-ship cruise missiles. Next up are 250kW to 500kW lasers, to shoot-down larger aircraft and missiles. Megawatt lasers are on the horizon. Just remember your physics: there is no limit to how much power you can put into a light beam. Can photon torpedoes be far away?

47 Dave Majumdar, The National Interest, "Revealed: Pentagon's Plan to Defeat Russian and Chinese Radar With A.I.", February 29, 2016, <http://www.nationalinterest.org/blog/the-buzz/revealed-pentagons-plan-defeat-russian-chinese-radar-ai-15357>

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49 Mark LaPedus, Semiconductor Engineering, "Neuromorphic Chip Biz Heats Up", January 21, 2016, <http://semiengineering.com/neuromorphic-chip-biz-heats-up/>

50 Ann Steffora Mutschler, Semiconductor Engineering, "Quantum dot entanglement; robot vision; mapping Internet routing", January 5, 2016, <http://semiengineering.com/system-bits-jan-5/>

51 Ed Sperling, Semiconductor Engineering, "How Many Cores?", March 21, 2016, <http://semiengineering.com/how-many-cores-2/>

52 Ray Alderman, "RAW - How This Embedded Board and Systems Business Works", November 2015, <http://www.vita.com/resources/Documents/Whitepapers%20by%20Ray/Business%20Strategies.pdf>

53 Ann Steffora Mutschler, Semiconductor Engineering, "What Cognitive Computing Means For Chip Design", March 30, 2016, <http://semiengineering.com/what-cognitive-computing-means-for-chip-design/>

54 Miriam Kramer, Mashable, "A tiny European nation is about to do big things for asteroid mining", February 4, 2016, <http://mashable.com/2016/02/04/luxembourg-asteroid-mining-initiative/#c.wCebFB3gq4>

55 EO Portal Directory, SMDC-ONE, <https://directory.eoportal.org/web/eoportal/satellite-missions/s/smdc-one>

- DARPA is now testing its new trimaran Sea Hunter (Anti-submarine warfare Continuous Trail Unmanned Vessel or ACTUV). It can stay at sea for three months without refueling and operate totally autonomously. The ship is controlled by 31 blade-servers and advanced software algorithms. The mission is to find and track enemy submarines and radio their position to other U.S. Navy vessels. No mention of the ordinance this new unmanned surface vessel might be carrying.⁵⁶
- And finally, IDT took the latest VME controller chip, the TSI-148, to end-of-life. That set off a flurry of emails and phone calls to VITA. Not to worry. Many VITA members have announced new VME boards using the VME IP core from IOXOS inside Xilinx FPGA devices. Others, such as Curtiss-Wright, have developed their own VMEbus to PCI Express bridge that guarantees them many more years of VME support. So, crisis averted and VME marches on.

Mergers and Acquisitions

General M&A activity in the U.S. has been very active. We have seen more semiconductor companies bought by market leaders and rivals. Healthcare, pharmaceutical, and cable companies continue to consolidate. Honeywell is trying to buy United Technologies. The lethargic GDP growth in the U.S. and declining world growth prospects are causing many companies to consider acquisitions to find growth anywhere they can.

In our little corner of the universe, we saw Mercury Computer buy three business units from Microsemi in March for \$300 million.⁵⁷ The products in these units are sold mostly to the defense industry: secure solid-state storage, RF devices, and microwave components. This acquisition adds about \$100 million to Mercury's sales, and gives them advanced technology for high performance SIGINT, RADAR, and intelligence-gathering systems.

For those of you who missed it, a bill, the Electronic Warfare Enhancement Act, has been introduced in Congress to speed-up the Pentagon's acquisition of advanced electronic warfare systems.⁵⁸ You may also have missed the latest assessment of our EW capabilities.⁵⁹ We must be able to intercept enemy signals, create a profile for them in real time, and respond to them. What we are talking about here is Cognitive Electronic Warfare (CEW).

While the defense budget is shrinking, there are segments within the military market that are growing nicely: RADAR, SIGINT, COMINT, SONAR, and CEW. We have the most accurate and effective weapons in the world. What we need now are targets.

“We have the most accurate and effective weapons in the world. What we need now are targets.”

Summary

From a macro-economic perspective, world GDP growth is slowing as stated in this and previous reports. The oil, commodities, and metals/ores/minerals/steel/concrete-exporting countries continue to suffer: Brazil, Russia, Canada, Venezuela, Argentina, the Middle East, most of the African nations, and Australia. All these economies have been positively driven for the past decade by the increased consumption of these materials by China. With China's GDP growth in decline, you have to ask if China created abnormal world growth over the past decade, and we are just getting back to normal economic conditions.

⁵⁶ Rick Stella, Digital Trends, “Ghost ship: Stepping aboard Sea Hunter, the Navy's unmanned drone ship”, April 11, 2016, <http://www.digitaltrends.com/cool-tech/darpa-officially-christens-the-actuv-in-portland/>

⁵⁷ Street Insider, “Mercury Systems (MRCY) to Acquire Three Business Units from Microsemi (MSCC)”, March 23, 2016, <http://www.streetinsider.com/dr/news.php?id=11444361>

⁵⁸ Joe Gould, Defense News, “US Senators Offer Bill To Speed Electronic Warfare Development”, February 8, 2016, <http://www.defensenews.com/story/defense-news/2016/02/08/us-senators-offer-bill-speed-electronic-warfare-development/80020114/>

⁵⁹ Loren Thompson, Forbes, “Electronic Warfare: How The U.S. Army Could Lose Its Next War”, March 15, 2016, <http://www.forbes.com/sites/lorenthompson/2016/03/15/electronic-warfare-how-the-u-s-army-could-lose-its-next-war/#61b2a3ec2a28>

From a technical perspective, we are seeing a schism in computer architectures. The data centers are concentrating on high-speed optical links using optical routers and switches (large distributed networked multiprocessor systems), while the cellphone and embedded CPU vendors are focusing on cache-coherent heterogeneous multicore systems.⁶⁰ Both efforts will affect our high-performance embedded computing industry, in one way or another. We don't know how, just yet.

ISIS is being squeezed out of Iraq and Syria, so they are moving into failed states (Libya, Yemen, and parts of Africa) while al Qaeda is retaking parts of Afghanistan. ISIS is also expanding their terrorist attacks into parts of Europe, primarily France and Belgium so far. Muslim migration out of war torn countries, from the Middle East into Europe, is straining the EU social systems and their political unity. That could lead to some countries exiting the union. Europe's financial condition is not very promising, as the central bank expands quantitative easing to spur growth while their commercial banks are sitting on huge amounts of bad loans (especially Italy). Europe has some severe financial, social, security, and political problems confronting them.

World economic, political, and social problems are affecting the major technology markets, especially the semiconductor industry. World semiconductor revenue declined in 2015 and another decline is forecast for 2016.⁶¹ Unemployment for electrical engineers is rising, another sign that the technology industries are feeling the effects of world conditions.⁶²

U.S. military budgets are shrinking, as we exit Iraq and Afghanistan. But the R&D budgets for new military systems still look good. Our enemies have recently developed sophisticated variable-programmable RADAR for their missile and attack aircraft and we must counter them with Cognitive Electronic Warfare systems. We must increase the abilities of our RADAR systems, as our enemies develop their own CEW counter-systems. This all means that we need faster interconnects on the backplane, and more CPU cycles, to stay ahead.

The negative macro-conditions are having an effect on the micro-conditions in our embedded industry. Telecom and industrial markets are already suffering worldwide. The U.S. markets look the best, even though our GDP growth will be slow. And in the U.S. markets, the military segment continues to offer better opportunities for those companies with the skills and abilities to design and build high-performance embedded systems for critical applications.

As Warren Buffet once said, *"In the business world, the rearview mirror is always clearer than the windshield."* This report is an effort to show you what is behind us, and a few ideas about what might be in front.



60 Ann Steffora Mutschler, Semiconductor Engineering, "Coherency, Cache And Configurability", March 24, 2016, <http://semiengineering.com/coherency-cache-and-configurability/>

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62 Patrick Thibodeau, Computerworld, "What STEM shortage? Electrical engineering lost 35,000 jobs last year", January 16, 2016, <http://www.computerworld.com/article/2487847/it-careers/what-stem-shortage--electrical-engineering-lost-35-000-jobs-last-year.html>