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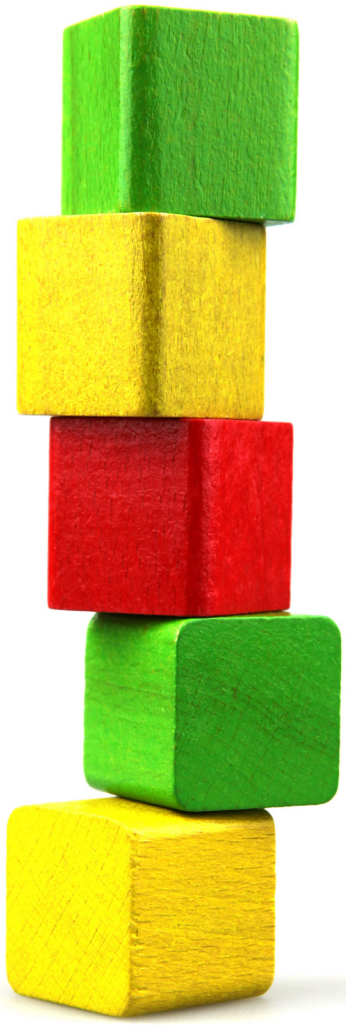
Shift index methodology



November 2013

Shift index overview

The Deloitte Center for the Edge developed the Shift Index to measure long-term changes to the business landscape. The Shift Index measures the magnitude and rate of change of today's turbulent world by focusing on long-term trends, such as advances in digital infrastructure and the increasing significance of knowledge flows.

Our research applied a combination of established and original analytical approaches to pull together four decades of data, both preexisting and new. More than a dozen vendors and data sources were engaged, four surveys were developed and deployed, and five proprietary methodologies were created to compile 25 metrics into three indices representing 15 industries. Architects of current "gold standard" indices were consulted throughout the development process.

In compiling the Index, the Center identified and evaluated more metrics than could possibly be included. In some cases, the Center obtained metrics directly from vendors.

In other cases, the Center leveraged existing studies and reproduced methodologies to construct metrics. Still others the Center constructed on its own.

Many of the metrics included in the Shift Index are proxies used to assess the concepts key to the Big Shift logic.

For example, our Inter-Firm Knowledge Flow survey is an attempt to use a proxy to estimate total knowledge flows across firms. For the list of Shift Index metrics, please refer to Exhibit 1.

To assemble the final list of 25 Shift Index metrics, we carefully analyzed more than 70 potential metrics, using a process detailed in Exhibit 2.

This process evaluated fit between potential metrics and the conceptual logic of the Big Shift. To measure geographic spikiness, for example, we started by evaluating U.S. urbanization and then measured the percentage of total population in metropolitan areas, the percentage of population in the top 10 largest cities, and the overall population density. Realizing that urbanization might not be an ideal measure to assess pull forces that

Exhibit 1: The shift index metrics

Foundation Index

Infrastructure Performance
- Computing
- Digital storage
- Bandwidth

Installed Base
- Internet users
- Wireless subscriptions

Public Policy
- Economic freedom

Flow Index

Virtual Flows
- Inter-firm knowledge flows
- Wireless activity
- Internet activity

Physical Flows
- Migrating of people to creative cities
- Travel volume
- Movement of capital

Amplifiers
- Worker passion
- Social media activity

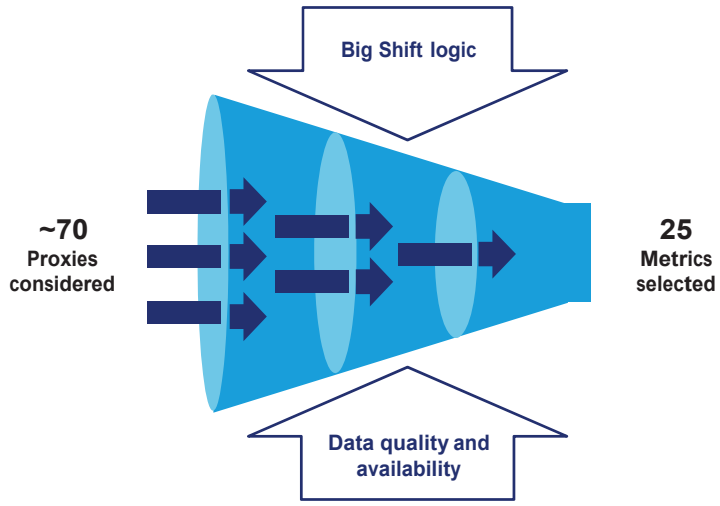
Impact Index

Markets
- Competitive intensity
- Labor productivity
- Stock price volatility

Firms
- Asset profitability
- ROA performance gap
- Firm topple rate
- Shareholder value gap

People
- Customer power
- Brand disloyalty
- Returns to talent
- Executive turnover

Exhibit 2: Shift index metric selection process



Source: Deloitte

certain geographic centers, such as Silicon Valley and Washington, D.C. possess over other cities, we elected to apply Richard Florida's study of creative cities. The creative cities identified by Florida are the epicenters of technology, talent, and tolerance. Thus, they represented places where people migrate to benefit from cognitive diversity and sharing of tacit knowledge. As the Big Shift takes further hold, we anticipate increased migration to the most creative cities, as compared to the least creative ones. Selecting the Migration of People to Creative Cities metric as a proxy for geographic spikiness seemed more appropriate and consistent with the logic of the Big Shift than using any general measure of U.S. urbanization.

Data quality and availability was another factor evaluated when selecting metrics. Proxies with outdated data or ones that are no longer maintained were discarded. For example, total factor productivity was a potential proxy for productivity improvements, but available data sources lacked industry-level information and had three-year data lags. These limitations led us to include Labor Productivity rather than total factor productivity in the Impact Index. For a representative list of metrics considered for the Shift Index, please refer to Exhibit 3.

Exhibit 3: Shift index proxies considered but not selected

Component index driver	Proxies considered
Foundation index	
Technology Performance	• Market spending on hardware, software, and IT services (U.S.$ per person) • Broadband connections (xDSL, ISDN PRI, FWB, cable, and FTTx) per person
Infrastructure Penetration	• Telecommunication equipment exports and imports (U.S.$) • Percentage of automatic phone lines compared to the percentage of digital phone lines • Number of fixed telephone line subscribers per 100 inhabitants • Number of mobile cellular telephone subscribers per 100 inhabitants • Total fixed and cellular telephone subscribers per 100 inhabitants • Number of people within mobile cellular network coverage as a percentage of total population • Total number of PCs • Percentage of homes with a PC • Internet users per 100 inhabitants • Total Internet subscribers (fixed broadband) per 100 inhabitants
Public Policy	• Number of regulations per industry • Number of new regulations per year
Flow index	
Virtual Flows	• Number of joint ventures • Number of co-branded products • Patent citations • Percentage of time spent interacting with external business partners • Patent distribution • Open innovation participation • Bibliometric analysis —academic paper citations • People movement/immigration • International Internet bandwidth (Mbps) • International Internet bandwidth per inhabitant (bit/S)
Physical Flows	• Percentage of total population in metropolitan areas • Percentage of population in top 10 largest cities • Population density
Flow Amplifiers	• Total number of people participating in online communities • Total number of open sourced products • Total number of social networking sites • Total unique users engaged in social networking sites

Component index driver	Proxies considered
Impact index	
Markets	• Total factor productivity • Average time to complete a set of employee tasks • Firm distribution (startup vs. incumbent) • Number of new firms created • Number of days stock price has changed more than three Standard Deviations from average of yearly returns
Firms	• Profit elasticity • Profit margin (earnings before interest, taxes, depreciation and amortization/revenue) • Economic margin • ROIC • Shareholder value creation
People	• Rank shuffling by Interbrand Survey score • Minimum wage as percentage of value added per worker • Hiring patterns for top management team • Average compensation of senior executives • Median age (in years) of patents cited

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Shift index metrics overview

The following set of tables provides detailed descriptions of each metric used to compile the Shift Index, including metric definition, high-level calculations, and primary data sources.

Foundation Index

Metric	Methodology
Technology performance	
Computing	**Definition:** Computing measures the vendor cost associated with putting 1 million transistors on a semiconductor. The metric provides visibility into cost/performance associated with the computational power at the core of the Big Shift. **Calculations:** The metric was derived from Moore's Law, which furnishes insight into the basic computing performance curve. Initial insights were confirmed by direct observations of the number of transistors vendors are able to put on the most powerful commercially available semiconductors, an analysis of wholesale pricing for individual chips and as a breakdown component of servers, and an assessment of vendor margins to determine cost as a component of wholesale price. **Data Source:** The data were obtained from a number of publicly available sources of information about semiconductor performance as defined by millions of transistors per semiconductor, including vendors, wholesale distributors of semiconductors, and leading technology research vendors.
Digital Storage	**Definition:** Digital Storage measures the vendor cost associated with producing 1 GB of digital storage. The metric provides visibility into the cost/performance curve associated with digital storage allowing for the computational power at the core of the Big Shift. **Calculations:** The metric is described by Kryder's Law, which is derived from Moore's Law. Kryder's Law provides insight into the basic cost/performance curve that governs digital storage. Initial insights were confirmed by direct observations of the wholesale pricing for 1 GB of memory and an assessment of vendor margins to determine cost as a component of wholesale price. **Data Sources:** The data were obtained from a number of publicly available sources of cost information, including vendors, wholesale distributors of digital storage, and leading technology research vendors.

Metric	Methodology
Bandwidth	**Definition:** The 2009 Shift Index measure for bandwidth captured the vendor cost associated with producing GbE-Fiber as deployed in data centers. In 2010, we chose to transition the bandwidth metric from GbE (1,000 Mbps) to 10 GbE (10 GB) based on increasing market penetration of 10 GbE and the resulting cost reduction as manufacturing volumes increase. Regardless of the measure used, this metric provides visibility into the cost/performance curve associated with network bandwidth, one of the key components of the new digital infrastructure. **Calculations:** Because technology performance in the Shift Index is designed to measure the impact of innovation and bandwidth, which is the result of a complex array of technologies that extend from the enterprise data center to the last mile into residential homes, this metric focuses on GbE—Fiber in the data center as the best commercially available example of bandwidth innovation. Initial insights were confirmed by direct observations of the wholesale pricing for GbE-Fiber and an assessment of vendor margins to determine cost as a component of wholesale price. **Data Sources:** The data were obtained from a number of publicly available sources of cost information, including vendors, wholesale distributors of network equipment in the data center, and leading technology research vendors.
Infrastructure Penetration	
Internet Users	**Definition:** The Internet Users metric measures the number of "active" Internet users in the United States as a percentage of total U.S. population. "Active" users are defined as those who access Internet at least daily. The Internet Users metric is a proxy for the core technology adoptions. **Calculations:** Active Internet user data were obtained directly from a report published by comScore, Inc. comScore, Inc. conducts monthly enumeration phone surveys to collect data on the Internet usage and user demographics. Each month, comScore, Inc. utilizes data from the most recent wave of the surveys and from the 11 preceding waves to estimate the proportion of households in the United States with at least one member using the Internet and the average number of Internet users in these households. comScore, Inc. then takes the product of these two estimates and compares it with the census-based estimate of the total number of households in the United States to assess total Internet penetration. **Data Sources:** The data were obtained from comScore's Internet and Social Metrics report.

Metric	Methodology
Wireless Subscriptions	**Definition:** The Wireless Subscriptions metric estimates the total number of active Wireless Subscriptions as a percentage of the U.S. population. The Wireless Subscriptions metric is a proxy for core technology adoption. **Calculations:** CTIA's semiannual wireless industry survey (traditionally known as the CTIA "data survey") gathers industry-wide information from Commercial Mobile Radio Service (CMRS) providers operating commercial systems in the United States. Only companies with operational systems and licenses to operate facilities-based systems are surveyed. The survey prompts respondents to answer the following question: "Indicate the number of subscriber units operating on your switch, which produce revenue. Include suspended subscribers that have not been disconnected. This number should not include subscribers that produce no revenue, such as demonstration phones and some employee phones." The CTIA survey requests the information on the number of revenue-generating wireless service subscribers and summarizes the result in the CTIA Wireless Subscriber Usage report. Since the metric measures Wireless Subscriptions and not wireless subscribers, it is possible for the total number to exceed the overall U.S. population, as one person can have multiple Wireless Subscriptions. **Data Sources:** The data were obtained from the CTIA Wireless Subscriber Usage report.
Public Policy	
Economic Freedom	**Definition:** The Economic Freedom metric measures how free a country is across 10 component freedoms: business, trade, fiscal, government size, monetary, investment, financial, property, labor, and, finally, freedom from corruption. The Economic Freedom metric is a proxy for openness of public policy and the degree of economic liberalization, which are both fundamental to either enabling or restricting Big Shift forces. **Calculations:** Each freedom component was assigned a score from 0 to 100, where 100 represents maximum freedom. The 10 scores were then averaged to gauge overall economic freedom. **Data Source:** The data were obtained from the 2012 Index of Economic Freedom by The Heritage Foundation and Dow Jones & Company, Inc., http://www.heritage.org/Index.

Flow Index

Metric	Methodology
Virtual Flows	
Inter-Firm Knowledge Flows	**Definition:** The Inter-Firm Knowledge Flows metric is a proxy for knowledge flows across firms. Success in a world disrupted by the Big Shift will require individuals and firms to participate in knowledge flows that extend beyond the four walls of the firm. **Calculations:** We explored the types and volume of inter-firm knowledge flows in the United States through a national survey of 3,008 respondents. The survey was administered online in September 2012. The results are based on a representative (95% confidence level) sample of approximately 200 (±6.9%) respondents in 15 industries, including 50 respondents (±13.9%) tagged as senior management, 75 (±11.3%) as middle management, and 75 (±11.3%) as frontline workers. In the survey, we tested the participation and volume of participation in nine types of knowledge flows: 1. In which of the following activities do you participate: • Use social media to connect with other professionals • Subscribe to email alerts • Attend conferences • Attend web-casts or web-conferences • Share professional information and advice over the telephone • Arrange lunch meetings with other professionals to exchange ideas and advice • Attend community organization events • Attend professional organization events • Contribute to online discussion threads/forums 2. How often do you participate in each of the above professional activities? • Daily • Several times a week • Weekly • A few times a month • Monthly • Once every few months • Once a year • Less often than once a year The knowledge flow activities were normalized by the maximum possible participation for each activity (e.g., daily for social media and weekly for webcasts). Thus, an Inter-Firm Knowledge Flow value was calculated for each individual based on his or her participation in knowledge flows. The average of these flows is the index value for the Inter-Firm Knowledge Flow value metric. **Data Sources:** Data were obtained from the proprietary Deloitte survey and analysis.

Metric	Methodology
Wireless Activity	**Definition:** The Wireless Activity metric measures the total number of wireless minutes and total number of SMS messages in the United States per year. The metric is a proxy for connectivity and knowledge flows. **Calculations:** CTIA's semiannual wireless industry survey develops industry-wide information drawn from CMRS providers operating commercial systems in the United States. Only companies with operational systems and licenses to operate facilities-based systems are surveyed. Wireless minutes are estimated from the CTIA survey, which measures the total minutes used by subscribers. The CTIA survey asks wireless carriers to report the total number of billable calls, billable minutes (both local and roaming), and total SMS volume on the respondent's network. Note that for the 2009 index, we used a December-December calendar year to measure wireless minutes and the six months ending in December for SMS volume. Due to data availability issues, this was changed for the 2011 and 2013 report: now, wireless minutes are measured from June-June and SMS volume from January-June as opposed from June- December. While this shift did impact the index in 2010, as it effectively gave these metrics less time to "grow" before being measured again, it is not indicative of a slowdown in wireless activity. Also, since this was a one-time change, it did not impact the index in 2013. **Data Sources:** The data were obtained from the CTIA Wireless Subscriber Usage report.
Internet Activity	**Definition:** The Internet Activity metric measures Internet traffic for the 20 highest capacity U.S. domestic Internet routes in gigabits/second. The metric is a proxy for connectivity and knowledge flows. **Calculations:** Internet volume data were obtained through TeleGeography, which determines Internet capacity and traffic data through confidential surveys, informal discussions, and follow-up interviews with network engineering and planning staff of major Internet backbone providers. **Data Sources:** The data were obtained from TeleGeography's Global Internet Geography report.

Metric	Methodology
Physical Flows	
Migration of People to Creative Cities	**Definition:** The Migration of People to Creative Cities metric measures the increase in population in cities ranked as most creative as compared to the increase in population in cities ranked as least creative. The metric serves as a proxy for physical flow of people towards centers of creativity and innovation in order to access knowledge flows more effectively and intimately. **Calculations:** As one of the proxies for physical knowledge flows expressed through face-to-face interactions and serendipitous connections, we were measuring the growth in population, as provided by the U.S. Census Bureau, within creative cities, as defined by Richard Florida. In the 2009 and 2011 indices, the most and least creative cities are defined based on Richard Florida's definitions in *The Rise of the Creative Class*, which ranks each city with more than one million people in population by its creative index score. In 2010, Florida revised the list of cities, ranking 361 metro areas regardless of their population size based on their updated creativity index, in his book *The Rise of the Creative Class Revisited*. Despite the more comprehensive list, Florida still determined the creative index score by adding three equally weighted components: technology, talent, and tolerance. In the 2013 Shift Index, we used the updated list of the creative cities to determine the most and the least creative. U.S. Census Bureau data were used to determine the population of the cities defined by Florida as most and least creative. We defined the metric as a gap between the two groups' population. **Data Sources:** Florida's books, The Rise of the Creative Class, and The Rise of the Creative Class Revisited, and the U.S. Census Bureau http://www. census.gov/popest/cities/cities.html.

Metric	Methodology
Travel Volume	**Definition:** The Travel Volume metric is defined as the volume of passenger travel. The metric serves as a proxy for physical flows of people and indicates levels of face-to-face interactions, which are more likely to drive the most valuable knowledge flows—those that result in new knowledge creation rather than simple knowledge transfer. **Calculations:** The Transportation Services Index (TSI) published by the Bureau of Transportation Statistics, the statistical agency of the U.S. Department of Transportation (DOT) is used to assess the volume of passenger travel. The passenger TSI measures the movement and month-to-month changes in the output of services provided by the for-hire passenger transportation industries. The seasonally adjusted index consists of data from passenger air transportation, local mass transit, and intercity passenger rail. Note that to keep pace with ongoing methodology adjustments by the BTS, we update the full historical data set each year the Shift Index is calculated. **Data Sources:** U.S. Department of Transportation, Research and Innovation Technology Administration,Bureau of Transportation Statistics Transportation Services Index; http://www.bts.gov/xml/tsi/src/index.xml.
Movement of Capital	**Movement of Capital Definition:** The Movement of Capital metric measures the value of U.S. FDI inflows and outflows. The metric serves as a proxy for capital flows between the edge and the core. Edges are peripheral areas of geographies, demographic generations, and technologies where growth and innovation tend to concentrate. The core is where the money is today. **Calculations:** Current dollar FDI inflows into the United States and outflows from the United States were summed. Absolute values were used to capture the total amount of flows regardless of the direction. The result was normalized by the size of the economy by dividing FDI flows by the U.S. GDP. This normalization will allow for comparability as we extend our index internationally. FDI stocks were excluded from the calculations as they do not directly represent the flows of capital. **Data Source:** The data were obtained from the United Nations Conference on Trade and Development (UNCTAD) FDI database (http://stats.unctad.org/FDI/TableViewer/tableView.aspx?ReportId=1254. Previous years' estimates for FDI flows were replaced with actuals when available. Also, note that due to ongoing changes in the way FDI flows are measured by the UNCTAD, we update the full historical data set each year.)

Metric	Methodology
Flow Amplifiers	
Worker Passion	**Definition:** The Worker Passion metric measures how passionate U.S. workers are about their jobs. Passionate workers are fully engaged in their work and their interactions and strive for excellence in everything they do. Therefore, worker passion acts as an amplifier to the knowledge flows, thereby accelerating the growth of the Flow Index. **Calculations:** Our exploration of worker passion was designed around a national survey with 3,008 respondents. The survey was administered online in September 2012. The results are based on a representative (95% confidence level) sample of approximately 200 (±6.9%) respondents in 15 industries, including 50 respondents (±13.9%) tagged as senior management, 75 (±11.3%) as middle management, and 75 (±11.3%) as frontline workers. In the survey, we tested different attributes of worker passion – commitment to domain and questing and connecting dispositions — and the associated behaviors of the passionate. We used the following screening questions to test for each attribute: Commitment to Domain: 1. My goal is to achieve a significant and increasing impact on the industry in which I work **Target Answer:** Strong agreement (6 or 7 on the 1-7 agreement scale) 2. In the next 5-10 years, which of the following best describes your objectives for your career path? **Target Answer:** "I hope to stay in the same industry sector and job function (e.g., sales, accounting)" OR "I hope to switch my job function, but not industry" Questing Disposition: 1. I actively seek out new challenges in my work **Target Answer:** Strong agreement (6 or 7 on the 1-7 agreement scale) 2. How often pursue initiatives beyond direct responsibilities? **Target Answer:** "Very frequently" OR "Frequently" Connecting Disposition: 1. How often do you seek to work with other groups or departments outside your own in order to complete a task, solve a challenge, and/or see the task to completion, even if your job does not require it? **Target Answer:** "Very frequently" OR "Frequently" 2. When confronted with a new challenge at work that I cannot solve on my own, I am motivated to reach out to others who can help me address that challenge **Target Answer:** Strong agreement (6 or 7 on the 1-7 agreement scale) Those individuals who responded in the targeted way to all of the questions were classified as the "passionate" (i.e., having the "passion of the Explorer"). The index value for Worker Passion is the percentage of "passionate" respondents to the number of total respondents. **Data Sources:** Data were obtained from the proprietary Deloitte survey and analysis.

Metric	Methodology
Social Media Activity	**Definition:** Social Media Activity is a measure of how many minutes Internet users spend on social media Web sites relative to the total minutes they spend on the Internet. The metric is a proxy for two- and multiple-way communication, which amplifies knowledge flows by offering the ability to collaborate. **Calculations:** comScore provides industry-leading Internet audience measurement that reports details of online media usage; visitor demographics; and online buying power for home, work, and university audiences across local U.S. markets and across the globe. Using proprietary data collection technology and cutting-edge methodology, comScore is able to capture great volumes of extremely granular data about online consumer behavior. comScore deploys passive, non-invasive measurement in its collection technologies, projecting the data to the universe of persons online. For the purposes of collecting data for our analysis, comScore defines social media as a virtual community within Internet Web sites and applications to help connect people interested in a subject. **Data Sources:** The data were obtained from comScore's Media Metrix report.

Impact index

Metric	Methodology
Markets	
Competitive Intensity	**Definition:** IThe Competitive Intensity metric is a measure of market concentration and serves as a rough proxy for how aggressively firms interact. **Calculations:** The metric is based on the HHI, a methodology used in competitive and antitrust law to assess the impact of large mergers and acquisitions on the concentration of market power. Underlying the metric is the notion that markets where power is more widely dispersed are more competitive. This logic is consistent with the Big Shift, which predicts that industries will initially fragment as the traditional benefits of scale decline with barriers to entry. As strategic restructuring occurs, and companies begin to focus more tightly on a core business type, certain firms will likely once again begin to exploit powerful economies of scale and scope, but in a much more focused manner. **Data Source:** The metric was calculated by Deloitte, using data provided by Standard & Poor's Compustat on over 20,000 publicly traded U.S. firms (and foreign companies trading in American Depository Receipts). It is available annually and by industry sector through 1965.

Metric	Methodology
Labor Productivity	**Definition:** The Labor Productivity metric is a measure of economic efficiency that shows how effectively economic inputs are converted into output. The metric is a proxy for the value creation resulting from the Big Shift and enriched knowledge flows. **Calculations:** Productivity data were downloaded directly from the Bureau of Labor Statistics database. The Bureau of Labor Statistics does not compute productivity data by the exact sectors analyzed in the Shift Index. Therefore, Labor Productivity by industry was derived using data published by the Bureau. Bureau data were aggregated by five, four, and sometimes three-digit North American Industry Classification System (NAICS) codes using Bureau methodology to map to the Shift Index sectors. Sector Labor Productivity figures were calculated as a ratio of the output of goods and services to the labor hours devoted to the production of that output. A sector output index was calculated using the Tornqvist formula (the weighted aggregate of the growth rates of the various industries between two periods, with weights based on the industry shares in the sector value of production). The input was calculated as a direct aggregation of all industry employee hours in the sector. Note that due to ongoing methodology and data revisions by the Bureau of Labor Statistics, we update and replace the entire Labor Productivity data set each year. Note for the 2011 a n d 2013 Shift Indices, labor productivity and related cost measures for 2010 and 2012 (respectively) for mining, utility, manufacturing, and selected service industries were not available and will not be released by the Bureau of Labor Statistics until 2012 and 2013 (respectively). **Data Sources:** The metric was based on the Bureau of Labor Statistics data. Major sector data are available annually beginning in 1947, and detailed industry data on a NAICS basis are available annually beginning in 1987.

Metric	Methodology
Stock Price Volatility	**Definition:** The Stock Price Volatility metric is a measure of trends in movement of stock prices. The metric is a proxy for measuring disruption and uncertainty. **Calculations:** Standard deviation is a statistical measurement of the volatility of a series. Our data provider, Center for Research in Security Prices (CRSP) at the University of Chicago Booth School of Business, provides annual standard deviations of daily returns for any given portfolio of stocks. Rather than using an equal-weighted approach, we used value-weighting. According to CRSP: "In a value-weighted portfolio or index, securities are weighted by their market capitalization. Each period the holdings of each security are adjusted so that the value invested in a security relative to the value invested in the portfolio is the same proportion as the market capitalization of the security relative to the total portfolio market capitalization" (http://www.crsp.com/resources/financial-trading-terms). **Data Sources:** Established in 1960, CRSP maintains the most complete, accurate, and user-friendly securities database available. CRSP has tracked prices, dividends, and rates of return of all stocks listed and traded on the New York Stock Exchange since 1926, and in subsequent years, it has also started to track the NASDAQ and the NYSE Arca. (http://www.crsp.com/about-crsp/history)
Firms	
Asset Profitability	**Definition:** Asset Profitability (ROA) is a widely used measure of corporate performance and a strong proxy for the value captured by firms relative to their size. **Calculations:** In the Shift Index, Asset Profitability is an aggregate measure of the net income after extraordinary items generated by the economy (defined as all publicly traded firms in our database) divided by the net assets, which includes all current assets, net property, plants, and equipment, and other non-current assets. Net income in this case was calculated after taxes, interest payments, and depreciation charges. **Data Sources:** The metric was calculated by Deloitte, using data provided by Standard & Poor's Compustat on over 20,000 publicly traded U.S. firms (and foreign companies trading in American Depository Receipts). It is available annually and by industry sector through 1965.

Metric	Methodology
ROA Performance Gap	**Definition:** The ROA Performance Gap tracks the bifurcation of returns flowing to the top and bottom quartiles of performers and is a proxy for firm performance. **Calculation:** This metric consists of the percentage difference in ROA between these groups and is a measure of how value flows to or from "winners" and "losers" in an increasingly competitive environment. **Data Sources:** The metric is based on an extensive database provided by Standard & Poor's Compustat. It was calculated by Deloitte. The metric is available annually and by industry sector through 1965.
Firm Topple Rate	**Definition:** The Firm Topple Rate measures the rate at which companies switch ranks, as defined by their ROA performance. It is a proxy for dynamism and upheaval and represents how difficult or easy it is to develop a sustained competitive advantage in the world of the Big Shift. **Calculations:** To calculate this metric, we used a proprietary methodology developed within Oxford's Said Business School and the University of Cologne that measures the rate at which firms jump ranks normalized by the expected rank changes under randomness. A topple rate close to zero denotes that ranks are perfectly stable and that it is relatively easy to sustain a competitive advantage, whereas a value near one means that ranks change randomly, and that doing so is uncommon and incredibly difficult. We applied this methodology to firms with more than $100 million in annual net sales and averaged the results from our 15 industry sectors to reach an economy-wide figure. **Data Sources:** This metric is based on data from Standard & Poor's Compustat. It was calculated annually and by industry sector through 1965.

Metric	Methodology
Shareholder Value Gap	**Definition:** The Shareholder Value Gap metric is defined in terms of stock returns and it aims to quantify how hard it is for companies to generate sustained returns to shareholders. It is another assessment of the bifurcation of "winners" and "losers." **Calculations:** The calculation uses the weighted-average TRS percentage for both the top and bottom quartiles of firms in our database, in terms of their individual TRS percentages, to define the gap. Total returns are annualized rates of return reflecting price appreciation plus reinvestment of monthly dividends and the compounding effect of dividends paid on reinvested dividends. **Data Sources:** The metric is based on Standard & Poor's Compustat data and is available annually and by industry sector through 1965.

Metric	Methodology
People	
Consumer Power	**Definition:** The Consumer Power metric measures the value captured by consumers. In a world disrupted by the Big Shift, consumers continue to wrestle more power from companies. **Calculations:** A survey was administered online in October 2012 to a sample of 2,000 U.S. adults (at least 18 years old) who use a consumer category in question and can name a favorite brands in that category. The sample demographics were nationally balanced to the U.S. census. A total of 4,381 responses were gathered as consumers were allowed to respond to surveys on multiple consumer categories. A total of 26 consumer categories were tested with approximately 180 (± 7.3%, 95% confidence level) responses per category. We studied a shift in Consumer Power by gathering 4,381 responses across 26 consumer categories to a set of six statements measuring different aspects, attributes, and behaviors involving consumer power: • There are a lot more choices now in the (consumer category) than there used to be. • I have convenient access to choices in the (consumer category). • There is a lot of information about brands in the (consumer category). • It is easy for me to avoid marketing efforts. • I have access to customized offerings in the (consumer category). • There isn't much cost associated with switching away from this brand. Each participant was asked to respond to these statements on a 7-point scale, ranging from 7=completely agree to 1=completely disagree. An average score was calculated for each respondent and then converted to a 0—100 scale. The index value for the Consumer Power metric is the average Consumer Power score of all respondents. **Data Sources:** Data were obtained from the proprietary Deloitte survey and analysis.

Metric	Methodology
Brand Disloyalty	**Definition:** The Brand Disloyalty metric is another measure of value captured by consumers. As a result of increased Consumer Power and a generational shift in reliance on brands, the Brand Disloyalty measure is an indicator of consumer gain stemming from the Big Shift. **Calculations:** A survey was administered online in October 2012 to a sample of 2,000 U.S. adults (at least 18 years old) who use a consumer category in question and can name a favorite brands in that category. The sample demographics were nationally balanced to the U.S. census. A total of 4,381 responses were gathered as consumers were allowed to respond to surveys on multiple consumer categories. A total of 26 consumer categories were tested with approximately 180 (±7.3%, 95% confidence level) responses per category. We studied a shift in Brand Disloyalty by gathering 4,381 responses across 26 consumer categories to a set of six statements measuring different aspects, attributes, and behaviors involving brand disloyalty: • I would consider switching to a different brand. • I compare prices for this brand with other brands. • I seek out information about other brands. • I ask friends about the brands they use. • I switch to the brand with the lowest price. • I pay attention to advertising from other brands. Each participant was asked to respond to these statements on a 7-point scale, ranging from 7=completely agree to 1=completely disagree. An average score was calculated for each respondent and then converted to a 0—100 scale. The index value for the Brand Disloyalty metric is the average Brand Disloyalty score of all respondents. **Data Sources:** Data were obtained from the proprietary Deloitte survey and analysis.

Metric	Methodology
Returns to Talent	**Definition:** The Returns to Talent metric examines fully loaded compensation between the most and least creative professions. The metric is a proxy for the value captured by talent. **Calculations:** The most and least creative occupations were leveraged from Florida's study. A fully loaded salary (cash, bonuses, and benefits) was calculated for each group and the differences were measured. **Data Sources:** The most and least creative occupations were obtained from Florida's book *The Rise of the Creative Class* and *The Rise of the Creative Class Revisited*. (There was no significant difference between the book editions.) Fully loaded salary information was gathered from the Bureau of Labor Statistics data leveraging the Occupational Employment Statistics (OES) Department and Employer Cost for Employee Compensation information (ECEC). The analysis was performed by Deloitte. ECEC: http://www.bls.gov/ect/home.htm OES: http://www.bls.gov/OES/ Creative Class Group: http://www.creativeclass.com/

Metric	Methodology
Executive Turnover	**Definition:** The Executive Turnover metric measures executive attrition rates. It is a proxy for tracking the highly unpredictable, dynamic pressures on the market participants with the most responsibility—executives. **Calculations:** The data were obtained from the Liberum Research (Wall Street Transcript) Management Change database and measures the number of executive management changes (from a board of director through vice president level) in public companies. For the purposes of this analysis, we summed the number of executives who resigned from, retired, or were fired from their jobs and then normalized that one number, each year from 2005 to 2009, against the number of total management occupational jobs reported by the Bureau of Labor Statistics (Occupation Employment Statistics) for each of those years. Liberum Research's Management Change Database is an online SQL database. Each business day, experts examine numerous business wire services, government regulatory filings (e.g., SEC Form 8K filings), business periodicals, newspapers, RSS feeds, corporate and business related blogs, and specified search alerts for executive management changes. Once an appropriate change is found, Liberum's staff inputs the related management change information into the management change database. Below are the overall management changes tracked by Liberum: • I-Internal move, no way to differentiate if the move is lateral, a promotion, or a demotion • J-Joining, hired from the outside • L-Leaving, SEC Form 8K or press release contains information that states individual has left the • firm; no indication of a resignation, retirement, or firing • P-Promotion, moved up the corporate ladder • R-Resigned/retired • T-Terminated **Data Sources:** Liberum Research (a division of Wall Street Transcript); http://www.twst.com/liberum.html OES: http://www.bls.gov/OES/

Index creation methodology

After a rigorous data collection process, we made several adjustments to the data to create the final Shift Index. To ensure that each metric has an appropriate impact on the overall index and to focus on secular, long-term trends, we performed five steps:

Classifying metrics

A key challenge in assembling the index is being able to combine metrics of different magnitudes, trends, and volatility in a sensible way. The first step in this process involves carefully evaluating each metric with respect to historical trends, future projections, and qualitative research and classifying it as either "secular non-exponential," meaning any non-exponential metric with a defined or assumed long-term trend, or "exponential," which pertains to metrics, such as Computing and Wireless Activity. With these classifications, we then apply one of two smoothing/transformation methodologies to make the metrics statistically comparable.

Smoothing metric trends and volatility

Metrics that are classified as exponential present a particular challenge, in that their rapid growth can overwhelm slower moving metrics in the index. At the same time, accurately representing trends in the underlying data is critical, especially those related to technology and knowledge flows, whose exponentiality is at the core of the Big Shift. Our solution to these concerns is exactly the middle ground: We dampen exponential metrics, but not so much as to make them linear. To do this, we use a Box-Cox Transformation (a commonly accepted technique for normalizing exponential functions), which uses a transformation coefficient to effectively reduce their growth rate. All exponential metrics are transformed using the same coefficient in order to preserve the relative differences between them.

For secular non-exponential metrics, we engage in a different kind of dampening: Smoothing out volatility to focus the index on long-term trends. This is of particular concern in the Impact Index, which contains a number of metrics that are highly volatile in the short term, but over the long run show defined trends. Stock Price Volatility, for example, swings wildly, but is also trending upward over time; the latter is what we want the Impact Index to represent. On the other hand, Labor Productivity moves very little, so any large fluctuations are critically important to include. Essentially, the degree to which we want to smooth secular non-exponential metrics depends on how volatile they typically are.

To make this assessment, we calculate something called a "deviation score" for each metric of this type, which represents how much (on average) it deviates from its long-term trend line. This score sets the "threshold" for how much volatility we allow through to the final index.

We do this by revising the raw values to represent a combination of (a) the value predicted in a given year by linear regression and (b) the difference between the raw value and the predicted one (e.g., volatility). The former is always given a weight of one, but the latter is dynamic: This is where the deviation score comes in. The higher the deviation score, the less weight is given to this difference. Before indexing, the contribution of Movement of Capital (which is highly volatile and, by extension, has a high deviation score) to the index in a given year is 100% of the predicted value and a small percentage of the deviation around that mean. By the same token, Labor Productivity, which fluctuates much less, contributes a very large percentage of that deviation in addition to 100% of its predicted value.

Because our next step is to index these values to a base year (2003) — which will be discussed in the next section — this artificial inflation or deflation has no impact on the index and instead serves only to minimize or preserve volatility in the underlying data.

Normalizing rates of change

After smoothing exponential and non-exponential metrics to make them comparable and to represent long-term trends, we normalize each metric by indexing it to 2003. This process refocuses the Shift Index from magnitudes to rates of change, which is in the end what we are trying to measure.

By choosing 2003 as a base year, we can easily evaluate rates of change in the past five years. In addition, historical data are available for nearly all 25 metrics by 2003, limiting the need for estimation to backtest the index. However,

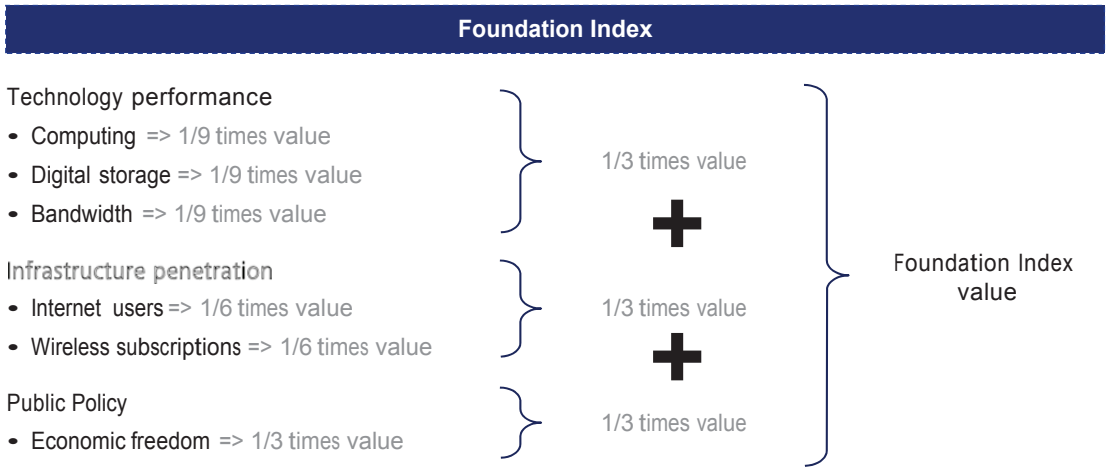
those metrics that did not have historical data starting in 2003 (e.g., our four proprietary survey metrics, Internet Activity, and Social Media Activity) are indexed to 2008. This last difference in indexing treatment accounts for the less-than-100 value of the Flow Index in 2003.

Weighting metrics to reflect the logic

The final step before calculating the Foundation Index, Flow Index, and Impact Index is properly weighting each metric to ensure each driver (key concept) contributes equally to the index. This process is detailed in Exhibit 4, but to clarify, the Foundation Index contains three drivers: Technology Performance, Infrastructure Penetration, and Public Policy. Each of these contains different numbers of metrics, but overall they represent three core concepts about what forces are driving foundational shifts. As such, we want to give equal weights to each concept, regardless of how many metrics it contains. To do this, each metric is assigned a weight based on the number of metrics in its respective driver (Technology Performance contains three metrics, so one-third) times one-third again, representing the fact that Technology Performance accounts for an equal share of the Foundation Index.

In addition to preserving the logic, what this system allows us to do is add and subtract metrics in future years without needing to materially restructure the index. Additionally, when the Shift Index is released on a global scale, it provides room to choose geographically relevant metrics and proxies while maintaining comparability with the U.S. index.

Exhibit 4: Shift index weighting methodology



Source: Deloitte

Other tools:
Correlation model To explore conceptually plausible relationships in and among various Shift Index metrics, as well as with macroeconomic indicators, we also conduct a simple quantitative exercise to identify the strength of these relationships and the subsequent correlations or degrees of linear dependence. The formula and function we use to calculate the correlation coefficient for a sample uses the covariance of the samples and the standard deviations of each sample. To obtain the most accurate results, we only note quantitative correlation relationships between data sets with a time series of at least three years and an identifiably linear trend.

To be clear, this approach and our assertions do not imply causality. Two data sets might be related and have a strong correlation, but could be independently related to another variable or not conceptually related at all. We invite others to join with us and engage in further exploration and rigorous analyses where interesting insights might be developed further. Correlations greater than 0.60 (signifying an increasing linear relationship) or less than -0.60 (signifying a decreasing linear relationship) are considered to be significant and worthy of applying conceptual logic and/or further exploration.

For example, the results of this basic analysis show a significant positive correlation between the Heritage Foundation's business freedom and GDP (0.69) and between the Heritage Foundation's business freedom and Competitive Intensity (0.88). Because business freedom is defined as the "ability to start, operate, and close businesses that represents the overall burden of regulations and regularity efficiency," it seems plausible that as business freedom increases, there is greater opportunity to create economic value, for the regulatory environment encourages growth while at the same time creating a more competitive environment due to lower barriers to entry and participation.