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Technology is changing at an ever-increasing pace, boosting companies' competitiveness, profits, and stock prices. The rate of change in the application of new disruptive technologies is crucial to maintaining the global competitiveness of the United States. Capital is critical and innovatively responsive in supporting the speed of the application of new technologies, but the same is not so for required and supporting changes in labor force knowledge gained through traditional education.

The United States leads innovation in goods and services production resulting from the application of new technologies (e.g., personal digital assistants [PDAs], robotics, artificial intelligence [AI], dual manufacturing, and blockchains), but implementation hinges on complementary improvements in labor-force education and knowledge. Meanwhile, the shortage of better-educated labor in math and science is spurring progress in developing AI for use with robots as a potential alternative. Improved algorithms based on expanding "big data" decisions is enhancing the accuracy of AI, as evidenced by AI repeatedly defeating grand masters of various games, including chess and Go.

Recent articles in *The Economist* on the future of learning and how technology is transforming education summarize attempts to resolve this labor-education roadblock.<sup>1</sup> The number of computers per child in the classroom has increased greatly, and software for these computers has been improved to personalize the learning process, especially for math and science. Increasingly, this "personalized, adaptive digital learning" has begun to spread in U.S. public schools, as well as in other developed countries, with an estimated 70% of students reaching some sort of proficiency in one required subject. However, many students have not yet been affected, leaving 30% of the student body not reaching proficiency, which would be considered a very high defect rate in manufacturing. But what does proficiency really mean, and how is it measured?

The percentage of students exposed to EdTech adaptive (personalized) learning technology is still relatively small. Nevertheless, this individualized learning, possible with adaptive EdTech educational techniques, is believed to have made a difference, particularly in schools that are private and chartered. Adding good teachers who embrace using personalized learning software is proving to make the learning process even better. In this regard, much research also has been done to better understand the psychology of learning, the process of deep thinking, memory improvement and recall, and its application to improve performance.<sup>2</sup> In addition, there have also been related improvements in understanding the impact of the environment on learning and the

process of communicating knowledge and new ideas to others via the use of adaptive learning.

Forthcoming developments of much better micro-microphones for use with PDAs may also contribute to a broader understanding of new technologies for the labor force. To get a taste of what is new, for example, you need only to look at your cell phone (which is now a phone, directory, watch, camera, computer, radio, map, weather forecast, compass, flashlight, news source, TV, movie theater, social media source, etc.) to see the advances in the visualization of content and the improvement in electronic voice recognition and communication. Significant improvements in the technology of testing and skill-measurement are shifting the emphasis of learning from memorization to depth of understanding and application ability in math and science and to problem solving in the production of goods and services.

The third leg of this knowledge stool is the cost of this improved educational learning process. At the beginning level, individuals or their families cover much of the cost, whereas at the higher level, companies or government provide some or all of the financing. Not everyone can afford the cost of high-quality education, and those that can usually amass a huge amount of debt. Adaptive online learning opportunities offered by for-profit and not-for-profit companies have greatly reduced the cost of higher education and offer a much more flexible and personalized educational experience, which is now recognized as comparable to that of a traditional classroom. However, more is needed.

Industry requirements for better-educated workers now focus on application, innovation, and productivity. Increasingly, some larger companies are initiating their own internal educational programs/campuses to upgrade the required skills of their current labor force to achieve improved productivity by accepting and adapting new technologies in their jobs and to gain improved efficiencies more rapidly.<sup>3</sup> Company executive experts or college faculty with application experience in the skill subject area have taught these programs. Other companies have increasingly relied on skill-based learning programs developed for them by community and technical colleges or major educational publishing companies to better educate or upgrade current

labor's immediate knowledge. In contrast, universities have tended to focus on Executive Education programs for growing future leaders with better cross-cultural leadership skills and enhanced strategic-thinking skills in which experiences are shared and communicated by other executives. These programs can vary in price from a low of \$30,000 for online programs up to \$250,000 for traditional, top-ranked universities.

By elevating and scaling these new learning technologies and delivery systems to make them available at a much lower cost, venture capital (VC), and private equity (PE) are needed to keep the United States competitive and to raise the overall level of knowledge and standard of living of the labor force. Continued economic growth and job creation with higher wages is dependent on increasing productivity, which requires innovation and its application to the production process—the sale and distribution of what is produced. Although the U.S. growth engine is robust, opportunities on the demand and supply side are not only domestic but also global.



Yair Erez, Justas Grigaluskas, Dmitry Podpolny, and Thomas Rudolph, in their special feature report “European Healthcare: A Golden Opportunity for Private Equity,” identify possible European opportunities. Aging populations, the drive for better preventive medicines, and the increasing reliance on the private sector to help societies pay for ballooning healthcare costs continue to make healthcare a prized sector, with returns higher than in most other industries. That is as true in Europe as it is elsewhere in the world. Yet PE participation in the region remains stubbornly low, and this report examines how PE can increase its presence.

Some U.S. PE companies focus only on the domestic market because of perceived overseas risks. Josh Lerner and Mark Baker address this concern in “An Empirical Analysis of Investment Return Dispersion in Emerging Market Private Equity.” They find evidence suggesting that the distribution of transaction-level total value to paid-in capital (TVPI) has lower variance within emerging than developed markets, although with some caveats.

Tracking future U.S. innovations is examined by Mark Cannice in “Trends in Confidence among Silicon Valley Venture Capitalists: Q1 2004–Q2 2017.” Many different market participants track confidence indicators. Venture capitalists, as long-term investors in innovative firms that disrupt existing industries and create new ones, make decisions based in part on their confidence in future conditions. Cannice reviews a long-term continuing study of Silicon Valley venture capitalists’ confidence in the future high-growth entrepreneurial environment by measuring confidence among Silicon Valley venture capitalists and assessing the factors driving confidence based on the commentary of the responding venture capitalists each quarter from Q1 2004 to the present.

Nimble PE companies sometimes face their stiffest competition from domestic corporations. This battle is changing, as explained by John Mathis in “The Corporate M&A Brand—*Winning the War for Acquisitions*.” Wall Street continues to ratchet up growth expectations for successful companies, and M&A is one of the most effective ways to show growth in revenue and earnings in a short period of time. M&A deals can be incredibly impactful in today’s environment, where innovation and time-to-market timelines are compressed. The companies that continue to view their acquisition programs passively are at a distinct disadvantage to their competitors and the often-nimble PE buyers. The war for acquisitions is on, as the traditional corporate development methodology looks for more creative methods of finding growth through M&A, which is resulting in a new M&A brand.

As an example, Mathis examines the issue in “Mortgage Tech Is Experiencing an Innovation Surge.” After a long dry spell where lenders, servicers, and end-customers were unwilling to try new ideas, it appears that a corner has been turned, and innovation is becoming the new trend in mortgage tech. With looming political tailwinds, consumer preference shifts, and disruptive technologies like blockchain, the mortgage landscape will continue to be transformed in 2017 and beyond. Expect to see more innovation and consolidation as mortgage-service companies place their bets for the coming “liftoff” in eMortgage.

Successful growth strategies are built on maintaining a strong reputation, and how PE companies maintain one is important, as explained by Nir Kossovsky in “Private Equity Firms Must Ensure That Captive Insurance Companies Meet Stringent Government Requirements.” Captive investment vehicles have become increasingly attractive in the PE and hedge fund arena—and, with respect to reputation insurance, for good reasons. Kossovsky cautions to tread carefully, because the U.S. Internal Revenue Service and state regulators have now provided clear signals—as evidenced by their investigations of Caterpillar and Moody’s—that they intend to more closely scrutinize anything they believe may have been constructed to be purely a tax shelter.

PE shareholder agreements are essential to the successful relationship between VC providers and recipients and are structured to balance the interests and objectives of both parties. However, these contracts are complex and contain a broad range of design options. David Sonius, Rustin Yerkes, and Katharina Westhues, in “VC Contract Design: *Development State, Bargaining Power, and the Classification of Early-Cycle Companies*,” propose classifying early-cycle companies into two dimensions. Their survey shows that most VC contracts include a core set of standardized investor rights and varying rights according to the degree of bargaining power and development state.

Manu Sharma and Puneet Gupta, in “CapEx Funding, Capital Structure, and Revenue Targets for Entrepreneurial Financing Ventures in the Manufacturing Sector by Venture Capital Funds,” examine how VCs give revenue, operating income, and net operating income-based targets to entrepreneurs’ post funding their respective ventures. They analyze the total funding in terms of equity and debt to fund capital expenditures and then separate out comparable companies trading in the same industry, offering similar products, and in the same revenue range (large-cap, mid-cap, or small-cap).

Two countries where domestic PE activities have not been examined recently are Australia and Taiwan. Hugh Sheppard explores the situation in Australia in “Capital Gone Walkabout: *The Development of Venture Capital in Australia*.” The Australian business landscape is characterized by a high proportion of small businesses

relative to other developed economies, partly due to the lack of equity finance for small businesses. Repeated government inquiries and policies have recognized this need, and yet the supply of equity capital to early-stage enterprises remains low relative to levels in other comparable economies. Sheppard examines this lack of equity finance and the failed government attempts to develop a VC industry. He concludes that little change may be expected, because of government restrictions on investor flexibility and the selective targeting of specific industries and businesses.

Tzu-Yi Yang, Yu-Tai Yang, and Andrew Yi-Hung Liang pursue a different approach in analyzing Taiwan's stock market in "Does a Seasonal Effect Exist in Stocks of Different Industries of Taiwan's Publicly Traded Companies?" Taiwan has fallen into an era of growing debt, as double-digit rises in gasoline and electricity prices have led to product inflation, forcing consumers to spend more money for living expenses, including food, clothing, housing, transportation, education, and entertainment. With fixed incomes and a rising cost

of living, the result is a slowing of economic activity. The authors investigate the resulting effect on stock prices of different industries and relate these changes to the impact on decisions of new issuers and investors in different industries.

## ENDNOTES

<sup>1</sup>See "Brain gains" and "Edtech: Machine learning," *The Economist*, July 22, 2017, p. 9 and pp. 15–18.

<sup>2</sup>Such research has been recently popularized. See, for example, Angela Duckworth's *Grit: The Power and Passion of Perseverance*, 2016; Carol S. Dweck's *Mindset: The New Psychology of Success*, 2006; and Daniel. H. Pink's *Drive: The Surprising Truth About What Motivates Us*, 2009.

<sup>3</sup>The automated and massive robotic chip plant in Austin, TX, runs educational programs taught by Austin Community College faculty for their engineers, 24-hours a day, onsite, in production labs.

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