

United States Contingent Workforce Challenge



4 April 2016

The U.S. Contingent Workforce Challenge

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4 April 2016

Jobenomics reports on U.S. employment and unemployment size, characteristics and trends. This employment analysis focuses on the U.S. labor force, business and job creation, and transformative trends—with emphasis on the 60 million workers in the rapidly growing, and underreported contingent workforce.

The Bureau of Labor Statistics (BLS) defines the contingent workforce as the portion of the labor force that has “nonstandard work arrangements” or those without “permanent jobs with a traditional employer-employee relationship”.

The “contingent” workforce could be the predominant source of employed U.S. labor by 2030, or sooner, depending on economic conditions and seven ongoing labor force trends. Today, Jobenomics estimates the contingent workforce to be 60,000,000 employed Americans or 40% of the total employed workforce. By 2030, this will rise to 80,000,000, or 50%, of the total employed workforce.

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The Contingent Workforce Challenge

U.S. Contingent Workforce Size Estimates 1998 to 2030

	BLS/GAO 1995 CWS	BLS/GAO 1999 CWS	BLS/GAO 2005 CWS	GSS 2006	GSS 2010	Jobenomics 2016 Est.	Jobenomics 2030 Est.
Employed	123,208,000	131,494,000	138,952,000	143,150,000	138,438,000	149,703,000	160,000,000
Contingent Workforce	39,549,768	39,448,200	42,519,312	50,531,950	55,790,514	59,881,200	80,000,000
	32.1%	30.0%	30.6%	35.3%	40.3%	40.0%	50.0%

Source: GAO Contingent Workforce Report (GAO-15-168R), Tables 3 & 4, 20 April 2015

Source: Jobenomics

Jobenomics 2016 estimate of 40% for core and non-core contingency workers is roughly equivalent to the GAO's high water mark of 40.4% of the U.S. labor force in 2010¹ and Bloomberg's contingency workforce estimate of 40% for 2020.² Jobenomics 2016 estimate is similar to estimates from other developed economies. For example, in Japan, contingent workers (non-regular workers) accounted for up to 50% of younger Japanese workers and 40% of the total Japanese labor force in 2014, up from 10% in 1990.³

Defining the Contingent Workforce. To understand the contingent labor force, it is necessary to first know what U.S. government agencies (Bureau of Labor Statistics, Census Bureau, Government Accountability Office and others) say about part-time, temporary, nonstandard, independent, or workers with "alternative" work agreements, who are collectively defined as contingent workers.

According to an April 2015 study by the Government Accountability Office (GAO), compared to the standard workforce, the size, character, earnings and benefits of today's contingent workers are largely unknown to U.S. Department of Labor and U.S. policy-makers. Quoting the GAO, "there is a lack of consensus on how to define contingent work, in part because researchers focus on different aspects of the labor market. Some definitions focus on job tenure or the precariousness of work, while some focus on employer-employee relationships. Available data thus produces varying estimates of the size of this workforce, depending on definition. Available data also does not fully enable analysis of trends in the size of the contingent workforce or the effects of economic cycles, such as the recent recession."⁴

As a result, there is no government consensus on the magnitude of the contingent workforce. Estimates vary from a low as 5% to a high of 40% of the total U.S. employed workers in 2016. Jobenomics analysis asserts that 40% is the most accurate estimate. Jobenomics also asserts that this percentage will continue to increase and exceed 50% of the employed labor force by 2030, or sooner,

¹ U.S. Government Accountability Office, Contingent Workforce: Size, Characteristics, Earnings, and Benefits, 20 April 2015, <http://www.gao.gov/products/GAO-15-168R>

² Bloomberg Businessweek, 20-25 October 2014 Edition, Companies/Industries, Page 20

³ Asia-Pacific Journal, Scott North, "Limited Regular Employment and the Reform of Japan's Division of Labor", The Asia-Pacific Journal, Vol. 12, Issue 15, No. 1, April 14, 2014, <http://www.japanfocus.org/-Scott-North/4106/article.html>

⁴ U.S. Government Accountability Office, GAO-15-168R, Contingent Workforce: Size, Characteristics, Earning and Benefits, 20 April 2015, <http://www.gao.gov/assets/670/669766.pdf>

based on seven labor force trends, described herein, and the state of the economy—unlike standard employment growth, contingent employment will increase whether the economic conditions are positive, neutral or negative. Neutral and negative economies usually reduce full-time labor.

Generally speaking, policy-makers view the contingent workforce a relatively insignificant portion of the U.S. labor force. They also view contingent workers more as a governmental liability than a public asset. The prevailing view of policy-makers is that most contingent workers receive lower wages and fewer employer-provided retirement and health benefits compared to standard workers. As a result, these workers are compelled to turn to government welfare and other means-adjusted programs for assistance. While this is true for the low-end of the contingency workforce, it is not necessarily the case for top-end contingency workers who chose nonstandard work as a matter of choice.

Largely due to the current standard workforce focus of labor force survey questions, policy-makers are unaware of the fact that contingent work is no longer an aberration, but a key component of the labor force (60 million contingent workers versus 90 million standard workers). In addition, a growing number of contingent workers do want full-time jobs and traditional careers. 90% of independent contractors and self-employed workers reported in the last BLS Contingent Workforce Survey that they would not prefer a different type of employment from the one they have.⁵ Uber drivers, apps developers, fracking industry wildcatters and knowledge workers are just some of many examples of the upside of the growing contingent workforce in occupations that did not even exist a decade ago.

The Bureau of Labor Statistics (BLS) defines the contingent workforce as the portion of the labor force that has “nonstandard work arrangements” or those without “permanent jobs with a traditional employer-employee relationship”. The BLS further makes a distinction between contingent and alternative employment agreements. According to a BLS special supplemental survey conducted in February 2005 (the last contingent workforce survey conducted by the BLS), “Contingent workers are persons who do not expect their jobs to last or who reported that their jobs are temporary. They do not have an implicit or explicit contract for ongoing employment. Alternative employment arrangements include persons employed as independent contractors, on-call workers, temporary help agency workers, and workers provided by contract firms.”⁶

A 2015 GAO report, entitled the “Contingent Workforce: Size, Characteristics, Earnings, and Benefits”, grouped contingency workers into two categories: core and non-core. The core category includes agency temps, direct-hire temps, on-call workers and laborers and contract company workers who are characterized as low wage earners who are subjected to nonstandard work arrangements out of necessity. Core workers cede control over their work making them economically dependent on employers. Consequently, a disproportionate number of these involuntary core workers are subject to exploitation in terms of wages and benefits. The non-core category includes independent contractors, self-employed workers and standard part-time workers who work fewer than 35 hours per week as a matter of choice and are economically independent by volition.

⁵ Ibid, Job Satisfaction, Table 12: Estimated Percentage of Workers Who Want a Different Type of Employment, 2005

⁶ U.S. Bureau of Labor Statistics, Contingent and alternative employment arrangements, retrieved 23 January 2016, <http://www.bls.gov/cps/lfcharacteristics.htm#contingent>, and <http://www.bls.gov/news.release/pdf/conemp.pdf>

From a social science perspective, the major difference between core and non-core work involves social compact, an implicit contract for remuneration and protection in exchange for surrendering personal liberties. Relational employer-employee social compacts that evolved over the 20th Century are now less enforceable in today's transactional society. Relational social compacts emphasize mutual-interests whereas transactional social compacts promote self-interests. Relational compacts better accommodate low-skilled, risk-adverse, vulnerable core contingent workers who are dependent on near-term wages and benefits. Transactional compacts favor skilled non-core contingent workers who tend to be more self-directed, entrepreneurial and self-supporting.

Consequently, Jobenomics believes that America needs a dual contingent workforce strategy to (1) minimize low-end core contingent workers and (2) maximize top-end non-core contingent workers with emphasis on individuals and occupations with the highest need and potential.

According to many labor force experts, new workforce entrants (e.g., Generation Z "Screenagers", and Generation Y "Millennials") prefer contingent work over standard work for a number of reasons including self-direction, variety, flexibility, skill development, as well as a general disillusionment with traditional corporate social compacts and promises that have proven to be short-lived with older generations. Millennials also understand that standard workforce growth is highly dependent on a growing economy, whereas contingent workforce growth is more resistant to economic fluctuations.

The rise of the contingent workforce is not unique to the United States. Furthermore, contingent work is being embraced by foreign policy-makers to a greater extent than in America. Japan serves as an example. Japanese contingent workers (called non-regular workers) accounted for up to 50% of younger Japanese workers and 40% of the total Japanese labor force in 2014, up from 10% in 1990.⁷ In 2015, Japanese Prime Minister Shinzo Abe announced policies to make it easier for companies to dismiss standard workers in favor of contingency workers in order to make Japanese companies more competitive. An aging Japanese population will also fuel contingent work growth in Japan as retired workers and older women are seeking part-time work to supplement income in a struggling national economy.

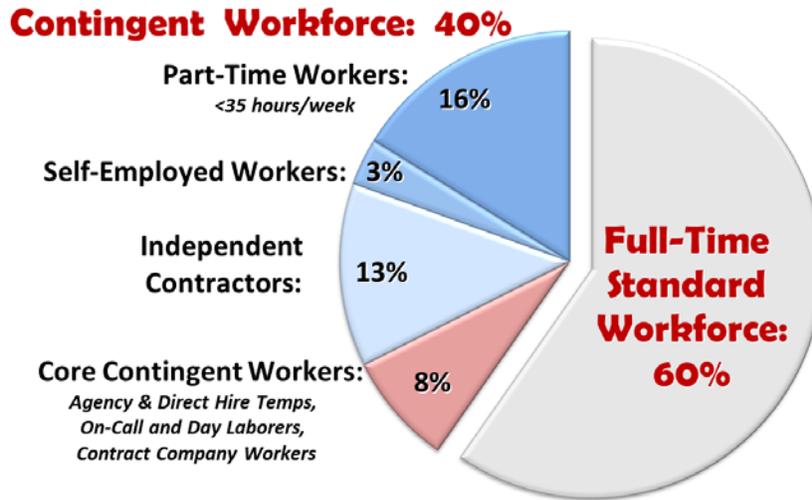
Policy-makers in other parts of Asia and many countries in Western Europe are also actively preparing for the possibility of contingent work becoming the dominant element of their national labor force. China's 13th Five-Year Plan, a roadmap for the nation's development from 2016 to 2020, emphasizes the need to create a policy environment that can foster homegrown contingent workforce development and investment with emphasis on micro and self-employed businesses engaged in the emerging digital economy (e-business and e-commerce).

⁷ Asia-Pacific Journal, Scott North, "Limited Regular Employment and the Reform of Japan's Division of Labor", The Asia-Pacific Journal, Vol. 12, Issue 15, No. 1, April 14, 2014, <http://www.japanfocus.org/-Scott-North/4106/article.html>

2016 U.S. Employed Labor Force

149,703, 000 Americans (16 Years and Older)

Source: GAO, BLS, NORC, Jobenomics



Estimating the Size of the Contingent Workforce. Out of approximately 150 million employed American workers in 2016, 60 million people are in the contingent workforce (part-time, self-employed, contracted workers, temps and day laborers). By 2030, Jobenomics forecasts that contingency workers will be the dominant (over 50%) component of the U.S. labor force with 80 million standard full-time employees and 80 million “non-employee” contingent workers.

To understand size of the U.S. labor force and its contingent workforce component, one must have a basic knowledge on how data is collected by the government.

The two primary sources of data are from joint Census Bureau/BLS household surveys and BLS industry surveys. The “Household” survey collects data via the Current Population Survey (CPS) and the “Establishment” payroll survey via the Current Employment Survey (CES).⁸

- CPS Household data is collected monthly from a sample from over 60,000 American households and includes comprehensive data on the labor force, the employed, and the unemployed classified by such characteristics as age, sex, race, family relationship, marital status, occupation and industry attachment. The CPS also provides data on the characteristics and past work experience of those not in the labor force.
- CES Establishment data is collected monthly from a sample of approximately 143,000 businesses and government agencies representing approximately 588,000 worksites throughout the United States. The primary statistics derived from the CES survey are monthly estimates of employment, hours, and earnings for the nation, states, and major metropolitan areas. CES produces estimates

⁸ U.S. Bureau of Labor Statistics, Household vs. Establishment Series, <http://www.bls.gov/lau/lauhvse.htm#hvse>

on the number of employees on nonfarm payrolls, average hourly earnings, average weekly earnings, and average weekly hours.⁹

CPS and CES data are reported in the BLS monthly Employment Situational Report and various BLS Supplements to the Current Population Survey. The monthly BLS Employment Situational Report is a widely read government report used for policy-making in the United States. BLS Supplements are also important since they provide a significant level of detail for public and private analyses. It is important to recognize that these BLS reports and supplements are focused mainly on standard workers who are employed by nonfarm, industry-centric and employer-providing firms. Agricultural (farms and ranches) and nonstandard (contingent) worker data is sparse and episodic due to historical precedent and budgetary constraints.

The BLS Employment Situational Report's focal point is on the "civilian noninstitutional population" that consists of three main categories: "Employed", "Unemployed" and "Not in Labor Force". To be Employed, one must have a job. To be Unemployed, one must be looking for a job. To be Not-in-Labor-Force, one must be an able-bodied adult who is neither employed nor unemployed.

The overwhelming amount of BLS statistical labor force data is centered on statistics relating to the 143 million nonfarm Employed Americans, who are accounted in three general sectors (private sector goods-producing, private sector services-providing and government) that are subdivided into 13 industry groups and further subdivided into 130 industries. Since the BLS defines contingent workers as those without "an explicit or implicit contract for long-term employment", their focus is on the temporary nature of work. Consequently, those that chose not to work or work outside traditional labor occupations receive less scrutiny.

Jobenomics applauds the work the BLS accomplishes with standard industries, but believes that the U.S. government should allow the BLS to evaluate at super sectors, like energy and healthcare, and major trends, like the contingent workforce and Not-in-Labor-Force group, with the same intensity.

To a lesser degree, BLS Employment Situational Report contains data on 16 million Unemployed Americans who are accounted in 6 unemployment categories. To a minimal degree, the BLS reports on the 94 million people who are categorized in a single Not-in-Labor-Force category that is reserved for able-bodied Americans who can work but chose not to work for a variety of reasons. Jobenomics sees the evergrowing Not-in-Labor-Force, which has grown by 25.4 million Americans since year 2000, as impactful to the U.S. labor force as the rise in the contingent labor force. Not-in-Labor-Force is addressed in detail in the Jobenomics U.S. Unemployment Analysis.

The CPS is also used to collect data for a variety of other studies. Supplements cover a wide variety of topics depending on the needs of the supplement's government sponsor, including a BLS sponsored Contingent Workforce Supplement (CWS).¹⁰ A total of five CWSs were conducted by the BLS in 1995, 1997, 1999, 2001 and 2005. Since the 2005 CWS, the BLS has repeatedly requested that the CWS be

⁹ BLS, CES Survey Frequently Asked Questions, <http://www.bls.gov/web/empsit/cesfaq.htm>

¹⁰ U.S. Census Bureau, Supplemental Surveys, <http://www.census.gov/programs-surveys/cps/about/supplemental-surveys.html> and <http://www.census.gov/programs-surveys/cps/about.html>

reinstated but until recently has not been unsuccessful in doing so.¹¹ After a 10-year hiatus, the BLS will now resume the CWS. In the FY2016 Budget, out of a total BLS budget of \$637.4 million, the BLS was granted \$1.6 million and 3 full-time equivalent personnel to conduct a CWS every two years.¹²

Even though the CWS budget is only ¼ of 1% of the overall BLS budget, Jobenomics contends that resumption of the CWS will be a vitally important first step to laying a framework in understanding the contingent workforce’s size, character and impact on the U.S. labor force and economy. However, Jobenomics is concerned that the BLS has historically been constrained by key worker protection laws that focus surveys on employees of standard companies as opposed to non-core contingent workers who are not classified as employees. Without a complete analysis of the entire contingent workforce spectrum (core and non-core, standard and nonstandard, or contingent and alternative work arrangements), it will be impossible for policy-makers to assess the degree of influence that the contingent workforce is having on the labor force.

This chart was derived from the GAO’s GAO Contingent Workforce Report that compared historical surveys (CWS, CES Establishment, CPS Household, CPS Disability, CPS Annual Social and Economic Supplement, NORC General Social [GSS], Survey of Income and Program Participation).¹³ Jobenomics 2016 and 2030 estimates are also included.

U.S. Contingent Workforce Size Estimates 1998 to 2030

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	32.1%	30.0%	30.6%	35.3%	40.3%	40.0%	50.0%

Source: GAO Contingent Workforce Report (GAO-15-168R), Tables 3 & 4, 20 April 2015

Source: Jobenomics

Agency & direct-hire temps, On-call workers & day laborers, Contract company workers

	7,269,272	7,495,158	7,781,312	10,163,650	10,936,602	11,976,240	19,200,000
Core Contingent	5.9%	5.7%	5.6%	7.1%	7.9%	8.0%	12.0%

Independent contractors, Self-employed workers, Standard part-time workers

	32,280,496	31,953,042	34,738,000	40,368,300	44,853,912	47,904,960	60,800,000
Non-Core Contingent	26.2%	24.3%	25.0%	28.2%	32.4%	32.0%	38.0%

Using composite data from multiple sources, the GAO estimates core and non-core contingent workers between 5.7% to 7.9% and 24.3% to 32.4% respectively, for a total of approximately 30% to 40% of the employed labor force. As of January 2016, the total number of U.S. employed is

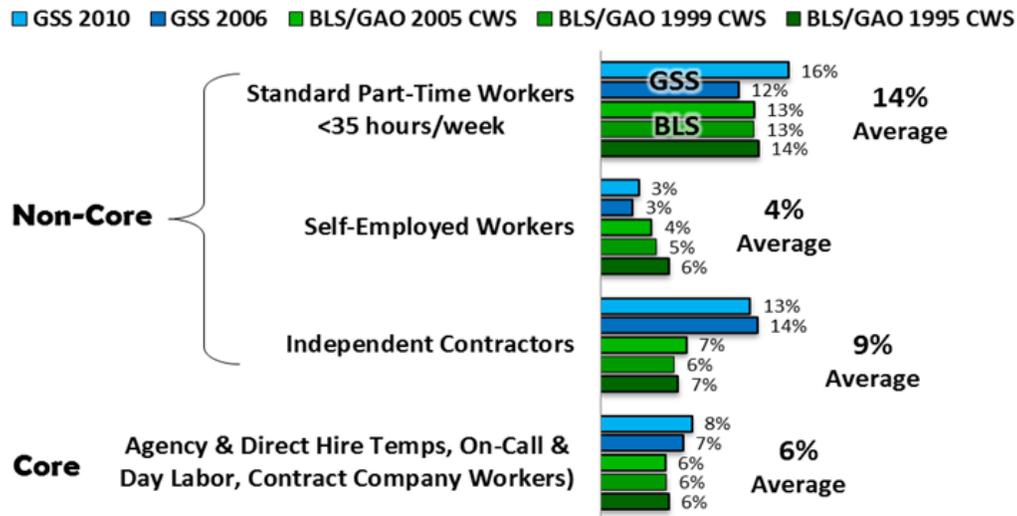
¹¹ U.S. Government Accountability Office, GAO-15-168R, Contingent Workforce: Size, Characteristics, Earning and Benefits, 20 April 2015, Background, page 3, <http://www.gao.gov/assets/670/669766.pdf>

¹² FY 2016 Congressional Budget Justification Bureau Of Labor Statistics, Labor Force Statistics, CWS, pages BLS-1 and BLS-11, <http://www.dol.gov/sites/default/files/documents/general/budget/2016/CBJ-2016-V3-01.pdf>

¹³ GAO, Contingent Workforce Report (GAO-15-168R), Tables 3 & 4, 20 April 2015, <http://www.gao.gov/assets/670/669766.pdf>

149,703,000 million people.¹⁴ Using the 30% and 40% figures, a total of 45 to 60 million Americans would be considered contingent workers. By 2030, at 50% of all employed workers, the United States would have a total of 80 million contingency workers and 80 million standard full-time workers.

Contingent Workforce By Type Worker



The recent growth in 1099 workers (IRS Form 1099-MISC used by independent contractors, aka contingent workers) suggests a massive transition from full-time to contingent work this decade. In 2010, 82 million 1099s were sent to the IRS. By 2014, the number grew to 91 million for a total of 9 million for the four-year period or roughly 22 million if extrapolated for the entire decade. It should be noted that 1099s are only filed for wages over \$600. Many contingent workers, like apps developers, are working for zero wages with the hope of a large future payoff or jobs with leading network-centric corporations.

Within the contingent workforce, standard part-time workers are the largest group, at 14%, of all employed workers, followed by independent contractors at 9%, self-employed workers at 4% and core group workers at 6%. It appears that only the incorporated self-employed number were included (5.8 million today), not including the unincorporated self-employed (9.4 million today), which is consistent with the Jobenomics premise that government surveys are focused on incorporated businesses in existing nonfarm industries. It is also important to note that the number of incorporated self-employed businesses has grown by 35% since year 2000, giving credence to the notion that non-core contingent businesses are an important faction of the U.S. labor force and overall economy—a faction that is neither well reported nor understood.

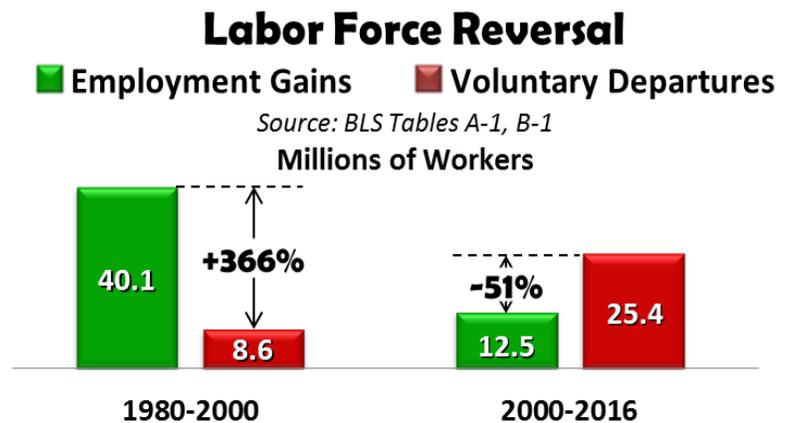
Jobenomics Contingent Workforce 50%+ Forecast (Seven Major Factors). By 2030, or sooner, Jobenomics forecasts that contingency workers will be the dominant (over 50%) component of the U.S. workforce. This forecast is based on seven factors: (1) increasing labor force losses versus labor force gains, (2) adverse corporate hiring and employment practices, (3) revolution in energy and network technologies, (4) automation of manual and cognitive jobs, (5) impact of the emerging digital

¹⁴ BLS, Table A-1. Employment status of the civilian population, <http://www.bls.gov/news.release/empsit.t01.htm>

economy, (6) shift from full-time, to part-time and task-oriented labor, and (7) cultural differences of new labor force entrants.

(1) Increasing labor force losses versus labor force gains. The U.S. labor force took an ominous reversal at the beginning of the 21st Century when able-bodied adult workforce departures dramatically outpaced the number of people entering the labor force.

During the 1980s and 1990s, employment gains were 366% more than voluntary departures (40.1 million versus 8.6 million). From the beginning of year 2000 to 2016, employment gains were 51% less than voluntary departures (12.5 million versus 25.4 million). From a Jobenomics standpoint, this labor force reversal is largely due to poor economic conditions, conservative hiring and leaning practices, the demise of the American middle-class, and attractiveness of government welfare and mean-adjusted assistance programs.



Without significant jobs growth in conjunction with a meaningful reduction of voluntary departures, the U.S. economy is not sustainable, middle-class wages will continue to erode, consumption (70% of U.S. GDP) is likely to falter, and another recession is probable. Consequently, it is imperative that policy-makers, decision-leaders and business executives aggressively create employment opportunities that will motivate citizens towards workfare over welfare and self-sufficiency over public/familial dependence.

The best way to motivate these individuals to emphasize the plethora of employment opportunities afforded by the 4.9 million open U.S. jobs¹⁵, the fastest-growing service industries that are generating 80.9% of all new jobs, and by the millions of new opportunities that are available via the ongoing energy technology and network technology revolutions.

Contingent work and new non-core contingency businesses are an important component of fulfilling these opportunities—a component that has not been aggressively supported in the United States. Today, there are 60,000,000 American contingent workers. Prior to the end of the next decade, this number is likely to grow to 80,000,000 Americans. Now is the time to plan and create meaningful employment and income opportunities for the contingency workforce.

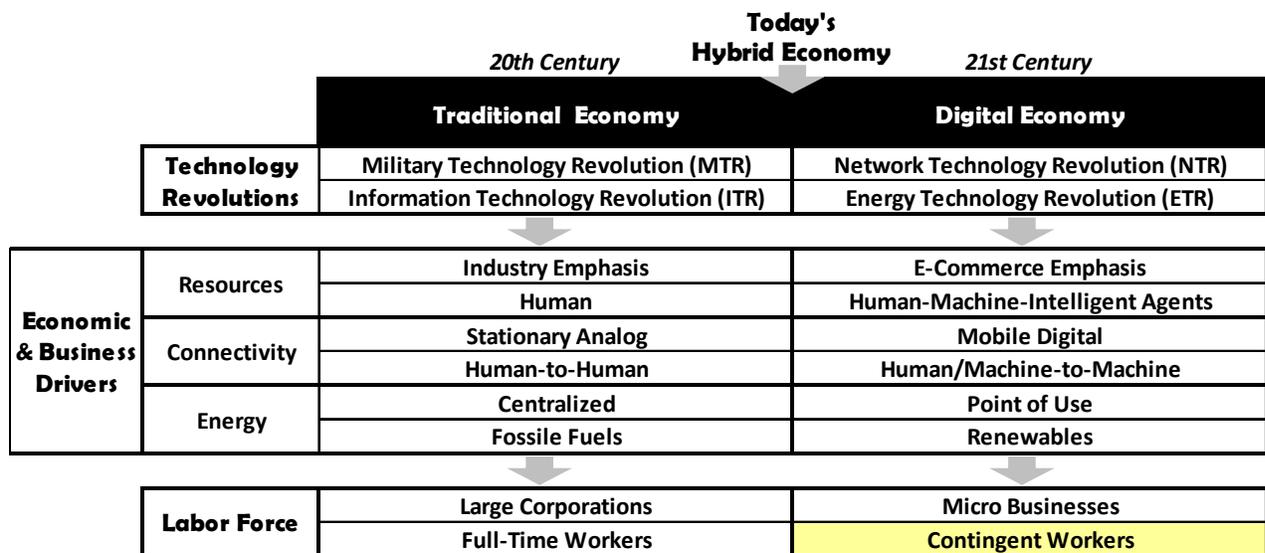
(2) Adverse corporate hiring and employment practices. From 2010 to 2016, big businesses with over 500 employees provided only 3,014,000 net new jobs, whereas small businesses with less

¹⁵ U.S. Bureau of Labor Statistics,, Job Openings and Labor Turnover, Table 7, retrieved 23 January 2016, <http://www.bls.gov/news.release/jolts.t07.htm>

500 employees produced 10,511,000 net new jobs.¹⁶ Today, corporate America makes more money on money than on people-made goods or people-provided services. If not for small business, the U.S. labor force would be much smaller than it currently is.

Since the end of the Great Recession in 2009, big business received numerous government incentives and low interest loans compared to small businesses. Rather than using these incentives and financial largess to recapitalize, most corporations understandably used the money to buy back stock, merge, acquire and invest in the secondary market. The net result of these actions was stronger corporations and a weaker labor force.

While it is essential that the United State maintain strong corporations, it is equally essential to develop a strong labor force. Major corporations must play a larger role in developing skills, jobs and startup businesses to fill the 4.5 million open private sector jobs.



The U.S. economy is transitioning from a traditional W-2 economy with standard employees to a digital 1099 economy with non-employee contingent workers. From a corporate standpoint, non-employees (contingent workers) make a lot of sense. Outsourcing work to a task-oriented and temporary workforce can provide corporate managers more flexibility and higher profitability than maintaining higher-priced, full-time employees. Contingent workers are also a solution to corporations that are struggling to attract talented workers. Critical skillsets can often be obtained by independent contractors, flex-workers, freelancers and on-demand labor.

According to Ardent Partners, a U.S. research consultancy, “95% of organizations today perceive their contingent workforce as important and vital today not only to day-to-day operations, but also to ultimate enterprise success and growth.” In 2015, Ardent calculates that 54% of corporate top talent is concentrated on traditional workers, 20% on contingent workers, and the remaining

¹⁶ ADP, National Employment Report, December 2016, <http://www.adpemploymentreport.com/>

balance (26%) a combination of traditional and contingent workers. By 2017, this concentration is expected to be 41% traditional, 25% contingent and 34% combined.¹⁷

Unfortunately, corporate America does not have a common contingent workforce management framework. The same is true with government agencies at both the federal and state level. In order to build a stronger U.S. labor force, leading corporate executives and government officials need to develop a strategic contingent workforce plan that will minimize exploitive hiring and contracting practices of non-employees as well as giving rise to contingency-oriented businesses that provide livable incomes to their constituencies.

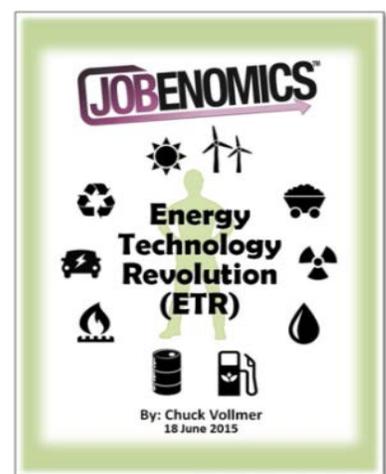
(3) Revolution in energy and network technologies. Today, the U.S. economy can be characterized as a hybrid economy that was formed largely by previous technology revolutions (the post-WWII Military Technology Revolution and the 1980s/1990s Information Technology Revolution) and is being transformed by two emerging technology revolutions (Energy Technology Revolution [ETR] and the Network Technology Revolution [NTR]).

The ETR and NTR have the potential to create millions of small and self-employed businesses and tens of millions of net new U.S. jobs. A substantial percentage of these new jobs will be high-end contingent work provided by contingent workforce oriented professional services firms, consultancies, independent contractors and self-employed businesses.

The ETR and NTR will be both innovative and disruptive. Innovative technology produces new and more efficient products and services that *create* new jobs, businesses, markets and industries. Disruptive technology produces new and more efficient products and services that *displace* existing jobs, businesses, markets and industries. If properly planned and executed, the churn created by the ETR and NTR can provide significant benefit to the U.S. labor force and economy. Unfortunately, the United States does not have a strategic vision for either of these revolutions.

Energy Technology Revolution ¹⁸ involves emerging energy technologies, processes and systems that will transform the global energy mix and create hundreds of millions of new jobs around the world. Countries that have a national ETR strategy will claim the bulk of these jobs. Future U.S. energy employment growth will be determined by the degree of forward planning and investment, new businesses creation, recapitalization of retrofitting/replacing old equipment and exportation of American energy-related goods and services.

Jobenomics estimates the size of the U.S. energy super-sector to be approximately 12 million employees, not including another 4 million automotive industry direct employees. If properly



¹⁷ Ardent Partners, The State of Contingent Workforce Management 2015-2016, <http://ardentpartners.com/CWM15/ArdentPartners-TheStateofCWM2015.pdf>

¹⁸ Jobenomics Energy Technology Revolution Report, <http://jobenomicsblog.com/energy-technology-revolution/>

managed, this super-sector’s future is so bright that is conceivable that the U.S. could double these numbers within the foreseeable future by (1) exporting energy, technology, processes and systems, and (2) moving from a centralized supply-driven architecture to a more decentralized demand-driven architecture that generates power at the point-of-consumption, whether it is a residence, a vehicle or a portable device. Replacing and retrofitting retiring power generation and transportation systems with newer, cost-efficient and cleaner systems will also produce a new generation of high-tech workers for a workforce that is likely to be dominated by contingent labor.

Global Energy Consumption Growth Forecast



Type Fuel	2013	2030	Growth Rate 2013-2030	Consumption	
	Quadrillion Btu			2013	2030
Petroleum and Other Liquids	181	211	16%	84%	80%
Natural Gas	121	163	34%		
Coal	155	208	34%		
Nuclear	27	50	85%	5%	7%
Renewables (All)	62	98	58%	11%	13%
Total	547	729	33%	100%	

Source: EIA International Energy Outlook 2013

Driven by growing global demand (shown above), climate change, renewable energy, cleaner fossil fuels and energy efficiency, the appetite for clean and affordable energy has never been higher. Climate change is a catalyst for nations, businesses and citizens to adopt new ETR technologies, processes and systems that will create a better, cleaner and cheaper energy ecosystem. Renewable energy sources, including **solar, wind, biofuels, hydroelectric, hydrokinetic, geothermal, municipal waste and biomass**, are already producing millions of new American jobs. Cleaner fossil fuels will play a major role in job creation in conventional and unconventional **oil and gas** production. U.S. **coal**, considered a dirty fossil fuel, has a strong upside potential with exports, and clean coal and coal gasification technologies. **Methane hydrates, liquefied natural gas and gas-to-liquid** production could also create millions of new jobs. The United States is also on the verge of major nuclear technology breakthroughs including **fusion, small modular and thorium nuclear** reactors.

The economic, business and employment potential in transportation is also huge considering revolutionary technologies in **alternative fuels, advanced vehicles, advanced batteries** and exciting new systems, such as **fuel cells**. In the alternative fuels industry a dozen technologies show promise including biodiesel, electric, propane, natural gas, hydrogen, ethanol, biobutanol, drop-in biofuels, methanol, P-Series fuels, renewable natural gas and Fischer-Tropsch xTL fuels. A wide variety of advanced vehicles (biodiesel vehicles, hybrid electric vehicles, plug-in hybrid electric vehicles, all-electric vehicles, flexible fuel vehicles, natural gas vehicles, propane vehicles, and fuel cell electric vehicles) are changing the global automotive and transportation landscape. Every advanced economy has a national advanced battery program. Advanced batteries and fuel cells will boost national economies, perhaps rivaling the economic impact of the personal computer. Jobenomics expects that lithium batteries (lithium-sulfur, lithium-ion, and lithium-ferrophosphate) will deliver the most viable near-term storage systems in both the transportation and electric power generation sectors. Global revenue for fuel cells (proton exchange membrane

fuel cells, direct methanol fuel cells, phosphoric acid fuel cells, molten carbonate fuel cells, alkaline fuel cells and solid oxide fuel cells) is projected to grow from \$2 billion today to \$40 billion in 2022.

Worldwide, the automotive manufacturing industry supports over 50 million jobs. Approximately 10 million are direct manufacturing employees and 40 million are indirect or induced jobs. If vehicle manufacturing were a country, it would be the sixth largest economy in the world.

The ETR is likely to change energy scarcity to energy abundance. No one saw the renaissance in the natural gas industry a decade ago due to the combination of horizontal drilling and hydraulic fracturing (fracking). Fracking is unlocking hydrocarbons buried deep underground in the continental U.S. and soon will do so around the world. A decade from now, hydrogen could replace gasoline, and renewables could replace coal. Equally possible, coal would be cooked rather than burned to produce clean methane and net-zero buildings could be energy self-sufficient. Gasification technology is unleashing clean-burning synthetic gases from garbage, human and animal waste and biomass. Energy efficiency has moved from the “hidden fuel” to the “first fuel”, exceeding output from any other fuel source. The vast majority of jobs created by these technologies will involve the contingent workers by a substantial margin over standard jobs.

The energy service-providing industry is one of the fastest growing, and least understood, American industries. Energy services include **energy efficiency, energy conservation, energy security and assurance, energy-as-a-service** (managing large and complex energy assets in an interactive, integrated and seamless way) and **energy disaster preparedness and recovery**. The energy efficiency sector alone could create 1.3 million new U.S. jobs by 2030 and saving U.S. consumers \$1.2 trillion by 2020. Energy service companies, called ESCOs, specialize in monetizing gains in energy efficiency. U.S. ESCO industry revenues grew from \$2 billion in 2000, to \$6 billion in 2013 and are projected to be as high as \$15 billion by 2020.¹⁹

Exotic technologies, such as **hydrogen**, energy harvesting, spray-on solar cells, cold fusion and vortex technologies are in development—each of which could have a significant impact on the U.S. economy and labor force. The impact of a hydrogen economy would be dramatic. According to a DoE report to Congress²⁰, under a rapid transformation scenario, hydrogen would completely replace new light-duty vehicle sales, replace 11 million barrels/day of oil by 2040, and provide 10% of U.S. electrical consumption by 2050. According to the same report, 675,000 net new direct jobs could be created with manufacturing hydrogen fuel cells, fuel cell maintenance and support systems, and hydrogen production from fossil fuels like coal and natural gas. Net employment in the automotive industry would remain unchanged between the gasoline and hydrogen economies, but replacement of gasoline-related skills with hydrogen-related skills would be substantial in the dealership and repair industries.

¹⁹ DoE, Berkeley Lab, September 2013, <http://emp.lbl.gov/sites/all/files/lbnl-6300e-ppt.pdf>

²⁰ DoE Hydrogen Program, Effects of a Transition to a Hydrogen Economy on Employment in the United States, Report to Congress, Page 6, July 2008, http://www.hydrogen.energy.gov/pdfs/epact1820_employment_study.pdf

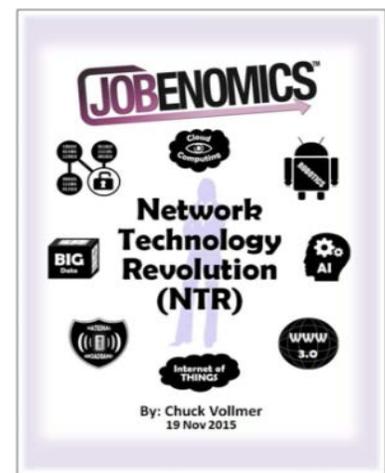
Renewable energy sources, **micro-grids**, **net-zero communities**, advanced vehicles, alternative fuels, **energy storage** devices and **smart networks** will allow energy generation to occur closer to the consumer and create millions of micro-businesses for the contingency workforce. Generating power close to the point-of-consumption eliminates cost, complexity, interdependencies and inefficiencies associated with transmission and distribution over 3 million miles of power lines in America. Like distributed computing (i.e., PCs) and distributed telephony (i.e., mobile phones), distributed generation shifts control to the consumer. It is also likely that on-site power generation will create an order of magnitude more businesses and jobs, much in the same way the PCs and smartphones and personal digital assistants currently provide.

Net-zero communities, buildings and homes could significantly reduce the \$2.0 trillion needed by 2030 to modernize and protect the aging and highly-vulnerable U.S. electrical grid that loses as much electrical energy as it delivers. By shifting energy generation from centralized to decentralized, point-of-use systems, the ETR will not only be more efficient but has the potential to create a massive number of local jobs and small businesses.

While the U.S. is in the forefront in the emerging ETR, America lacks an overall strategy from a business and job creation perspective. A combination of renewable, cleaner fossil fuels, nuclear, transportation, storage, energy efficiency and energy security advancements are needed as outlined in the Jobenomics ETR plan. In the view of many energy experts, the Jobenomics ETR plan is unique since it is a synergistic development plan that focuses on emerging energy technologies, processes and procedures across the entire energy ecosystem from a business and job creation perspective. As the unconventional oil and gas and renewable energy industries have proven, contingent workers and independent contractors are ideally suited for the ETR.

The Network Technology Revolution ²¹ is defined as the next generation in network and digital technology that will transform economies and the way we live, work and play. The NTR could produce tens of millions of net new U.S. jobs and millions of small businesses. On the other hand, via automation, the NTR has the potential to obsolete tens of millions of existing jobs. A national NTR strategy is needed to maximize labor force gains and minimize labor force losses.

From an NTR perspective, Jobenomics sees three major trends occurring in U.S. labor force that will have a dramatic effect on the economy and employment, (1) more than any other labor force trend, the NTR will create significantly more employment opportunities (ala the emerging digital, gig, internet, Uber or e-commerce economy) for the contingent workforce than the standard workforce, (2) new labor force entrants (Generations Y & Z, often described as “digital natives”) will be much more NTR-savvy than previous generations and have a substantial different view regarding the way business is currently conducted and their



²¹ Jobenomics Network Technology Revolution Report, <http://jobenomicsblog.com/network-technology-revolution/>

roles in business, and (3) those who cannot adapt will likely depart the U.S. labor force to the growing netherworld of perpetual familial and government assistance and join the rolls of those officially categorized as “Not in Labor Force”.

The NTR is characterized by a “perfect storm” of highly advanced technologies, processes and systems including **big data** (datasets that are too large to efficiently handle), **cloud computing** (practice of using a network of remote servers hosted in data centers to store, manage, and process big data), **semantic webs** (thinking websites), **augmented and virtual reality** (blending of the artificial and real worlds), **mobile computing** (proliferation of smart mobile devices and micro-devices), **ubiquitous computing** (embedding microprocessors in everyday objects to communicate without human interaction), **5G broadband networks** (50-fold speed increases and 1000-fold data volume improvements), **spatial sensing** (real-time detection, measuring, mapping and analysis of objects in relationship to the environment), **robotics** (automated machines capable of movement), **mechatronics** (combination of mechanical engineering, computing, and electronics to create nanomachines and nanobots), **telepresence** (operating machines remotely to create an effect or control), **geo-location** (the process of determining the location of an entity by means of digital information processed via the Internet), **near-field communications** (short-range wireless technology that connects devices), **machine learning** (systems that can learn and teach each other), **deep learning** (an artificial intelligence technique allowing machines to extract patterns from big data in the same manner that the human brain does), **memetics** (machines that can create memes to mimic cultural traits and ideas), **biometrics** (agents that can identify and track biological traits), **multifactor credentialing** (automated authentication and identification of crowds, individuals and intelligent agents), **emotive surveillance** (systems that analyze and manage emotions), **identity management** (controlling user access and restoring damaged online identities), **anonymity networks** (networks that enable users to block tracking or tracing data and identities), **ambient intelligence** (when formerly dumb or mute objects are given the ability to communicate), **artificial intelligence** (AI, intelligent algorithms and agents that will augment human interactions), and **intelligence agents** (automated AI agents that replace the need for human intervention and actions).

The NTR will transform economies, labor forces and society via including the **Internet of Things** (an environment where vastly more devices are connected to networks than people), the **digital economy** (also known as e-commerce, mobile-commerce, e-business and gig economies which are in their infancies compared to the traditional standard economy), the **sharing economy** (also known as the on-demand economy that individuals to rent or borrow goods rather than buy and own them) and the growing non-standard **contingent workforce**.

America is blessed to be the home of network and information technology giants like Apple, HP, Facebook, Google, CISCO, Amazon, Microsoft, eBay and dozens of other NTR companies. While U.S. NTR giants are making great technical advancements in communication, media and entertainment, foreign countries in Asia and Europe are using U.S. technology to develop their labor forces and economies to a much greater degree than in the United States.

As corporate citizens, U.S. NTR companies need to assume a much greater role in developing their domestic workforce that is capable of competing and prospering in the emerging global digital

economy. From a Jobenomics perspective, NTR CEOs should take the lead (i.e., the responsibility) for creating a minimum of 10 million net new U.S. jobs within the next decade via the creation of network-centric small, micro and self-employed American businesses.

The Apps industry serves an excellent example of only one subset in a myriad of NTR technologies listed earlier in the NTR inventory of emerging technologies. The Apps industry has grown in less than a decade from zero in 2008 to 4 billion apps in an \$87 billion marketplace in 2015 that is expected to double by 2018. According to a recent Apple press release, as a result of the Apple's App Store's success, Apple is now responsible for creating and supporting 1.9 million jobs in the U.S. alone.²² If the collective NTR CEO community wanted to create 10 million net U.S. jobs, with livable wages, they could easily do so without government intervention.

If Tim Cook turned Apple's creative energy to creating NTR-optimized e-business devices, tens of millions of more Americans (and billions of people around the world) could be given the opportunity to build a business. If Mark Zuckerberg used Facebook to monetize social networks, tens of millions of new careers could be created. If CISCO's Chuck Robbins will spend a small portion of time and effort developing the Internet of Business as compared to the Internet of Things, millions of new businesses could be created. The same is true of Jeff Bezos and Amazon, Satya Nadella and Microsoft, Sundar Pichai and Google, Ginni Rometty and IBM, as well as the rest of the American NTR CEOs. Together, these companies could create untold numbers of new U.S. jobs and micro-businesses that would mitigate the erosion of the middle-class, provide new career paths for the digital generation, and create meaningful income opportunities and livelihoods for the evergrowing contingent workforce.

(4) Automation of cognitive jobs and rise of centaurs. While the NTR can create tens of millions of jobs, it can also obsolete tens of millions of jobs. The more creative the NTR becomes the more destructive it will be. As more and more standard manual and knowledge workers are displaced, the contingent workforce is likely to expand—perhaps significantly.

The NTR is not today's version of the 1990s Information Technology Revolution (ITR) 2.0. While both the ITR and NTR incorporate revolutionary technology, the NTR portends to be significantly more intrusive than its earlier and more benign ITR cousin. ITR tools were designed to **assist** mankind's productivity via rule-based computation of routine-tasks. NTR agents are designed not only to augment, but also **replace** human endeavor via automation of non-routine tasks. As stated earlier, the NTR represents a perfect storm of technologies that emulates human form, attributes and intelligence. Not only does the NTR have the ability to create 10s of millions of net new American jobs, it has the ability to eliminate 10s of millions of American jobs via automation.

As skilled labor becomes less available or too costly, employers are turning to automation in order to augment, displace or replace the standard workforce. While automation has been replacing routine manual labor tasks for decades, as evidenced by factory floor robotics, emerging NTR technologies, processes and systems are replacing non-routine cognitive tasks, skills, jobs and

²² Apple, <https://www.apple.com/pr/library/2016/01/06Record-Breaking-Holiday-Season-for-the-App-Store.html>

occupations at greater and greater rates. By 2025, automation tools and systems could take on tasks equivalent to 140 million knowledge workers, equating to a global economic impact/savings of up to \$6.7 trillion annually. Knowledge work automation is possible by three NTR technologies: increased computer processing speeds and memory, machine learning and enhanced machine/human interfaces (such as speech recognition and other forms of biometric readers).²³

According to an Oxford University study on computer automation “about 47% of total U.S. employment is at risk over the next two decades”. If Oxford’s estimates are correct, out of the 143 million currently employed Americans, 67 million jobs could be at risk. It is incumbent on policy-makers, decision-leaders and NTR CEOs to plan now to mitigate this risk to the degree possible.

US Occupations Subject To Computerization

0% = not computerizable, 100% = fully computerizable

Probability of Computerization	Sample US Occupations <i>from 702 Occupations</i>
0% to 9%	Executives, supervisors, doctors, therapists, scientists, engineers, designers, lawyers, clergy, teachers, instructors, trainers, advisors, social workers
10% to 20%	Chefs/cooks, chemists, technicians, hairdressers, air traffic controllers, pilots, firefighters, electricians, physician assistants
20% to 29%	Middle managers, computer occupations, analysts, concierges, engineering technicians, sales representatives, middle school teachers
30% to 39%	Actors, medical assistants, investigators, editors, flight attendants, bailiffs, surveyors, interpreters/translators, upholsterers, plumbers
40% to 49%	Judges, health and medical technicians, law clerks, electronic repairers, economists, historians, computer programmers, dispatchers
50% to 59%	Court reporters, product promoters, leather workers, commercial pilots, teacher assistants, cost estimators, transit police, personal financial advisors
60% to 69%	Jailers, meat packers, ticket agents, pipelayers, building inspectors, stock clerks, librarians, janitors, bus drivers, mail carriers, dental hygienists
70% to 79%	Airfield operators, laundry workers, carpenters, broadcast technicians, archivists, painters, bartenders, machine & computer operators
80% to 89%	Attendants, bellhops, cashiers, tool makers, security guards, meter readers, power plant operators, drillers, conservation workers, real estate agents, construction laborers, cartographers, bakers, stonemasons, technical writers
90% to 100%	Inspectors, appraisers, bookies, tour guides, station operators, pharmacy technicians, insurance sales agents, retail sales, butchers, accountants, auditors, waiters, welders, messengers, paralegals, assemblers, clerks, receptionists, gaming dealers, cashiers, real estate brokers, tellers, umpires/referees, loan officers, tax preparers, underwriters, telemarketers

Source: Oxford University, *The Future of Employment: How Susceptible Are Jobs To Computerisation?*, 17 Sep 2013

²³ McKinsey Global Institute, *Disruptive Technologies: Advances that will transform life, business, and the global economy*, Page 40, May 2013, https://www.sommetinter.coop/sites/default/files/etude/files/report_mckinsey_technology_0.pdf

The Oxford University study²⁴ regarding the effects of computer automation on the American labor force is the first major effort to quantify what recent technological advances may mean for future employment and the labor force. Oxford analyzed 702 occupations from the U.S. Department of Labor. This Jobenomics chart above, derived from Oxford data, shows the probability of computerization of 100 occupations arranged from 0% (not computerizable) to 100% fully computerizable.

A job is considered to be “exposed to automation” or “automatable” if the tasks it entails allows the work to be performed by a computer, even if a job is not actually automated. For example, technology has progressed to the point where secretarial and cashier jobs can be automated, but corporations and retail stores still employ approximately 6 million administrative assistants and cashiers in the United States.

The NTR’s impact will be felt across all industries that will become less labor intensive as NTR technologies, processes and systems are assimilated, which is happening quickly at greater and greater rates causing large swaths of the U.S. labor force to become less competitive against their mechanical and digital counterparts. However, the Oxford study acknowledges that political and sociological forces will likely restrict many of these jobs from actually being computerized. Historical objections to automation of factory floor manual labor eventually gave way to free-market forces. At the dawn of the Industrial Revolution (England 1811-16), Luddites tried to organize and destroy factory automation to preserve standard jobs. Today’s Luddites maybe able to slow down the rate of transformation but the economics of automation will eventually defeat techno-pessimists who are resistant to new technologies and change.

In cooperation with Citi Global Perspectives & Solutions, Oxford University conducted two later studies in 2015 and 2016 that addressed automation and computerization in greater detail.^{25&26}

The February 2015 Oxford/Citi study reaffirmed the earlier study probability that 47% of the US labor force is at a high risk of automation. It also assigned the probability that 33% of U.S. workforce is at a low risk of automation (namely the jobs that are highly creative and require social and cultural skills) and the remaining 20% at a medium risk of automation.

According to a 2015 study, “the dominant narrative now characterizing how global labor markets are responding to technological change is one of job polarization: the fact that employment growth has been most robust at the highest and lowest ends of the skills spectrum. The middle skill jobs, in contrast, contain the highest concentration of routine tasks and are thus relatively easy to automate.”

³ Oxford University, *The Future of Employment: How Susceptible Are Jobs To Computerization?*, 17 Sep 2013, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdfhttp://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

²⁵ Oxford Martin School and Citi Global Perspectives & Solutions, *Technology At Work: The Future of Innovation and Employment*, February 2015, http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work.pdf

²⁶ Oxford Martin School and Citi Global Perspectives & Solutions, *Technology At Work v2.0: The Future Is Not What It Used to Be*, January 2016, http://www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work_2.pdf

According to a report published by the U.S. Federal Reserve Bank of Kansas City, job polarization is a primary cause for the vanishing American middle-class. “Over the past three decades, the share of middle-skill jobs in the United States has fallen sharply. Middle-skill jobs are those in which workers primarily perform routine tasks that are procedural and repetitive. The decline in the employment share of middle skill jobs has been associated with a number of sweeping changes affecting the economy, including **advancement of technology**, outsourcing of jobs overseas, and contractions that have occurred in manufacturing. As the share of middle-skill jobs has shrunk, the share of high-skill jobs has grown, and that trend has drawn considerable attention. Less well known is the fact that the share of low-skill jobs has also risen. This employment phenomenon where job opportunities have shifted away from middle-skill jobs toward high- and low-skill jobs is called ‘job polarization’”.²⁷

From a Jobenomics perspective, low-skill jobs are the easiest to automate, whereas medium-skilled jobs are the easiest to bifurcate into task-oriented work that can be performed by a combination of humans and machines. While the NTR is creating new positions for high-skilled workers, it is causing increased competition for medium and low-skilled workers who are increasingly being replaced by smart machines. Increased competition causes workers to accept lower wage jobs or forcing medium and low-skill workers into the contingent workforce or out of the labor force entirely. As discussed in detail in the Jobenomics Unemployment Analysis, the number of able-bodied adults that voluntarily have departed the U.S. labor force has grown from 68 million to 94 million citizens and the number of people working part-time or in other “non-employee” contingent jobs is now 40% of the employed workforce.

Since the year 2000, U.S. economic growth is 66% less than what it was prior to the turn of the century. The primary reason for concern is largely due to NTR innovation that “benefits the few rather than the many”. While NTR has produced remarkable achievements like the iPhone, Google, eBay, Facebook, Skype and a myriad of other advancements in genome and autonomous systems, median wages have stagnated in about half of all OECD countries since 2000. Unlike 19th Century Industrial Revolution innovations that created gains for both producers and workers, the NTR has so far has benefited mainly the producers and is displacing workers via the revolution in network technology. “In short, while the digital age has been a blessing to consumers, it is changing the world of work in ways that may make a growing share of workers worse off.”

The January 2016 Oxford/Citi study takes a deeper dive into the effects of automation not only in the United States but the rest of the world. Building on the Oxford’s original work showing 47% of the U.S. workforce at risk, recent data from the World Bank suggests the risks are higher for other countries. Equivalent figures for India are 69% and 77% for China. As compared to the developed world, emerging and developing economies have a much higher rate of low-skilled workers that are more susceptible to automation.

As labor-intensive industries succumb to more automated-intensive industries, middle-income countries like China and India will face a major dilemma inasmuch as more automation will be

²⁷ Federal Reserve Bank of Kansas City, The Vanishing Middle: Job Polarization and Workers’ Response to the Decline in Middle-Skill Jobs, <https://www.kansascityfed.org/publicat/econrev/pdf/13q1tuzemen-willis.pdf>

require to compete internationally but is likely to reverse labor force gains that recently raised hundreds of millions of Asians out of poverty. Countries with large low and medium-skilled populations are especially vulnerable to the so-called “middle income trap”, where a country gets stuck at a level of development out of poverty without the wherewithal to elevate to levels of more advanced economies.

China created its economic miracle via labor-intensive industries that required low and medium-skilled labor. Over the last two decades, China lifted 400 million people out of poverty largely by state-controlled labor-intensive industries in urban areas. Today, China is considered a middle-income country with a per capita income of \$7,600, compared to \$54,600 for the United States.²⁸ Over the last five decades only a few countries (Japan, Israel, South Korea and Singapore) have been able to escape the middle-income trap and evolve to the high-income club. NTR automation is likely to make the jump even harder since it is to the advantage of smaller high-skilled communities and will disadvantage larger low-skilled ones. In terms of manufacturing, automation incentivizes companies to move facilities closer to consumers, which could reduce the offshoring trend. 22% of the study respondents believe that North America has most to gain from automation, while 24% believe China has the most to lose.

Within the United States, there is a wide disparity between metropolitan areas in regard to automation. Cities like, Boston, Washington DC, Raleigh, New York, San Francisco are considered low risk, while, Fresno, Las Vegas, Greensboro, Harrisburg and Los Angeles are considered higher risk cities. Generally speaking, diversified, rich, highly educated cities are least exposed. The cities that are most exposed are older single industry centers replete with poorer and low skilled workers. Cities with a high concentration in information-, communication- and network-centric industries are the best prepared to embrace the upsides of NTR automation and the up-skilling that these industries produce for their labor forces. The most promising industries for job creation are in information technology, automotive, robotics, 3D printing, health and medical, which collectively will generate over 50% of all new American jobs. The bulk of these jobs will be in small businesses.

76% of the 2016 Oxford study respondents consider themselves as “techno-optimists” compared to 21% who see themselves as “techno-pessimists”.

From a Jobenomics perspective, this is an extremely important statistic. Too often, pundits overstate the extent of machine substitution and ignore the positive aspects of human/machine partnership in terms of increased productivity, earning and demand for skilled labor. The introduction of machines to the labor force has not historically hurt the labor force. The machine-smashing Luddites certainly did not foresee the massive labor force expansion caused by the industrial revolution in the 1800s. Agricultural machines displaced tens of millions of farmers and farmhands. Mass-produced automobiles displaced skilled artisans. Power tools displaced construction workers. The Information Technology Revolution (ITR) of the late 20th Century increased the U.S. labor force.

²⁸ World Bank, GDP Per Capita, 2011-2015, <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

On the other hand, a high percentage of economists believe that while automation has not historically reduced employment, today's information technology and automation is indeed different.

According to a report prepared for the U.S. Federal Reserve, a recent poll on the impact of technology on employment and earnings of leading academic economists conducted by the Chicago Initiative on Global Markets, 43% of the respondents agreed with the statement that "information technology and automation are a central reason why median wages have been stagnant in the US over the past decade, despite rising productivity," whereas, only 28% disagreed or strongly disagreed with the statement.²⁹

The 2016 Oxford/Citi study calculates that "between 2002 and 2012, 33 legacy jobs were lost for every new digital job that was created."³⁰ The 2015 Oxford/Citi study cited three primary reasons why the NTR is likely to be different from previous technology revolutions: (1) the pace of change has accelerated; (2) the scope of technological change is increasing; and (3) unlike innovation in the past, the benefits of technological change are not being widely shared — real median wages have fallen behind growth in productivity and inequality has increased."

With a proper national strategy (that currently does not exist), the NTR can replace jobs lost to computerization and automation via the creation of new small business and career paths. The 2016 Oxford/Citi report recommended the top four policy responses to the risks of automaton impacting labor and wealth distribution are (1) invest in education, (2) encourage entrepreneurship, (3) fund active labor market policies that help people find jobs, and (4) fund research that enables innovation and enhances employment.³¹ In general Jobenomics agrees with the following caveats. Rather than investing in education invest instead in skills development and means to create businesses and occupations that will satisfy next-generation business opportunities and align the workforce with new labor market realities, like contingent work.

As history has demonstrated, technological innovation initially has a destructive effect as automated systems replace labor, but as new industries are established, employment expands along with wage growth. Some believe that the NRT may be different. Jobenomics does not concur. A proper national strategy, led by corporate citizens, engaged by entrepreneurial contingent workforce professionals and supported by government, could transform the U.S. labor force and economy for generations to come. To be successful, this strategy would have to maximize productivity and prosperity of both the standard and contingent workforce, and achieve a proper balance between the existing traditional economy and the emerging digital economy.

The business world has already started the replacement process. With the advent of computers and personal digital assistants, most businesses have mostly eliminated the secretarial workforce. Today, semantic (thinking) websites know our shopping and buying habits and modern e-

²⁹ Polanyi's Paradox and the Shape of Employment Growth, by David, H. Autor, MIT, NBER and JPAL, 3 September 2014, Page 5, <http://economics.mit.edu/files/9835>

³⁰ Ibid 36, Technology Is Impacting Media Employment. Page 79

³¹ Ibid 36, Figure 89. Citi's Survey Results on Policy Responses, Page 98

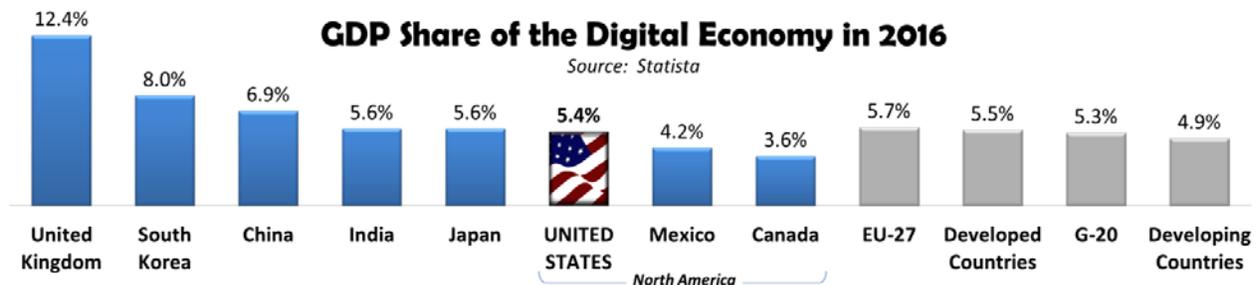
commerce is rapidly upending the standard retail workforce. Intelligence agents are now entering the scene. Got a question, need a direction or need a solution? Just ask Apple’s Siri, Amazon’s Echo or IBM’s Watson for the answer.

When artificial intelligence approaches human intelligence, humans will be compelled to turn more decision-making to automated intelligence agents. Hypothetically, machines will eventually mature from general-intelligence to the level of human-intelligence at the point of technical “singularity” when machines become as cognitive as humans. Many experts believe that intelligence agents will achieve singularity as early as mid-century. However, in several critical domains, such as the worldwide financial system, singularity will occur much sooner.

Automation will slowly supplant cognitive labor task by task giving rise to “centaurs” (a combination of human operators, automated intelligent agents and smart machines). Smart machines (that communicate with humans) and intelligence agents (that learn human behavior) are entering the cognitive workforce at a greater and greater rate. Today, these automated machines/agents need human support to perform most tasks. However, they can perform enough complex tasks to reduce the need for full-time human labor, thereby giving rise to centaurs where contingent human workers will provide input as needed or warranted.

(5) Impact of the emerging digital economy. Via the combined innovative and disruptive effects of the NTR, the global economy is transitioning from the 20th Century’s traditional economy to a hybrid 21st Century’s traditional/digital economy.

A digital economy is also referred to as the new, Internet, web, gig, Uber, 1099, freelance, on-demand, shared, network or e-commerce economy—all characterized by a much greater percentage of professional, self-directed contingent workforce owners and employees.



Today, the U.S. economy is a hybrid economy that is approximately 95% traditional and 5% digital as a percent of GDP.³² However, the U.S. digital economy is growing at 20% per year and is likely to be the dominant economy by mid-century based on a number of governmental, economic, technological and societal factors that can be managed but not controlled. As shown, global competition for digital economic dominance has already begun and, by many accounts, the

³² Statista, Share of the internet economy in the gross domestic product in G-20 countries in 2016, <http://www.statista.com/statistics/250703/forecast-of-internet-economy-as-percentage-of-gdp-in-g-20-countries/>

United States is not competing as well as one would expect given the U.S. dominance in enabling NTR research & development, technologies, processes and systems.

According to eMarketer, a research firm, worldwide retail products and services sold on the internet with account for 8.6% of the total retail market worldwide for a value of approximately \$2 trillion. By 2019, retail e-commerce is projected to increase to 12.8% for a value of \$3.6 trillion. The average growth per year ranges from 18.7% to 22.7% growth.

The digital economy provides a global network that allows individuals, organizations and governments to access information, interact, communicate, collaborate, and provide products and services. Digital products and services include a vast repository of digitized products (news, video, music, data, information, knowledge, etc.), financial transactions (e-government, e-business and e-commerce), social networking (Facebook, Twitter, Instagram, etc.), and networked physical goods (e.g., Internet of Things).

The digital economy consists of various components including: government (policy and regulation), infrastructure (internet, networks, telecom and electricity), providers (digital service, content, information and knowledge workers), technology (R&D, processes and systems) and e-commerce (business-to-business, business-to-consumer, consumer-to-consumer and government to business/consumer). To achieve maximum productivity, these components must operate efficiently and collectively.

A digital economy’s orientation is significantly different than the traditional economy in terms of technology, business and governance.

From a **technology** perspective, today’s traditional economy has an industrial/analog/physical/ product-based orientation as opposed to tomorrow’s digital economy’s informational/digital/virtual/knowled ge-based orientation.

From a **business** perspective, in today’s traditional business economy, corporations are oriented to maintaining corporate cultures, long timelines, mass production and relationship-focused transactions and leadership. Emerging digital businesses will be more oriented towards individuals, shorter timelines, customized services and products and task-focused transactions and leadership.

From a **governance** perspective, in today’s traditional economy, governance is oriented to meeting goals defined by performance standards defined by corporate leaders and accomplished by hierarchical, structured and stratified teams. In a digital economy, governance is oriented to tasked-focused managers of dispersed and networked teams and individuals collaboratively

Differences Between the Old and New Economies

	Traditional Economy Orientation	Digital Economy Orientation
Technology	Analog	Digital
	Industrial	Informational
	Tangible	Conceptual
	Labor-Intensive	Knowledge-Intensive
Business	Corporate	Individual
	Long Timelines	Short Timelines
	Mass-Produced	Custom-Made
	Relationship-Focused	Task-Focused
Governance	Centralized	Decentralized
	Ordered/Structured	Collaborative/Freewheeling
	Hierarchical	Flat
	Fiat Currencies	Digital Currencies

working on defined tasks with shorter-timelines and less cognizance of goals other than accomplishing the task at hand.

As more and more NTR technologies, processes and systems are incorporated, the difference between the old and new economy will become more profound. Cloud computing provides a good example of how a single NTR technology can quickly transform traditional organizations into digital organizations.

In less than a decade, the cloud has gone from a distant vision to the business mainstream. One-third of 200 surveyed senior traditional corporate executives said that cloud computing has a “transformative impact” on their business.³³ According to the Oxford Economics survey, a key benefit to cloud computing is the flexibility to start new businesses and close down old businesses. Over the next three years, the majority of these 200 corporate executives plan to make “moderate-to-heavy” cloud investments and increase migration of core traditional business functions into the cloud.

If a single NTR technology can create such big impact, one can only imagine the impact of incorporating dozens of other NTR technologies that will transform traditional businesses into hybrid e-businesses. Also imagine the transformative impact that e-commerce will have on small businesses and contingent workers, and the impact that e-government will have on enhancing bureaucratic efficiency and transparency.

The emerging digital economy will favor contingent work over full-time work. As traditional corporations embrace the digital revolution, the full-time workforce is likely to shrink to a fraction of its current size as corporations outsource greater amounts of full-time work to full-time equivalent (FTE) work to the contingent workforce.

Network-centric corporations are already exhibiting this trend. For example, Google has a market capitalization of \$455 billion with 54,000 full-time workers compared to General Electric’s market cap of \$293 billion with 305,000 full-time workers. While General Electric has perhaps five times as many indirect workers than Google, Google has enabled millions of contingent workers and contingent businesses that are engaged in global e-commerce and other NTR-related occupations. Another good example is a General Motors/Uber comparison. GM is worth about \$44 billion with 212,000 employees. Uber’s estimated worth is \$40 billion with 800 full-time employees and an estimated 500,000 contingent workers (mainly drivers) worldwide with approximately half the number in the United States.

(6) Shift from full-time, to part-time and task-oriented labor. Via the NTR and the emerging digital economy, many traditional full-time jobs will be dissected into discrete tasks, which in turn will be addressed by temporary collectives and virtual organizations. Today’s software can divide complex jobs into smaller tasks, automate the routine work, and then recruit contingent workers

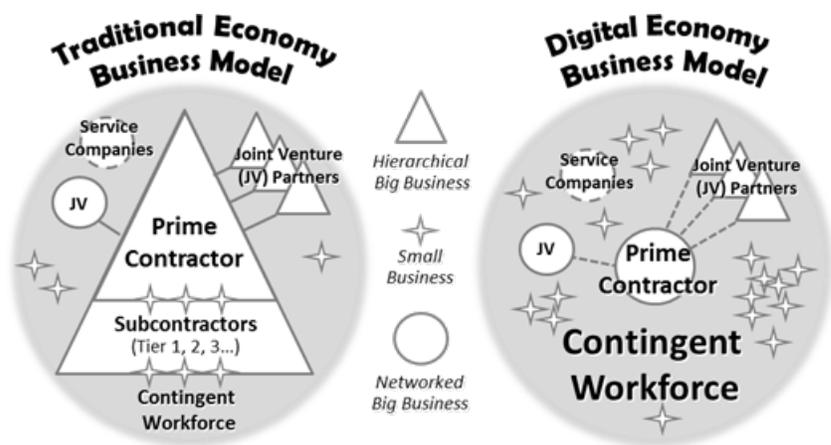
³³ Oxford Economics, The Cloud Grows Up, February 2015, http://www.sap.com/bin/sapcom/en_us/downloadasset.2015-02-feb-25-23.the-cloud-grows-up-oxford-economics-and-sap-pdf.bypassReg.html

through online network hubs to perform non-routine work. As automated NTR systems monitor human workers, over time these increasingly intelligent systems will learn and assimilate anthropomorphic traits in order to automate more and more complex non-routine cognitive tasks. Today, the NTR is facilitating the labor force shift to contingent labor. In the future, contingent workers will likely provide machines the wherewithal to replace a substantial percentage of the human labor force with cheaper and more efficient mechanical forms of labor. A McKinsey Global Institute (MGI) report that showed the 44% of U.S. firms that reduced headcount during the Great Recession did so via automation.³⁴

Team collaborative and management tools will further create “contextual” work environments that rapidly form, perform, and then reform to address subsequent tasks. Micro jobs, micro labor and micro tasks are becoming more common, while brick and mortar edifices that house full-time employees are giving way to temporary offices, mobile computing and home-based operations—environments ideally suited for contingent workers.

According to an annual four-year report and survey of 7,000 business executives in 130 countries, the Deloitte Global Human Capital Trends 2016 report states that 92% of the executives see a need to redesign their organizations from a hierarchical managerial model to “highly empowered teams, led by a breed of younger, more globally diverse leaders. To lead this shift toward the ‘new organization’, CEOs and HR leaders are focused on understanding and creating a shared culture, designing a work environment that engages people, and constructing a new model of leadership and career development.” Over 80% half of surveyed executives, across a wide range of public and private industry sectors, stated that they are in the process of restructuring or have already completed the process.³⁵

In the Jobenomics lexicon, as shown, tomorrow’s organization will be a hybrid model that embraces both the traditional and digital business models. In a traditional business model, supervisors mandate goals to meet to achieve defined performance standards accomplished by hierarchically structured and stratified teams. While the contingent workforce is present, it usually is a subordinated and a small fraction of the overall workforce.



In a digital business model, managers coordinate dispersed tasked-focused teams that play a much greater and influential workforce role. The formula for success for a hybrid labor force is to find the right balance between the models.

³⁴ McKinsey Global Institute, An economy that works: Job creation and America’s future, June 2011, file:///C:/Users/CHUCK/Downloads/MGI_US_job_creation_full_report.pdf

³⁵ Deloitte University Press, Global Human Capital Trends 2016, The New Organization: Difference by Design, <http://www2.deloitte.com/us/en/pages/human-capital/articles/introduction-human-capital-trends.html>

Task-oriented contingent work is likely to accelerate in proportion to digital economy and e-business growth. Contingent work will also be accelerated by the advent of online network hubs designed task-oriented workers.

Online network hubs (like Amazon’s Mechanical Turk, FlexJobs.com, microWorkers, Fiverr.com, Elance and TaskRabbit) provide online labor pools usable by corporations, governments and individuals for tasks of any scale. These network hubs provide access to a highly-skilled, diverse, on-demand, scalable workforce, and correspondingly provides contingent workers a selection of millions of tasks for bid.

Similar hubs are available to contingent businesses. For example, Amazon started Amazon Launchpad³⁶ for startups to launch, market, and distribute their products to hundreds of millions of Amazon customers across the globe. The program offers a streamlined onboarding experience, custom product pages, a comprehensive marketing package, and access to Amazon’s global fulfillment network.

Educational institutions are also experimenting with network technology and contingent workforces. Founded and run by a former Google engineer and using from the founder of Google and other philanthropic sources, AltSchool is a collaborative community of micro-schools that uses outstanding teachers (contingent workers), deep research, and innovative creative collaboration tools to offer a personalized, whole child learning experience for the Generation Z. The future of business and the labor force is certainly not anything like it used to be.

(7) Cultural differences of new labor force entrants. Ethnology involves a branch of study that analyzes cultures in regard to their development, differences and relationships between various demographic groups. The ethnology of new labor force entrants will be increasingly important as 154 million NTR-savvy “Screenagers” (Generation Z, born 1996 to present, now 20 years old and younger) and “Millennials” (Generation Y, born 1980 to 1995, now ages 21 to 36) enter the workforce over the next decade, especially as it applies to the number of Screenagers and Millennials entering as contingent workers.

154 Million NTR-Savvy Gen Yers and Zers Will Transform The American Labor Force

Generation	Born	Oldest Age In 2016	U.S. Population Millions		Predominant Technology Culture	Predominant Business Aspirations
Gen Z, Screenagers	Before - 1996	20	87	27%	NTR	Entrepreneurial
Gen Y, Millennials	1980-1995	36	67	21%	ITR/NTR	Aspiring-Entrepreneurial
			154	47%		
Gen X	1966-1979	50	62	19%	Analog/ITR	Intrapreneurial
Baby-Boomers	1946-1965	70	79	24%	Analog Systems	Quasi-Traditional
Great Gen	1912-1945	104	32	10%	Mechanical Systems	Traditional Employee

Total Population 326 100% Source: Jobenomics, U.S. Census Bureau, Ryan-Jenkins

³⁶ Amazon Launchpad, <http://www.amazon.com/gp/launchpad/signup>

Screenagers and Millennials generally prefer contingent work over traditional full-time occupations. 61% of Millennials still at “regular” jobs want to quit within two years and be entirely independent. 72% of surveyed Screenagers want to start their own business³⁷. While much of this is wishful thinking, the NTR will provide many of these Millennials and Screenagers with business and nonstandard employment opportunities that will make their wishes come true.

Properly structured, the digital economy can provide employment opportunities for those Millennials and Screenagers who exhibit “cultural dissimilarities” that make them a poor fit for the traditional workforce. Millennials are now firmly embedded into the U.S. labor force and are providing a multigenerational management challenge³⁸ compared to their Generation X (born 1966 to 1979) and Baby-Boomers (born 1946 to 1965) counterparts who have been integrated into the traditional workforce and corporate culture established by the baby-boom generation and their forefathers. Many Millennials, who have distinct ideas about what they expect from their jobs and the reliability of long-term corporate careers, are having a hard time conforming and integrating into traditional corporate culture.

The entrance of Screenagers, who spend an average of 7 hours a day of screen time (i.e., pads, tablets, smartphones and TV), will likely compound the workforce integration challenge since these newcomers have even greater cultural differences, expectations and timelines than the Millennials. Screenager ethnology is incompatible with today’s traditional career paths. Many people think that this will change as Screenagers mature and the harsh realities of earning a living ameliorate their cultural dissimilarities. Jobenomics is not so sure.

Rather than trying to force-fit new labor force entrants into the baby boomer-oriented legacy labor pool, it is prudent to seek solutions that recognize the realities of changing workforce attitudes and help newcomers to productively pursue their self-interests and self-sufficiency. As advocated by Adam Smith, the forefather of today’s classical free market economy, when individuals pursue their self-interest, they indirectly promote the greater good of society by producing vital goods, services and tax revenues for society. Accordingly, Generation Z’s “digital natives” should be afforded the opportunity to be self-directed in the emerging digital economy.

Jobenomics contends that micro and self-employed business creation is a viable way to accommodate the expanding contingent workforce and deal with the issue of cultural dissimilarities with new labor force entrants. Generation Z represents a demographic group with high motivation and great potential for micro and self-employed business growth.

Today, China is trying to replicate its economic success by promoting micro and self-employed businesses with the rural poor. According to recent government figures, the value of Chinese

³⁷ Ryan Jenkins Next Generation Catalyst, 7 Emerging Millennial and Generation Z Trends For 2015, <http://ryan-jenkins.com/2015/02/05/7-emerging-millennial-and-generation-z-trends-for-2015/> , and Global Messaging, Beyond Facebook: How to Market to a New Generation, <https://www.globalmessaging.co.uk/index.php/beyond-facebook-market-new-generation/>

³⁸ Business News Daily, Despite Skeptics, Millennials Taking Control At Work, 4 September 2013, <http://www.businessnewsdaily.com/5039-millennials-management-positions.html>

micro and small business loans were \$3.5 trillion³⁹ compared to \$0.6 trillion in the United States.⁴⁰ In addition to government-sponsored initiatives and financial incentive programs, Chinese companies are aggressively facilitating micro and small business creation.

Alibaba, a Chinese e-commerce company, was founded “to champion small businesses, in the belief that the Internet (digital economy) would level the playing field by enabling small enterprises to leverage innovation and technology to grow and compete more effectively in the domestic and global economies”.⁴¹ Today, Alibaba underwrites approximately 250,000 micro-businesses per year. Other Chinese NTR companies (Jingdong, Tencent, Baidu, NetEase, Amazon China, et al) are doing the same.

If leading U.S. technology companies were inclined to help U.S. contingency workers create micro and small business in support of filling the 5 million job openings and seizing emerging ETR/NTR employment opportunities, America could put tens of millions of people to work as well as creating millions of small and self-employed business.

Jobenomics asserts that the way to mass-produce startup small and self-employed businesses is via implementation of community-based business generators. A Jobenomics Community-Based Business Generator (J-CBBG) is designed to mass produce startup businesses with emphasis on minority-owned, women-owned, Generation Z (new workforce entrants)-owned and financially distressed/handicapped-owned businesses of all races and ethnicities.

The main focus of a J-CBBG is to mass-produce startup businesses by (1) working with community leaders to identify high-potential business owners and employees, (2) training and certifying these future owners and employees in targeted occupations, (3) creating highly repeatable and highly scalable “turn-key” small and self-employed businesses, (4) establishing sources of startup funding, recurring funding and contracts to provide a consistent source of revenue for new businesses after incorporation, and (5) providing ongoing mentoring and support services to extend the life span and profitability of businesses created by J-CBBG as well as other local businesses that require attention as support.

Given these seven trends, Jobenomics forecasts that the contingent workforce will continue to rise and eventually overtake today’s standard workforce as early as 2030. More importantly, the nature and character of the U.S. labor force, business and the economy is evolving at an ever increasing rate. More attention needs to be given to maximizing productivity and income security for the contingent workforce.

³⁹ Reuters, China pushes for more small business lending despite bad loans rising, 8 May 2015, <http://www.reuters.com/article/2015/05/08/us-china-economy-idUSKBN0NT00320150508>

⁴⁰ U.S. Small Business Association, Small Business Lending in the United States 2013 (Published December 2014), Table B. Value of Small Business Loans Outstanding by Loan Type and Size through June 2014, <https://www.sba.gov/sites/default/files/2013-Small-Business-Lending-Study.pdf>

⁴¹ Kauffman Foundation, The Importance of Startups in Job Creation and Job Destruction, Last Paragraph, 9 Sep 2010, <http://www.kauffman.org/what-we-do/research/firm-formation-and-growth-series/the-importance-of-startups-in-job-creation-and-job-destruction>

Conclusion

Job creation is the number one issue facing U.S. in regard to economic growth, sustainment and prosperity. Jobs do not create jobs, businesses do, especially small businesses that currently employ 78.2% of all Americans and created 80% of all new jobs since the end of the Great Recession.

Unfortunately, America is focused on big business and government employment solutions that have not been very effective growing the U.S. labor force. In fact, the U.S. labor force is in a state of decline as evidenced by the eroding middle-class and the transformation from full-time to core contingency workers. With the next fifteen years, Jobenomics forecasts that the contingent workforce will replace traditional full-time workforce as the dominant force of labor in the United States—a trend that is largely unknown to U.S. policy-makers and the American public.

The U.S. economy is not sustainable with only 34% supporting an overhead of 66%. The growing contingent labor force, which consists of mostly lower paid wage earners, makes the overhead burden even more precarious. More people with livable wages and greater discretionary income must be productively engaged in the private sector labor force for the U.S. economy to flourish.