TECHNOLOGY ECONOMICS:
The Massive, Underlying Force Reshaping Our Global Markets and World Economies

rubin worldwide

The Way Business is Done Will Change Fundamentally

You just woke up and Bloomberg reports that cloud processing futures (yes, cloud processing is a commodity) are up to .015 per image. The Swarm Confidence Index, which maps and predicts collective consumer confidence across every market in every nation and across every industry, is up 2%. Brazil announces it is raising its technology investment per worker by 16% over the next 18 months, well surpassing such investment by the United States and every other country.

The Dow Jones Industrial index no longer exists, replaced by a Technology Leaders Index that precisely gauges a company's mastery of technology and the impact this mastery has on profitability. The Gross Domestic Product (GDP) is no longer relevant, because a Global New Economy Index assesses the amount of change occurring as a result of digitization, privatization, and globalization, based on measuring such variables as availability of IT human capital skills, technological innovation, export of goods and services, Internet connections, and the development of e-commerce, computer usage, and computing power.

This is the Technology Economy—a massive, underlying force that drives every aspect of business today. By recognizing it, mapping it, and understanding the interaction of technology investment and the creation of value, we will fundamentally change the way business is done. We will be able to use this knowledge to optimize all aspects of technology investment on a global, national, and corporate level.

The Global Technology Economy Is Already Enormous, and Growing

In 2008, global technology spending—the combined spending on information technology as we think of it today, coupled with spending on all operational technology (such as processors embedded in cars, appliances, the smart grid, traffic lights, etc.)—was approximately $4.2 trillion dollars. This is the equivalent of $701 per year (or one personal computer, or 3.5 iPhones) for each and every person on the planet. If this $4.2 trillion dollars in technology spending was treated as GDP, it would represent the fourth largest economy of the 186 tracked by the World Bank, ranking behind only the United States, Japan, and China.

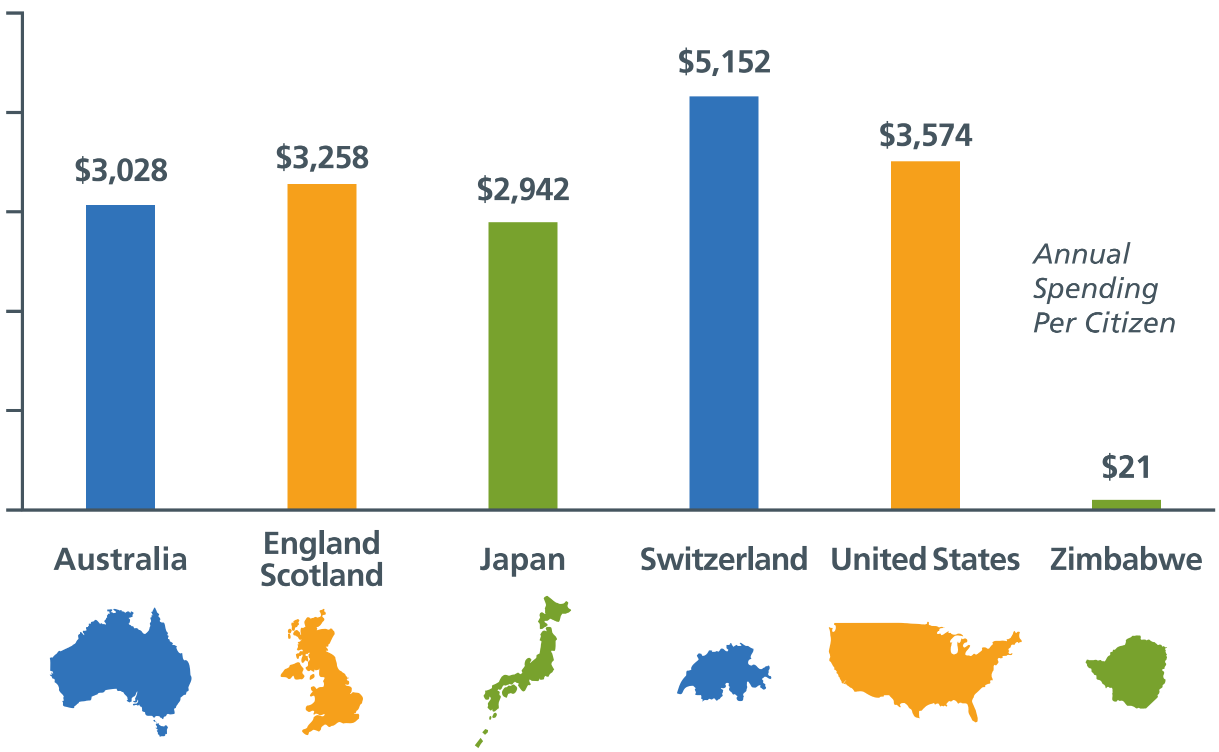
In the United States, total technology spending is equivalent to $3,500 per citizen and $5,600 per worker; in Switzerland, it is higher at $5,100 per citizen and $6,700 per worker. And in Third World countries such as Zimbabwe and Bangladesh, it is a mere $20 to $40 per worker. The correlation of technology spending and level of development is astonishingly clear.

Already, technology spending represents approximately 5% of revenue and 7% of operating expense across all sectors worldwide, and as much as 10% to 12% of new revenue and 16% to 18% of non-interest expense for the world's most technology-intense financial services firms.

This Technology Economy is not static. It is fluid and dynamic, and moves across the globe in waves that can be viewed in the same manner as trade balances. For instance, for every $1 of technology services spending ("imports") flowing into the US, $.87 flows out. Yet in China, every $1 in spending produces an outflow of $1.70, and in the high-growth economy of India the gap increases to $8.86 out for every dollar in.

In addition, the Technology Economy is growing at a rapid pace. India's technology investment per worker will grow 77% by 2011, the Ukraine's by 95%, Brazil's by 60%, China's by 55%, and the United States', which started well ahead, by 10%. Worldwide technology spending was $800 billion between 1980 and 1990 and $3.2 trillion between 1990 to 2000. Technology spending for 2009 is estimated at $4.2 trillion—which means that in this one single year, the world spent more on technology than it did in the 20 years between 1980 and 2000.

National Technology Spending



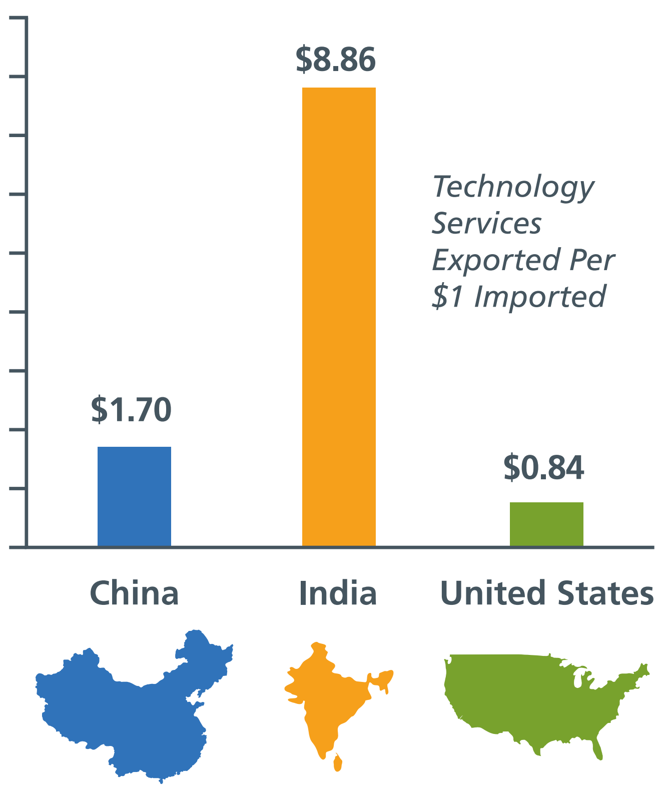
New Indicators Will Make the Technology Economy Transparent

As we begin to chart, calibrate, and take charge of this Technology Economy, new indicators—all of which will relate directly to technology and the measurement of its output—will begin to illuminate our business decisions in far more sophisticated ways.

For instance, if we begin to chart changes in US non-farm productivity during the various technology eras of the past 50 years, we find that non-farm productivity increased 16% during the mainframe era, 25% during the client server era, 70% during the initial PC era, and more than 150% during the current era of pervasive computing (all figures are indexed to 1960 national productivity). During the same period, the correlation between the change in US non-farm productivity and the change in technology investment shows an R-squared of .98. The visible changes we see in productivity are clear evidence that technology investment impacts business performance.

Observations relating to nations' investments in technology per worker show similar changes. For instance, during this same 50-year period described above, we have seen the BRIC countries in general and India and China in particular become key players in the global economy—a change that directly reflects those countries' investment in technology per worker.

Technology Balance of Trade



The Conference Board's Leading Economic Index is likely to be recast in Technology Economy terms, replacing the Industrial Age data used today with appropriate technology-focused data, such as technology unemployment versus general unemployment and software sales versus heavy equipment orders.

A Technology Leaders Index will emerge to replace daily market indicators like the Dow Jones Industrial Average, Standard & Poor's, the CBOE Volatility Index (VIX), and Russell 2000, none of which differentiate between technology-intensive and non-technology-intensive companies, nor between those that fully leverage technology and those that do not. The Technology Leaders Index will indicate which companies have become what Peter Weill, chairman of the MIT Sloan School of Management's Center for Information Systems Research, calls "IT savvy"—in other words, those companies that have learned how to exploit technology for profitable growth.

Moving from the world of markets to the world of people, measures such as the United Nations' Human Development Index (HDI) will be able to gauge the quality of life on a national level and correlate this with technology investment. Early results indicate that technology investment at a national level correlates well with long-term changes in HDI. We can already witness how a country's positioning for the new Technology Economy bolsters its basic human development standing.

In short, the key indicators that are used to gauge and predict the strength of economies, global trade, company performance, and even human quality of life are set to change dramatically.

Illuminating the connection between technology investment and outcome is the most important goal of businesses today. Capturing this connection will enable a completely transparent view of the value created by technology investment compared with the expense of that investment—and in so doing, unleash new ways to unlock profits.

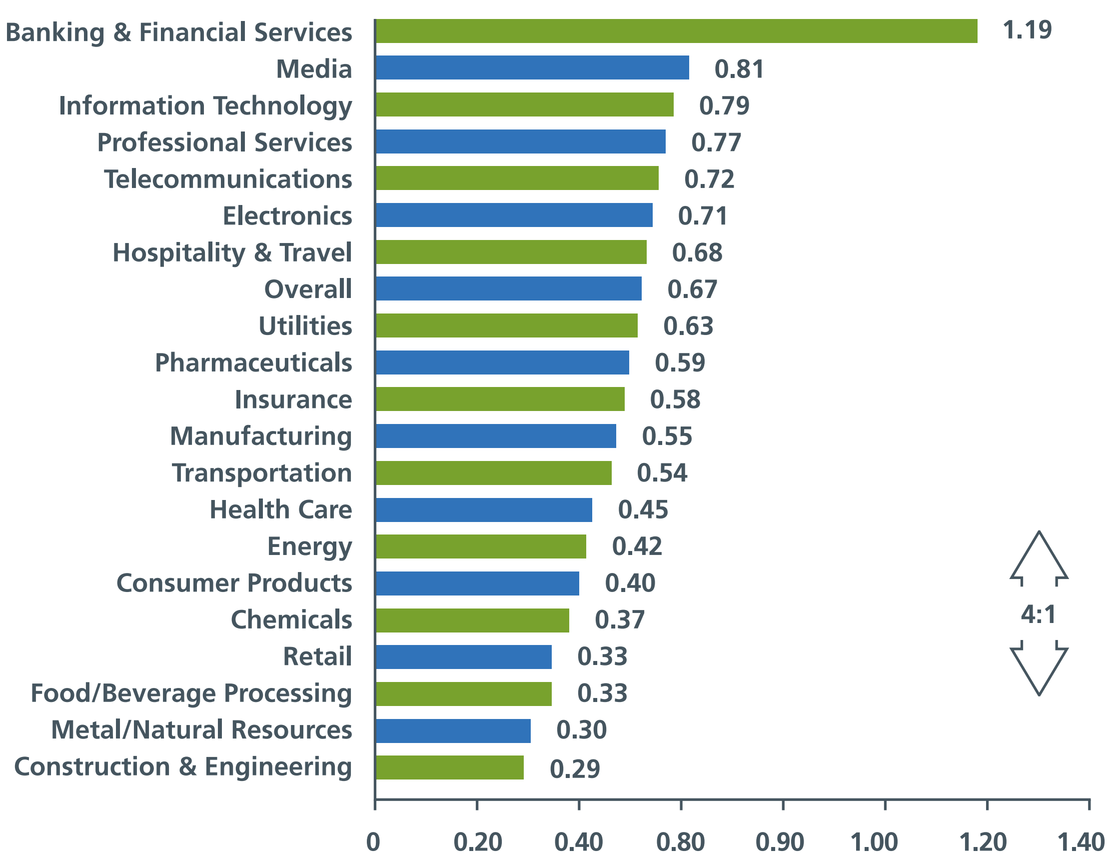
While IT financial measurement and benchmarking are currently the most popular measures of IT spending (spending as a percentage of revenue as well as of operating expense), these are static measures of IT spending that just can't stand on their own. The problem is with the denominator. Revenue is unstable and not tightly coupled in the short term to IT spending. Operating expense or non-interest expense has similar problems. While IT spending hopefully has a more direct impact on business process costs through automation-driven cost reduction and cost avoidance, such changes in profile are more typically a lagging effect of IT spending. In the new Technology Economy, we need to switch from a static, snapshot view to a dynamic view so that we may consider how these metrics interact and change over time.

In actuality, these measures' pattern of movement is more revealing than any single point in time. For a healthy company, IT spending as a percent of revenue will likely decrease over time, as IT investments will both protect existing revenue and grow new revenue. At the same time, IT investments to reduce cost, avoid cost, and manage risk will be a larger component of operating expense as automation plays a larger role in a company's workings. The health of a company will therefore take the form of IT spending versus revenue reduction (taking into account investment cycle impacts), while IT spending versus operating expense will increase to an asymptotic, optimized level.

Already, measurement of IT intensity considers the expense aspect of IT in the context of both revenue and operating expense. Initial findings show a frontier of performance that correlates to levels of optimal IT investment. The performance frontier varies by industry but enables detection of above-optimal and below-optimal spending levels, and can serve as an indicator of IT investment portfolio performance—how a company's IT investments are impacting its business performance in the short and long term. Essentially, IT intensity correlates well with IT investment yield while illustrating the dynamic of under- or over-investment in IT. Also in the context of the performance frontier, this model illustrates that cutting IT investment can potentially limit a company's outcome to levels below that of competitors who are investing at the optimal level. Likewise, it illustrates the performance penalty for over-investment.

Charting & Calibrating: IT Intensity

There is at least a 4 to 1 variation of the intensity of IT — cost and impact relate to revenue and operation experience across key sectors of our company



Companies need a view into the full role technology plays in revenue creation and operation expense.

There is wide variation in technology intensity by sector. The financial services sector is more than four times as intense by this measure as construction and engineering, while the media and telecommunications sectors fall just behind financial services in their levels of technology intensity. This doesn't mean technology doesn't play a role at the lower end of the technology intensity spectrum; it just means that role is perhaps different in relation to how companies invest and make money, and how they transform. In financial services, for example, it can be argued that technology is the product, or the product is manifested in technology. This is quite different than in construction and engineering, where technology is critical but is not the final product in and of itself.

Similarly, the processing requirements of different sectors show equally large variation. In financial services, the average large-scale global institution requires 1.07 mainframe MIPS (million instructions per second) and .49 servers for every $1 million in revenue it generates. In retail organizations, the processing load for a million dollars in revenue is about .33 mainframe MIPS and .14 servers.

Historically, there have also been some attempts to envelope IT investment in a business-focused framework. In the early 2000s, META Group introduced a taxonomy that classified IT investment into three spending categories: Run the Business, Grow the Business, and Transform the Business. (This was an outgrowth of the work of this author and META Group founder Dale Kutnick.) While this structure provided companies with some fundamental transparency, it didn't go far enough to expose IT's outcome potential.

Now we understand that IT investment has a minimum of five dimensions of impact. A fuller portfolio profile would include classifying investments based on the outcomes of growing revenue, protecting revenue, reducing cost in the short term, avoiding cost in the long term, and managing risk. Furthermore, the mechanisms by which these outcomes are attained fall into the realm of key IT competitive levers: the use of IT to increase operational efficiency and effectiveness, the use of IT to enable product leadership and differentiation, and the impact of IT on customer intimacy/relationship—in short, the Treacy-Wiersema model at work.

There are additional measures that "connect the dots" of business IT and thus further illuminate the balance of value and expense. Measures expressed in business terms can allow a holistic and cohesive view. One particularly interesting and revealing measure, for instance, is IT cost of goods. The IT cost of the average US newspaper, for example, is $.41 per copy, while the IT cost per hotel bed per day is $2.50, per megawatt hour is $2.63, per US car is $323, and per hospital bed per day is $65 (a figure which, multiplied by the 947,000 beds in the US, equals nearly $22.5 billion per year—more than the total $19 billion health IT stimulus approved by Congress in early 2009).

The dynamics of IT cost of goods will be explored exhaustively in coming years. As more and more technology finds its way into products and the IT systems that support those products, and the customer, this cost will rise—and as it rises, an understanding of the business outcome is essential. An increase in IT cost of goods will need to have a pre-defined and understood set of outcomes: reduction in total goods to costs to increase margin, increase in product differentiation (which may drive up market share but not necessarily increase margin per unit), increase in client stickiness (which may help maintain market share), or any other such variation.

Of course, not everything can be viewed in the context of IT cost of goods, but it surely is illustrative of a new form of transparency.

Another newly charted dynamic has to do with scale economics. Powerful relationships exist in the area of IT infrastructure, and inherent aspects of the current economy (M&A, industry consolidation) represent scale shifts that have downstream impacts on IT—impacts that tie directly to IT scale and flow into IT cost of goods. Imagine the impact on IT cost of goods when one company competes with another that has twice the infrastructure scale. Two years ago, for example, the largest global banks had perhaps 100,000 mainframe MIPS and 40,000 servers. As a consequence of industry consolidation, the largest now exceed 210,000 mainframe MIPS and 80,000 servers. The resultant infrastructure unit costs are 40% lower than those at the average industry scale.

And at the same time, with Moore's Law (Intel co-founder Gordon E. Moore's prediction that the number of transistors that could be placed inexpensively on an integrated circuit would double every two years) having proved accurate, there is clearly a moving marketplace underlying all IT commodities, which leaves no room for complacency. Mainframe MIPS, servers, and storage are showing annual unit cost decreases of 17%, 8%, and 12% respectively. For most companies, this phenomena by itself will change the economics of keeping pace and being competitive.

Perhaps one of the single greatest changes that will occur in organizations will be the use of cross-company/organization sharing and of what might be termed "technology commons" to scavenge technology resources.

These technology commons will provide access to scale economics for all companies. They will be created by establishing technology "corridors"—much like open space and green corridors in the physical environment—to enable large-scale sharing. Technology commons will be the basis of leveraging global technology capacity for the basics of technology-related services—from simple consumables such as connectivity, desktop services, and email to processing power grids and data-storage commons. In fact, it's not much of a stretch to envision the Internet, Google's "cloud," and various offerings from Amazon, Yahoo, and others as the beginnings of the new technology commons. In this basic commons or a set of commons, the most fundamental of IT services will reside-connectivity, virtual desktop support, email, etc. And of course this could be extended to the more power consuming services of computing (the cloud) and storage—clearly this could be implemented at the application/business system level too. The "software as a service" distribution model—such as Salesforce.com, where business software is purchased on a subscription basis and hosted offsite—is a clear instance of the new commons model.

Of course, there will always be special interest groups with needs not served by the commons. For example, the financial services industry has specialized email needs that are not met by the Gmails of the world. But suppose the commons were structured on multiple levels, with Gmail-like services available at the lowest level and additional layers built on top to address specialized needs—all without polluting the cost structure of the basics.

In our Technology Economy, the use of a commons is simply common sense. Services that cost $500 million in 2007 will be delivered by the most efficient companies for $295 million in 2010, and for $132 million in 2015 by those who migrate to the commons. A technology commons meets the needs of organizations under increasing financial stress, buffers their operations against high volatility, and meets the needs of a resource-scarce world in which a major and increasing source of waste is the under-utilization of growing technology resources.

Taking Charge of the Technology Economy

On a global level, the Technology Economy is a major engine and determinant of the total economy. When the Technology Economy is viewed at a national level, we can document its impact on reshaping the global distribution of wealth—as evident in the rise of India, Brazil, and China. In short, it is a critical component of national competitiveness.

As the realities of the Technology Economy become more evident, we will see new indicators that replace the Industrial Age relics that are failing us badly today: a Technology Economic Index to replace the Leading Index of Economic Indicators, a Technology Leaders Index to replace the Dow Jones Industrial Average, and a Technology Consumer Confidence Index instead of a Consumer Price Index.

Finally, in the context of company performance, companies that can fully leverage their own internal technology economies will be the new leaders. Historical evidence indicates this, and new models predict such a future.

Delving deeply and responsibly into the role of IT and how to take charge of it requires the adoption of a navigational discipline that is adaptive. Companies will need to embrace some kind of forensic solution to form rapid hypotheses for performance optimization in both the short and long term. The process will need to be continuous, and will provide an ongoing, fact-based "heat seeking" process to drive competitiveness. An organization will chart its current position, calibrate against competitors and the marketplace, form fast hypotheses, and then take action—and then it will need to cycle through the process again.

To make this happen, an organization needs a robust view and real-time window into both its internal technology economy and the greater Technology Economy, with a precise business focus. The management team needs to build the right leading and lagging indicators internally and also keep a continual watch on market data feeds to know what is going on in the outside world.

In this new Technology Economy, those companies that chart, calibrate, and make use of these principles first will have a substantial and sustaining impact on both the destinies of nations and the quality of life of the world's peoples. With a current technology investment equivalent to $701 (and rising) for every man, woman, and child on our planet, we have to master the dynamics of this emerging economic nation and distribute its wealth wisely.

The Basics Needed to Take Charge of the Technology Economy

- Transparency in order to accurately "size" IT and keep it cost-competitive and value-competitive
- Visibility to leverage the marketplace
- Competitiveness with the scale economics of your largest peers
- Agility in value and expense to quickly manage yield and return
- Constant/continuous monitoring and navigating from an outcome perspective:
  - Continuous optimization and not just cost-cutting
  - Leveraging new concepts such as the technology commons
  - Striving for economic agility tuned to the needs of your business dynamics
  - Making decisions based on an outcome model and not an input bias

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