

The Coming Transformation

June 2012

"How can I live among this gentle obsolescent breed of heroes and not weep?"

*Unicorns, almost, for they are fading into two legends
in which their stupidity and chivalry are celebrated.*

Each, fool and hero, will be an immortal."

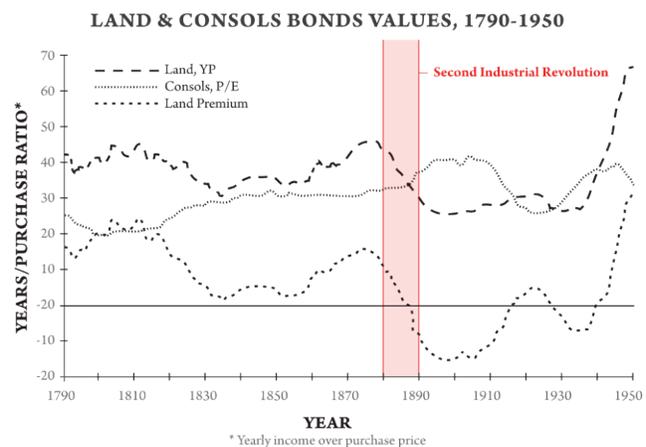
Keith Douglas, *Aristocrats*, 1943

I. The Decline and Fall of the American Aristocracy

The global economy will transform in the next decade. The present post-industrial economy, in which developed countries experience the limits of extensive growth, will give way to a digital global economy that requires different skills for workers and investors. Fortunes are at risk. Last-generation business models will collapse and a new generation of investors and entrepreneurs will create value across old-line industries through new trends in Information Technology (IT).

The Second Industrial Revolution serves as a guide for the disruption ahead. In the early 1880s, the British aristocracy, which controlled immense wealth built on generations of land ownership and agricultural production, felt assured of its economic dominance for generations. Yet by the mid-1890s, agricultural incomes had dropped due to increased competition spurred by improved transportation and production methods. Land prices fell precipitously, and fortunes collapsed.

Rather than keep pace with technological change, aristocrats bought land in Australia, Canada, and the United States. They used the land to pursue familiar business practices like cattle ranching, mining, and agriculture. Not only were economic conditions for these industries as bad, if not worse, overseas as in the U.K, but also cultural values so misaligned that, according to one commentator, “the Englishman” became synonymous with “inefficiency, unhandiness, inadaptability,” and “irritating, repetitious cocksureness.” By WWI, the aristocrats had lost hundreds of years of accumulated family wealth due to a basic ignorance of the forces shifting wealth up the value chain from landowners and commodity producers to industrialists with optimized manufacturing and operational systems.



In the present age of creative destruction, trillions of dollars will be lost by institutions and families that cling to the cornerstones of traditional wealth management practices. Those that survive and flourish in the coming transformation will leverage innovation, adapt practices to new standards, and address global challenges by applying new technology to the worlds of energy, finance, government administration, healthcare, education, and commerce. Businesses in which MBAs outnumber technologists, that reward age and connections over ideas and ethics, and that propagate the mindset that lawyers and consultants dictate value and deserve control face a painful decline. Product superiority will reign.

II. Understanding the Coming Transformation

Like the aristocrats of the nineteenth century, family offices and private wealth managers today hold wealth preservation as their primary goal. They seek allocation diversity, flocking to “safe” investments in big banks and large-cap multinationals. These investments are not safe. Ignoring Mike Markkula’s advice to Steve Jobs that long-term corporate survival requires continual reinvention or “metamorphoses,” most banks and large public companies adhere to business practices because those practices worked a generation ago. They fail to see that preserving wealth in the coming transformation will require family offices and private wealth managers to bet intelligently on a macroeconomic landscape subject to technological disruption.

A. Principal Themes

Investors must understand the principal themes at work in the coming transformation. These themes include: (i) Open platforms that promote transparency and information sharing; (ii) a trend toward higher-level conceptual work and man-machine symbiosis; and (iii) applications that enable personalization and customization across business-to-business and business-to-consumer transactions.

1. Open Platforms that promote transparency and information sharing

Old-economy businesses from encyclopedias to airlines have depended for generations on fractured communications to preserve information asymmetries, skewed pricing, and limited choice. This will change. To see why, consider an operating system like Android, now the best-selling smartphone platform in the world with over 300 million devices in use and 850,000 activations every day. Instead of internal content generation, the system enables and encourages application developers to create and offer content on the Android platform. Handset customers choose among hundreds of thousands of applications, from Yelp to IMDB to Chess, which the platform owner (Google in this case) did not create.

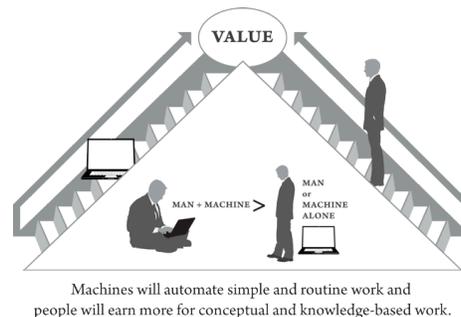


iOS, Apple's competing product, works the same way, although it is not quite as open. This will prove a disadvantage for iOS and Android will emerge as the dominant operating system (Android is expected to be operating 31.1% of the 1.84 billion smart devices by 2016, whereas iOS will operate 17.3% of the devices in 2016). These open operating systems compete with one another for users and for content. Companies like Nokia ignore this strategy, relying instead on closed platform operations. Closed platforms will lose. Capturing upside by boxing out competitive innovation cannot compete, whether in smartphones or in other systems, because open platforms will out-develop closed platforms.

2. Higher-level conceptual work and man-machine symbiosis

Increased conceptualization and abstraction will drive value to businesses that leverage high-level and abstract thought while decreasing reliance on rote work. Man-machine symbiosis, the idea that people drive strategy while machines calculate, will direct work according to comparative advantage.

Increasingly, machines do well-defined rote work better than people, but machines do not write code or articulate ideas better than people. J.C.R. Licklider articulated this idea in the 1960s: "Man-computer symbiosis is an expected development in cooperative interaction between men and electronic computers. . . . Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking."



This phenomenon has surfaced, and not just in the sciences. Palantir Technologies, for example, helps analysts in certain areas of finance and government spend 95% less time doing rote work, meaning that the best analysts spend more time iterating on their hypotheses and sharing results rather than manipulating spreadsheets in Excel, cleaning data, or writing code. Apple's new app, Siri, which seeks to replace basic assistant work, provides a similar illustration. As people increasingly do what people do best, combined with machines doing what machines do best, value propositions change dramatically.

3. Applications to enable personalization and customization

Information technology that enables personalized solutions will turn twentieth-century mass production techniques into relics. This trend portends much more than the ability to pre-order a custom BMW (or modify it after market) or have initials stitched onto a French cuff. It means that rather than a single vineyard running a wine club and determining what bottle to send according to availability, a recommendation algorithm will direct a "hand-picked" bottle from a range of vineyards based on a detailed assessment of tastes. Programs will "learn" an individual's interests and even basic decision-making biases—based on, for example, where one walks, drives, or flies, or who one connects with on social media platforms. That learning will inform target advertisements, suggest charities, and make vacation recommendations. As technology intelligently engages with consumers and purchasers based on

personality, history, and loyalties, businesses will capture more of the long-tail. This is not the case just for retail; in industries as diverse as healthcare, wealth management, and B2B services, processing relevant contextual information will lead to tailored products and services that are far superior to those presently available.

B. Macroeconomic Consequences

These themes will engender social and political challenges, as well as investment risk. First, unemployment will rise as automation and off-shoring squeeze the middle class and as skills fail to match the needs of a changing economy. Income will move in a ‘sociological butterfly’ where the middle is hollowed and the very high-end and the lower-middle socioeconomic classes continue to grow. Global competition will keep unemployment and under-employment high for a protracted period, leading to disenchantment with markets, dubious legislative proposals to stanch job losses, and social unrest. Power players, like bank leaders, will seek to influence policy. Governments will accrue more debt. Countries that want to compete, including the U.S., will have to fight hard to keep a level playing field for new IT-enabled businesses to compete against established players who may argue that disruption brings unbearable political difficulty.



Second, and related, wealth stratification will grow by virtue of the high stakes – the fortunes created by new technology winners will be immense. Indeed, the present age is a sort of twenty-first century gold rush, in which technology entrepreneurs and their backers seek to claim the many platforms that should, but do not yet exist. More wealth will be created than lost as the economy becomes more efficient, but much of the wealth will reside in illiquid investments, not public equities. The most connected investors, those who work most closely with the best technologists and entrepreneurs, will reap outsized gains. This trend buttresses the likelihood of widespread disenchantment, political volatility, and social unrest.

Third, public and credit markets will experience continued volatility as new platforms and innovations wipe out established companies. Markets will not easily process the uncertainties, particularly where icons of twentieth-century technology, like HP and Kodak for instance, must steer massive organizations toward new business lines that leverage intellectual property portfolios and software development. The prospects for start-ups and young companies may engender optimistic valuations, subject to wild swings as the market receives product iterations and sales figures. As industries transform, major winners and losers will emerge over short periods of time and markets will rewrite valuations more rapidly than in the past.

Fourth, as certain types of information increase in value, the amount and severity of cyber attacks will increase. Nearly every Fortune 500 company has suffered data theft, and governments in particular are subject to compromise and scandal from a range of attackers from basement-dwelling teenagers to international syndicates like Wikileaks. With increased reliance on IT, companies will have to invest in costly protections. Prophylactic technologies will become cheaper, better, and more broadly adopted over time, but attacks also will grow in sophistication, perpetuating an arms race of sorts.

Fifth, as IT further integrates into our lives and traditions, views of privacy, community, and identity will transform. Individuals may enjoy less personal interaction, which will contribute to feelings of depression and isolation in society. Countries like Korea already deal with high gaming and online addiction rates. In one case, a man died in an Internet café after playing games for 50 hours. Distrust of, and disaffection with, technology may grow and may result in a cultural backlash against those who research, develop, propagate, and invest in technology. In August 2011, for example, an anti-technology terrorist group in Mexico sent a parcel bomb to two university professors at one of Mexico’s leading technical research universities. The group claiming responsibility cited Ted Kaczynski, the Unabomber, who advocated for the abolition of the industrial-technological age as their primary influence. Despite the challenges, the coming transformation will be worth its costs. Better technology will enable new types of connection, creativity, and insights that will radically elevate standards of living. As explained below, software, mobile, and Internet advances will increase outputs in energy markets while lowering costs and conserving resources, add to the efficiency of governments, democratize global finance while reducing risk, improve access and outcomes in global healthcare, create more equal and optimized educational experiences, and offer more opportunity for personal joy and satisfaction.

III. Drivers of the Coming Transformation

Given the prospect of volatility from both an economic and sociological standpoint, understanding the drivers of the coming transformation and the anticipated effects on old-line industries will help mitigate individual investment risk.

IT advances have created a possibility-gap in business process efficiency that is, in most major industries, larger than it has been since the nineteenth century. Workers and managers alike spend hours daily searching for information to which they should have ready, automated access—information like the strengths and weaknesses of various teams or performance statistics on certain plants or branches. The platforms and technology-driven processes missing from major industries are especially important in areas involving large amounts of information, like energy, finance, government, healthcare, and education.

In fact, the potential for efficiency gains is so great that relatively small companies with good IT, albeit lesser scale and fewer distribution channels, will outperform larger, more-established, and better-networked businesses. In some cases, larger businesses will purchase upstarts and integrate them effectively. In other cases, new technology, particularly in the software, mobile, and Internet spaces, will redefine the core of those businesses and their cultures, forcing a transition that few companies will make.

A. Software, Mobile, and Internet Technologies

Software, mobile, and Internet technologies will drive the trends in open sourcing, man-machine symbiosis, and customization. As these technologies rapidly deploy, the most effective business processes will require them, fueling further expansion in these areas. Consequently, the most successful applications will be those that integrate the three elements.

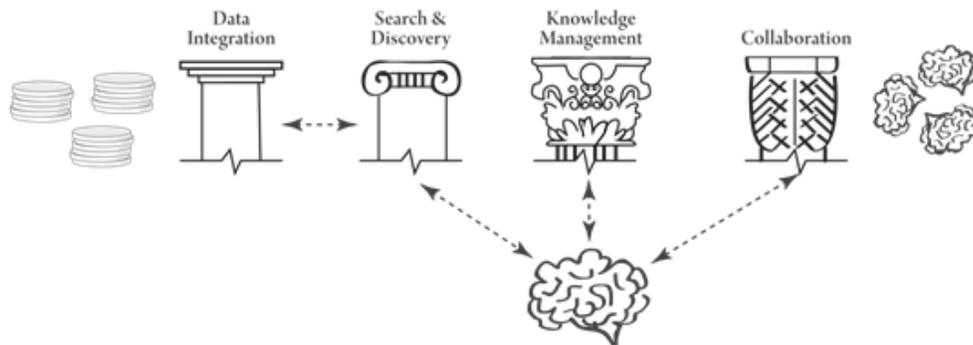
1. Software and new enterprise

Many of the best investments of the previous generation have been in software and this will remain true in the coming transformation. New software will support connectivity and improve data analysis, visualization, and modeling, improving efficiency across industries and industry subsectors. Following these improvements, market volume will increase from nearly half a trillion dollars in 2012 to over \$640 billion by 2015.

New enterprise software – software that enables conceptual work and new networks of collaboration – holds particular promise. Traditional enterprise software has focused on well-defined processes in areas that require little conceptual thought, such as payroll, reporting, accounting, and human resource tracking. Perceived as a boring space, the prospect of iterating on esoteric data-intensive problems for the back-office failed to attract the most dynamic engineers. But now, because pervasive inefficiencies in these sectors require dynamic solutions that call on disparate domains to facilitate high-level conceptual work, many of the brightest minds work on hard problems involving enterprise software for old-line industry issues. These complicated enterprise problems will involve tremendous amounts of data, engendering a related field of innovation known as “Big Data,” discussed further below.

THE FOUR PILLARS OF BIG DATA

creating value by connecting disparate business elements

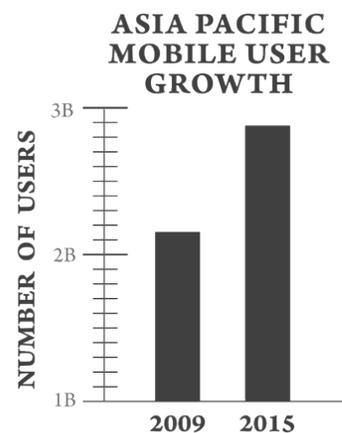


Good software will connect concepts and topics from disparate networks. For example, the need for collaboration in the intelligence and security domain demands that software jump across networks and gather data rather than wait for communication from specific departments. Many companies now focus on these types of solutions. The solutions will continue to improve as more of a knowledge worker's data becomes available in application programming interfaces (APIs) hosted in the cloud, including mobile phone data, email data, and work data. New enterprise software will hold relevance to senior employees driving core business lines, not just HR staff and sales assistants. And it will provide value across organizations to people dealing with high-level policy questions.

2. Mobile platforms

Mobile platforms will accelerate Internet accessibility and enable instant and low-cost access to increasing amounts of real-time and localized information. As near-field communications emerge, and apps like Ness and Any.do build intelligent profiles of what consumers want, where they go, and what they do, mobile interaction with consumers and businesses will deepen. Advances first made in the consumer space will spill into the rest of the global economy and affect thousands of businesses. Personalized information can convince people to visit their favorite restaurant and it can notify officers of a suspect's movements.

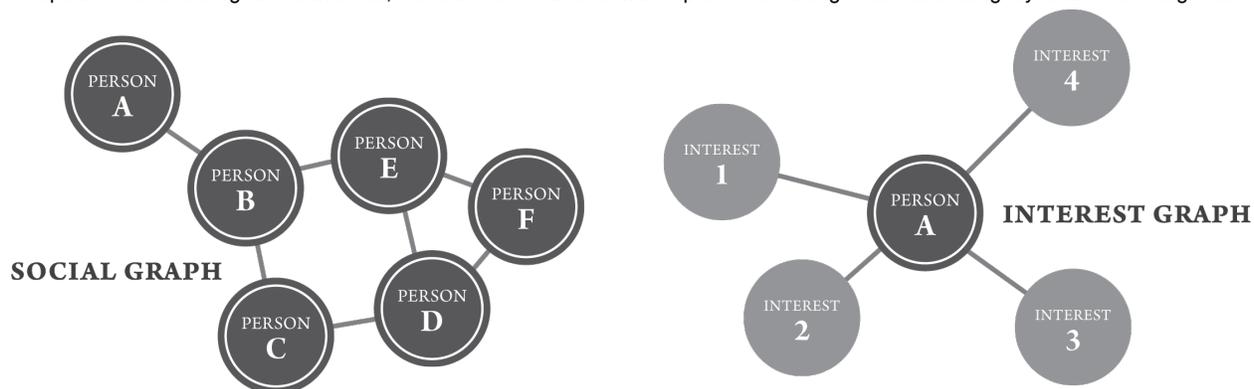
Total global mobile traffic will grow 26x between 2010 and 2015 (from .24 to 6.3 exabytes/month). Asia shows the fastest mobile adoption rates in the world, driven by increasing wealth and openness to new technology. In 2009, Asia Pacific was the world's largest mobile market, representing 57% of global mobile revenues. The most technologically developed regions, such as Japan and South Korea, will see increased smart phone usage – a tenfold increase by 2016 – while less developed countries will see heightened mobile penetration. Many new technologies developed in the U.S. will look to enter these Asian markets. Those that do so successfully will take advantage of a massive opportunity: By 2015, the 2.14 billion mobile users in the Asia Pacific will grow to 2.89 billion, at which time one out of every two mobile users in the world will reside in that region.



3. The Internet

Internet advances have democratized pricing, eliminated middlemen, and reduced the need for capital intensive infrastructure in markets ranging from books to stocks. The Internet also serves as the enabling infrastructure without which mobile and new enterprise software cannot function. New networks also continue to grow on the Internet and add value.

The hottest areas involve the social and interest graphs. The social graph, which refers to one's web of relationships, has been mapped by Facebook, LinkedIn, and other social networking sites. The interest graph is less charted. The term refers to one's web of likes or interests – or, as with the company Backplane, the web of one's influences or inspiration. Given the huge market opportunity to tap into what people care about, as opposed to only who they care about, many of the best engineers in Silicon Valley now work in this space. Whether one hunts terrorists or sells gelato, networks offer exponentially more relevant data than do nodes. On Facebook, for example, brands already target influential people and use them to generate "likes." Whole ecosystems of companies have emerged around this, because the winners will improve marketing and advertising by orders of magnitude.



The personal and social data referenced above speak to the broader, rapidly emerging field of "big data," in which technologists compete to capture, store, search, analyze, and visualize massive data sets. In addition to the social and interest graphs, exploding quantities of data from other disciplines, ranging from public health to demography and polling to logistics, demand exceptional technologies that can process the data quickly and gain insight into its patterns. Companies that can map the largest data sets into conceptual structures that enable fast, intelligent data-driven decisions will create tremendous value. Companies like Relate IQ and Blend Labs work to combine social graph technology with Big Data through the empirical quantification of communication events and other markers of relationships. These companies and many other emerging newcomers will transform personal lives and disrupt established business throughout the sectors discussed below.

Again, investors must watch Asia. Global revenues in the consumer Internet space are forecasted to reach \$1 trillion by 2020, and Asia will account for 35% of total global spending by 2015. By 2020, Asia will account for more than 56% of global Internet users. This increased Internet adoption will affect not just advertising, but also many aspects of daily life, including how customers interact with businesses, how buyers and sellers of goods and services find one another, how marketplaces set prices, how individuals use and store personal and professional data, and how citizens interact with governments.

B. Remaking the Old-Economy

To understand the power of software, mobile, and Internet advances on old-line businesses, consider the potential effects on the multi-billion dollar cement industry. Operating plants struggle with poor communications, weak analytics, and problems in pricing, certification, customer service, maintenance, and overall profitability. One particular problem concerns the limited life of mixed concrete (concrete must be poured within a couple of hours of saturation). Expired shipments waste entire truckloads. Sometimes builders use shipments despite the loss of integrity, causing future problems or regulatory exposure. With better tracking through mobile and software platforms, site managers can charge penalties for delays or use mobile incentives or gamification techniques to save tens of millions of dollars and increase quality. Cloud-based applications will process operating data and web-based mobile applications will distribute timely information, improving efficiency and preventing disasters like the Big Dig in Boston. Targeted applications will improve communication by linking drivers, site managers, dispatchers, and mixers. Pricing will grow more accurate and personalized as customer and job information assimilate. Better data analysis will streamline manufacturing and distribution.

Similar developments in data management, analytics, information transfer, and process improvements will remake the worlds of energy, finance, government administration, healthcare, education, and commerce. In the next generation, these market segments will flatten the information landscape and gain in efficiency and cost savings, stability and security, processing power, analytical capabilities, network communications speed and depth, storage and automation, and functional abstract computing.

Transformational Technologies*

Health Care	Energy	Finance	Commerce	New Media	Education	Government
 	  	  	 	 	 	  

*Companies represented here are examples of transformative technology companies built or invested in by Formation 8 partners

1. Energy

Given the size of the industry and rising demand, the energy sector holds the most potential for adoption of high-impact IT innovation. States increasingly recognize, particularly in the Asia-Pacific region, that economic stability and growth require optimization of current power assets and new energy. The main opportunities for addressing these needs involve technologies that

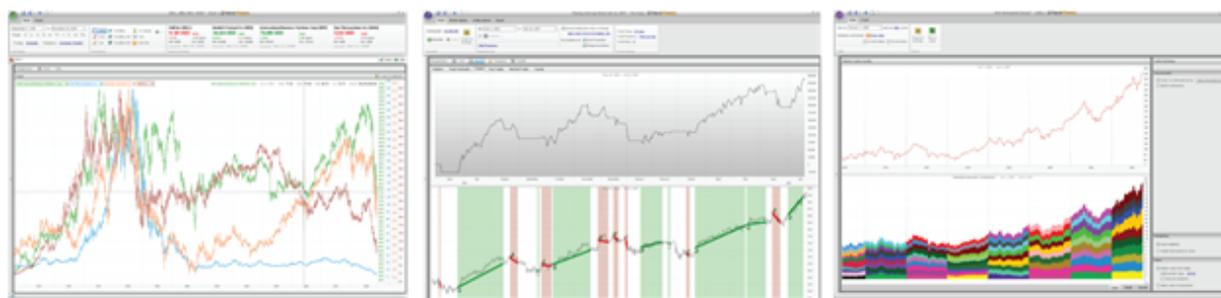
1) increase efficiency of existing energy infrastructure; 2) improve energy generation through better exploration or alternative sources, and 3) create and improve methods to store energy.

Nowhere is the need for energy innovation more pressing than in large cities. Urbanization in equatorial and other warm-weather regions will strain the energy supply. Cooling demand in metropolitan Mumbai, for example, is equivalent to 24% of the cooling demand of the entire U.S. The standard solution to increasing energy usage has been weak legislation or public service announcements imploring people to conserve. Better IT will enable more effective solutions. Office buildings will receive real-time alerts to spark short-term adjustments, like minimizing cooling and lighting during off-peak times. Automatic sensors will shut down home electronics accidentally left on. Drivers will receive up-to-date notifications of open parking spaces or uncongested roads, reducing traffic and corresponding emissions. Smart grids will analyze and respond to energy demand moment-by-moment, optimizing plant usage to reduce both cost and outages. Smart meters will provide consumers and utilities with accurate usage information, allowing utilities to set prices that more accurately reflect demand. Consumers will benefit from concrete savings analyses.

By 2020, South Korea will have erected the first “smart city,” Songdo. By 2030, total global energy infrastructure will have undergone a \$20 trillion transition. Operations management necessitates strong IT, including platforms to monitor, analyze, and control power generation, distribution, and consumption; dynamic pricing models; and automated responses to system disruptions to prevent widespread outages and security scares. Distribution and grid operations will benefit from new IT platforms that will make existing energy technology infrastructure more productive and lower-cost due to improved data analytics, process optimization, and intelligent communications systems. Exploration, production, distribution, and consumption will benefit by virtue of IT advances that bolster and coordinate information flows using sensors, pulses, measurements, and statistical analyses.

2. Finance

Several million people in the financial sector spend significant time on data entry and basic data manipulation that can be done by computers. Fraud and error-rates are high. Transparency is low. Few institutions know exactly what they own and entire banks face collapse because they cannot evaluate hidden risks. Indeed, many of the worst-run firms would have been destroyed by the latest financial collapse were it not for government intervention. Open platforms and superior technology that helps information, products, and services reach needy customers with the fewest middlemen will overtake these decaying institutions.



Addepar, Palantir, and other financial software companies work to increase transparency, reduce manual labor costs, and drive value to conceptual

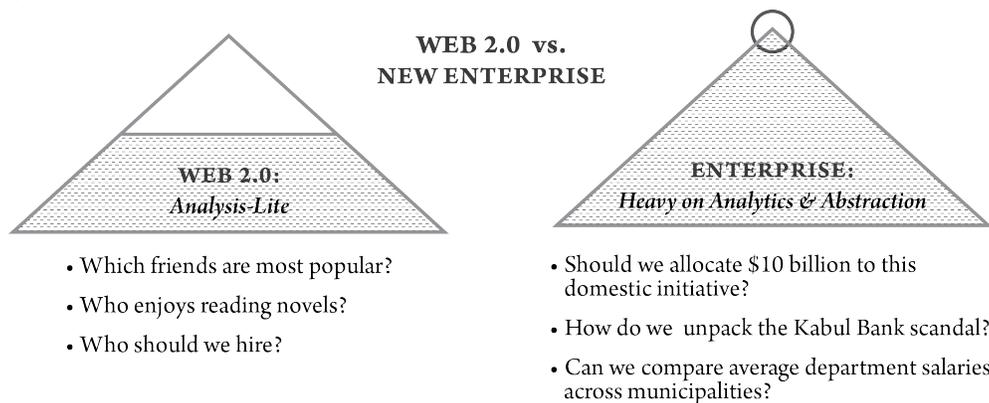
Consider the private wealth management space, where more than one million workers manually enter information on capital calls, distributions, K-1s, and other communications between financial parties. Given the predictable ontology of this type of information, systems should talk to each other directly rather than rely on expensive and error-prone human data entry. Given multiple currencies, different asset classes, and different financial product structures, family offices and large institutions manage only limited portfolio analysis. Companies like Addepar offer open platforms to increase transparency and improve analytics. Open platforms aggregate data on a massive scale, facilitating holistic portfolio views. They also allow application developers to address a multitude of specific problems, like options pricing or currency risk, providing long-term value to customers. Reducing opacity will have spillover benefits for the industry, reducing the potential for fraud and democratizing information that will empower families and small investors in comparison to large institutions.

3. Government

As in the financial industry, the government administration and security realms rely on closed platforms with slow back-office processes and excess manual data entry. Because market-based mechanisms are limited in government, disruptive technologies must be an order of magnitude better than established competitors and they must provide solutions on a grand scale where either lives or billions of dollars are at stake. These issues come together in defense, a place where Palantir Technologies has prospered by providing platforms that connect disparate databases and provide advanced analytics to improve intelligence and transparency.

Other areas of government, particularly in state and local administration, sacrifice hundreds of billions of dollars to poor accountability, weak systems, and error. Enterprise systems are usually customized, built from the ground up in major deployments. This means that IT consultants must make changes to the code every time pension contributions change or labor negotiations conclude. In fact, the average 100,000 person city maintains a staff of at least 10 – and often many more – IT consultants to run the system. Further, although cities pay millions for their systems (often tens of millions), and notwithstanding promises of advanced collaborative tools, municipalities typically use Microsoft Excel to build budgets and conduct financial planning because the purchased software does not work. A majority of cities consider their major enterprise deployments failures, and a nontrivial number of these deployments end in lawsuits.

New software platforms and technology solutions, like those presently being developed by Delphi Solutions, will address these pain points. Holistic, modern systems will improve data access, improve budgeting through with sophisticated collaborative tools, sharpen financial planning through more accurate benchmarking and performance indicators, and facilitate transparent and seamless interaction between and within agencies. As the paradigm in government technology solutions shifts from service-created to COTS (Commercial-Off-The-Shelf), cities will more easily compare systems meaning that the best technologies stand a better chance of dethroning old leaders. Moreover, new systems will empower stakeholders and ordinary citizens with greater transparency, better opportunities to interact with public financial data, and easier avenues for engagement with elected officials and administrators.

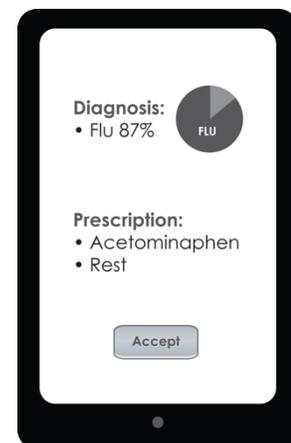


4. Health Care

Medical costs continue to rise. They do so at an unpredictable pace, and few systems provide transparency or keep costs in line. Even commodity providers within cities charge differing amounts, depending on relationships with clients as opposed to price-competitive services. The healthcare industry needs new technology platforms to enable market-based mechanisms to reduce waste, share information, analyze data, and improve outcome analysis.

High-level medical professionals spend much of their time doing rote work. In fact, early electronic medical record (EMR) companies may have worsened the situation in that doctors spend more time entering data and parsing details. Improved IT will free doctors and other professionals to deal with higher level conceptual work – the exceptions and unusual cases – while other forms of treatment and interaction will be pushed down and even automated.

Imagine a world in which a nurse works with a patient to enter in the patient's key background information, and then a computer spits out a diagnosis: 87% chance the patient has the flu,



10% chance the patient has a certain type of fever, and 3% chance the patient has a more serious condition. The program may then cross-reference the patient against similar patients and ask the nurse additional questions missed in similar situations in the past. The computer will compare the patient to others in the area and others across the world who, for example, had been pregnant recently and suffered a bad flu within the last three years. After this analysis, the computer generates a series of recommendations. A highly-trained doctor will review, modify, and approve the recommended steps. Eventually, doctors will attend to only the exceptional or unusual cases, the sort that require high-level conceptual 'detective' work.

Early-stage companies presently work on technologies like this, and the savings will revolutionize over-strapped and under-resourced medical systems. Costs will also fall through competition and by eliminating waste. On the latter point, consider that Americans spend roughly \$500 billion per year on standard medical office visits, yet 25% of these visits require no diagnostics (only basic question and answers). A robust system of online communication could route questions to relevant professionals and aid them in responding to patients, saving up to \$100 billion in unnecessary in-person diagnostic sessions.

5. Education

As in healthcare, technology will allow educators to spend more time on high-level problems, such as research and curriculum development. Technology will also facilitate personalization. Companies following traditional enterprise models have failed in the education space, because good education requires engaging students at a conceptual level, on terms directly relevant to their interests. But software development has started to show capabilities in intelligent personalization that involves flexibly dealing with high-level context versus easily repeatable, well-defined processes.

Networks such as edModo, Schmoop, and Piazza have access to, and increase, collaboration among millions of teachers and students. Airy Labs, Ntelligent, and others use gamification to engage students in new ways. They also try to map the ontology of learning to enable personalized challenges that come from precisely measuring students' skills. As these early efforts collect data, the technology will network to target and deliver content for each student. A technology-empowered educator will focus on a child's weaknesses, while also gearing advanced study materials for her math prowess. These materials will interest her and engage her mind based on what she enjoys studying, say, nature, science fiction, and logic. Parents and educational institutions will pay substantial sums for technology that helps children excel in multiple aspects of their education.

The general trends in man-machine symbiosis apply. As with a doctor and patient in medicine, teachers will deal with exceptions and with iterative areas too complicated for computers to understand. The human touch will remain critical, and indeed increase in value, to complement the computer-aided educational experience. Presently, the industry suffers from weak infrastructure, incompetent IT support, and thin technology cultures. But as evidenced by initiatives at top universities to put classrooms online and by the growth of for-profit learning in general, these factors are changing. Professors and educators will focus on research, its applications, and training that requires hands-on instruction, while rote learning and numerous forms of basic instruction will be placed online or in modes of automation.

6. Media and Commerce

Media and commerce will continue radical change on the backs of companies that use technology to aggregate customers, disseminate virtual goods, improve in-app commerce, and provide access to local, personal, and real-time discounts and trends. The advertising domain shows a \$50 billion dollar gap in the amount of time spent on a mobile device relative to the money spent on advertising. In entertainment, the avenues for expanding content are burgeoning—mobile entertainment grows near 20% per year and it's expected to reach \$54 billion by 2014. In retail, everything is changing. Between 1991 and 2001, U.S. retail growth maintained a 4-5 percent rate. Since Amazon.com turned its first profit in 2001, U.S. old-economy retail has grown only 1.2%, while online retail grew at close to 20% per year in the same period.

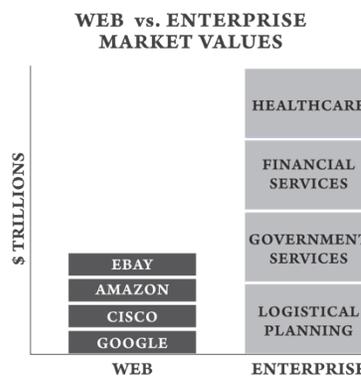
To see the reach of some of these trends, consider the impact on charity fundraising, which has been revolutionized by social networking and also mobile applications that allow for text-based donations. ONE HOPE, for example, enables charities to use its site for free to raise money with a modern point-based engine for supporters, and to use wine products as one way of doing so. Through its site, ONE HOPE gives wineries access to its national charitable networks and offer wine to millions for good causes. Charities get upside and consumers get upside; middlemen lose. With online wine sales growing steadily at over 35%, distributors and retailers should be scared. ONE HOPE even works with distributors to change the technology available to them and give them a better lock-in and value-add to retail locations with inventory management and a deal interface when it takes its brand offline.

This example speaks to the larger alcohol industry. Major distributors still reach retail and restaurants manually through face-to-face sales relationships. Distributors do not employ real-time inventory tracking and they do not use customer relationship management systems. Buyers regularly pay premiums given the inconvenience of comparative pricing. Software and enterprise platforms will remake this entire vertical, and many others like it from fashion to furniture.

IV. Navigating the Coming Transformation

To successfully navigate the coming transformation, investors must heed two important principles. First, risk-reward favors the valuable areas over the popular areas. Valuable areas include areas that remain nearly untouched by recent technology advances – massive old-line industries plagued by systemic problems and deep operational inefficiencies. Popular areas are areas in which a multitude of competitors fight for copycat victories in subsectors of industries already changed by technology and the success of companies like Amazon, Facebook, Groupon, and Zynga.

To understand the popular areas to avoid, consider the areas in which the majority of talented young programmers work, such as communications, billing and payments, consumer investing, and gaming. Companies that garner attention in the press create copycat entrants, as is the case with social networking, deals sites, and local business analysis and support. To understand the valuable areas to seek out, consider the spaces still run by older executives uninfluenced by technology, like oil and gas, banking and financial services, government administration, medical practice and healthcare management, and secondary and higher education.



Along with investors, many technologists remained charmed by popular areas and choose to focus on first order problems, while failing to understand the back-end infrastructure and difficult applications of IT to business processes that make companies like Amazon successful. Investors and technologists often yearn to enable new ways for people to interact or see advertisements, but they ignore superior platforms in areas of industry like shipping or security or debt that will make the economy more efficient and solve hard global challenges.

The best entrepreneurs and investors will ask the right questions: What areas are worth billions of dollars and are important for our society, but do not currently employ advanced IT? What major areas of the economy are frustrating to work in when compared to how those areas should function?

Another important principle, and perhaps the least understood aspect of the coming transformation, is the critical element strong technology cultures. Running a business to take advantage of optimal processes enabled by advances in IT requires a meritocracy where engineers work for upside and control important parts of the company. Businesses frequently ignore or refuse to make this transition even as they are outcompeted and eliminated by new competition. Investors also fail to measure and appreciate the importance of this variable. An early-stage technology company not run by the most talented engineers has little chance of becoming a disruptive billion-dollar business. Many investors do not come from a top engineering culture and this will differentiate the elite.

The importance of a technology culture carries meaning at the macro level in addition to the corporate level. Although growth in U.S. markets may wane, the U.S. still produces the world's best innovation because it maintains the best entrepreneurial ecosystems. Communities like Silicon Valley or Cambridge combine university research, funding, expertise, technology, and entrepreneurs in a swirling mix, valuing ideas over established hierarchies. These ecosystems will engender hundreds of new networks and platforms across global industries. On this scale, a technology culture represents the opposite of the mindset among the British aristocracy before the second industrial revolution. Wealth will not be "preserved" through "safe" investments. Technology cultures, well managed and fostered, will push expenditures on software, mobile, and Internet technologies to fill efficiency gaps in the old

economy. And the creative destruction wrought by companies possessing the right mix of superior technology, market knowledge, cultural understanding, and execution will measure in the trillions of dollars.

As Henry Kissinger said: "History knows no resting places and no plateaus." This applies to investing, where companies must create value and create it anew. The British aristocracy lost its wealth and power through complacency and a failure to adapt to coming change. America's aristocracy will lose its wealth by virtue of a similar complacency and a similar failure to adapt to changes wrought by IT innovation. Many investors know that the world around them is changing, but they do not have the tools to translate that awareness into successful investments. A few investors, those most connected with the robust technology ecosystems that foment the changes and those best-versed in the hard and soft qualities that make an outstanding technology company, will understand the factors that expose an industry to disruptive technology. And those investors will create, and benefit from, these immense disparities.

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