PATHWAYS TO PROSPERITY IN THE 21ST CENTURY

The future of workforce development and educational credentials

Thought Brief by Chelsea Barabas

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In addition to her work at MIT, Chelsea has also lived and worked in Africa, South America, and the Middle East as an educational consultant and designer. Through this work she has led the development of innovative technologies and pedagogical approaches that are designed to broaden access to high-quality learning opportunities for people who struggle to enter traditional institutions of higher education.

"Behold him [a statue of Benjamin Franklin], ye that are humblest and poorest...lift up your heads and look at the image of a man who rose from nothing, who owed nothing to parentage or patronage...but who lived to stand before Kings, and died to leave a name which the world will never forget."
- Robert C. Winthrop, 1856

The American Dream, the idea that all individuals have the opportunity to pull themselves up by their own bootstraps to succeed regardless of where they start out in life, has been a fundamental pillar of American notions of fairness and equality since the country's founding. Historically, U.S. educational institutions have played a critical role in harmonizing conceptions of the American Dream with the nation's need for a skilled workforce to fuel economic growth. In the 20th century, expanding access to higher education served as the focal point for U.S. efforts to foster social mobility and a sense of equal opportunity for all its citizens. In the years following World War II, there was a significant increase in the number of students enrolled in institutions of higher education, particularly among the working class and racial minorities.[1] This growth was fueled largely by the introduction of the G.I. Bill and a significant increase in the number of public universities and community colleges established across the nation.[2]

1 Between 1947 and 1968, the proportion of young adults, ages 18–21, enrolled in college roughly doubled from 25.2 to 48.4 percent of the population (Karabel and Astin 1975).
2 By 1980 more than 90 percent of the U.S. population was within commuting distance of a community college, as there were more than 900 distributed across the country. In contrast to four-year institutions, community colleges were designed to enable students to live, and even work, at home while taking classes.

Many have characterized this expansion of higher education as indicative of the shifting manpower needs in the U.S.'s rapidly evolving post-war economy, in which the proportion of the workforce engaged in professional or technical work increased by 157 percent in the two decades following the war.[1] But there remains a long-standing debate over the best way to prepare a workforce with the skills and knowledge necessary to keep up with the technological advances driving the modern-day economy. Some argue that a liberal arts degree alone fails to provide the practical skills necessary to enter the workforce as a white collar worker, while others warn against narrowly designed skill-based programs that circumscribe students' abilities to keep up with changes in the economy over time.

Regardless of the competencies actually developed in college, a degree has long been considered a sure ticket to upward mobility. This sentiment is reinforced by a large body of research demonstrating the clear returns on investment in a college degree. Individuals who pursue higher education earn substantially more over the course of their careers than those with only a high school degree.[2] Moreover, the benefits of a degree have proven to be particularly pronounced for members of disadvantaged groups.[3]

However, in recent years, people have begun to seriously question the assumption that a traditional college experience is the most appropriate means of achieving widespread job security and social mobility. Over the last few decades the price of a college degree has drastically increased; between 1982 and 2007 college tuition and fees increased by 439 percent, while median family income rose only 147 percent.[4] 3 This has led to a corresponding increase in student debt. In 2014 the average college student graduated with about $33,000 of debt, more than double the amount students had 20 years ago, even after adjusting for inflation.[5]

3 This means that, on average, the net cost of a four-year public university amounts to about 28 percent of the median family income. For the lowest income quintile, a four-year degree is 55 percent of the median family income, up 16 percent from the 1990s.

Yet as student debt increases, the return on investment in a degree is diminishing. The number of underemployed college graduates has grown significantly over the last few decades. A 2013 study found that about 48 percent of employed U.S. college graduates today are working in jobs that require less than a four-year college degree.[6] Heightened levels of unemployment and underemployment of college grads has led to rising default rates on college loans.[7] Moreover, these hardships are not evenly distributed across society. A 2014 study revealed that Black college graduates have faced unemployment rates more than double that of their peers since 2008.[8] In *Paying for the Party: How College Maintains Inequality*, sociologists Elizabeth Armstrong and Laura Hamilton argue that class inequality is often reproduced in the party culture that pervades large public universities.[9] College has become the place where the children of the privileged have permission to play while the children of the poor work away only to realize that their degree has given them more debt than opportunity.

At the same time, recent technological developments are calling into question the central role that universities play as the primary mediator between skilled workers and opportunity in the labor market. Digital technologies, and the data produced from them, are driving significant shifts in the demand for certain kinds of skilled workers. Artificial intelligence is rapidly automating tasks that used to fall clearly within the domain of human work. Of particular interest to some scholars is the evolution of "good white collar jobs" that a college education historically served to prepare the population to do. The future economy will require fewer credit analysts and accountants, some argue, while data scientists and high-level programmers will find themselves in increasingly high demand. This transition will be smoother if the education system is reoriented away from industrial-era notions of workforce preparation to include a broader set of skills and experiences necessary to work effectively alongside the tools of the 21st

century.[10]

Furthermore, the dramatic increase in the quantity and quality of data produced by our everyday activities has given rise to a new discipline called "workforce science," which infuses human resource management with the analysis of big data.[4] This new discipline is challenging age-old assumptions about what signals and credentials are true indicators of an employee's future success on the job. For example, Google's head of human resources, Laszlo Bock, claims that, after studying the longitudinal data from thousands of its employees over the last decade, the company found no clear correlation between traditional metrics, such as GPA or university prestige, and employee performance. He argues that general cognitive abilities, such as innate curiosity and the ability to learn, are far more valuable than expertise or training in a specific domain.[11] Accordingly, Google has broadened the set of criteria and metrics it uses to evaluate candidates in order to emphasize cognitive abilities and leadership skills rather than educational pedigree. Along with Google, there has been a surge in the number of human resource companies seeking to identify, and monetize, signals from big data that more precisely indicate how people will think, communicate, and collaborate on the job.

Against this backdrop, a university degree is often characterized as a crude instrument for differentiating human potential. Big data methods could potentially broaden the types of pathways individuals are able to take in pursuit of promising careers in the future, as traditional credentials are displaced by other indications of competency. Leaders in this space hope that big data hiring practices will lead to more fair and meritocratic labor market dynamics, whereby individuals no longer need a costly four-year degree in order to be competitive for desirable jobs.[12]

These developments have revived age-old debates over what characteristics and skills will actually matter

4 The term big data refers to a set of techniques and technologies that enable new forms of data integration and analysis to uncover hidden insights from large datasets that are diverse, complex, and of a massive scale.

in the future economy, as well as what institutions we need in order to effectively mediate the relationship between employers and the future workforce. In the next section I will explore the following issues related to the future of workforce development:

What skills and competencies should we focus on equipping the workforce with in order to meet the labor demands of the future economy?

Are we moving toward a more skill-based economy or are more nebulous "21st century competencies," such as metacognition and adaptability, more important to succeed in the future labor market?

How will we demonstrate and package our competencies in the future?

Given the rapid rise of big data and the digitization of implicit professional activity, how will we demonstrate and differentiate our professional abilities in the future?

What institutions are needed in order to mediate fair relationships between potential employees and employers in the labor market?

As the services and benefits of higher education institutions are "unbundled" into less formalized career pathways, what types of platforms and institutions will we need in order to maintain equal opportunity practices moving forward?

In order to answer these questions, I outline a few specific trends currently underway in the arenas of workforce development and recruitment and hiring. I'll describe the potential benefits and risks of each of these developments, as well as identify key areas of inquiry for future researchers to pursue moving forward. I'll conclude with some speculations on what a fair and effective system of higher education could look in the next 25 years.

DEVELOPER BOOT

CAMPS: CULTIVATING METACOGNITION THROUGH SKILL-BASED TRAINING

The rapid evolution of the technologies used in the workplace has heightened the need for workers to continuously "skill up" throughout their careers. In order for individuals to keep up with the rapid pace of technological change, it is critical for them to cultivate a foundation of metacognitive abilities that enable them to learn new skills throughout their career. Leading educational theorists such as Sugata Mitra and Sir Ken Robinson argue that 21st century education should be re-centered around the cultivation of student curiosity and the ability to "learn how to learn".[13] In contrast to a traditional liberal arts education, both Mitra and Robinson emphasize the value of practical, hands-on learning experiences for cultivating such metacognitive abilities. There are a growing number of educational institutions that have embraced this approach to education by offering programs that equip students with marketable skills while also cultivating students' ability to learn on their own as their careers develop.

A great example of this trend is the emergence of "developer boot camps," which train learners in high-demand coding skills through intensive, boot camp-style programming.[5] Developer boot camps are typically 8–12 weeks long, and are designed to equip learners with the skills necessary to get a job as an entry-level programmer with only minimal formal training and work experience. The boot camps center their curriculum on practical projects that enable students to build up a portfolio of work to show to potential employers. Through the process of completing the projects, students learn how to navigate the vast educational resources and programming communities available online in order

to solve problems and learn new skills. The hope is that learners will continue to practically hone their skills once they are employed upon completion of the program.

The benefit of this model is that it focuses on learning activities that cultivate metacognitive skills within a specific domain of expertise, while simultaneously giving students the opportunity to build up a professional portfolio to be competitive in the job market. Proponents of this model claim that boot camps provide a more efficient and cost-effective means of entering the tech workforce.[14] However, it remains unclear how many boot camp students are actually able to attain a job upon graduation from such programs.[15] Others have pointed out that boot camps fall short of democratizing access to tech careers because they typically require students to have access to a substantial amount of cash and free time in order to participate.[16][6] Much more work will need to be done to determine how boot camp-style programs can be modified in order to become a viable option for individuals who face significant obstacles in accessing both traditional and emerging institutions of higher education.

Nevertheless, developer boot camps provide an interesting example of an alternative educational pathway into a rapidly growing industry, one that emphasizes hands-on learning experiences that simultaneously equip students with in-demand skills and foundational metacognitive competencies.

edX, Khan Academy, and Degreed: Emerging Opportunities for Mass Customization

Over the last couple of years there has been a boom in the number of platforms that deliver educational services and course content online. Some argue

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5 Examples include: MakerSquare, The Flatiron School, App Academy, and Bitmaker Labs. For a more exhaustive list, please see: http://www.skilledup.com/articles/the-ultimate-guide-to-coding-bootcamps-the-exhaustive-list/

6 The price of most boot camps falls within the range of $8,000–$15,000. In addition to this substantial up-front cost, most programs require individuals to stop working during the time they're enrolled the boot camp, creating an additional opportunity cost that renders such programs prohibitively expensive for a wide swath of the population. It's no surprise, then, that most boot camp participants tend to hold a college degree and are looking to pivot from a white-collar job in one industry to a different one in the tech sector.

that the rapid rise of Massive Open Online Course (MOOC) platforms like Coursera and edX is an indication of the unbundling effects that the Internet is having on higher education, whereby the services that were historically bundled together and sold as one product under the heading of a university degree are now being disaggregated into smaller modules that can be remixed to address a learner's specific needs and circumstance.[17]

In addition to course content, sites like Khan Academy, Achievery, and Degreed provide tools and services that enable students to plan and track their progress within customized learning programs. These platforms aim to help students navigate all the educational resources available on the Internet in order to identify appropriate next steps for achieving their near- and long-term goals. Many of them provide the additional benefit of making less formalized learning pathways more transparent to potential employers by offering authenticated credentials for specific skills and knowledge learned online. For example, companies like Udacity have partnered with major companies in the tech industry in order to create "nano-degrees," which focus on teaching specific skillsets that are currently in high demand in the industry. The emergence of these platforms could enable students to identify concrete goals and next steps that are customized to their skill level and experience. They also signal the rise of "on-demand" learning resources, which provide manageable chunks of curricula that learners can access whenever they need to increase their literacy in a new technology or skill.

However, concerns have been raised about how little these emerging enterprises are regulated, which could lead to great variations in the quality of learning experiences and increase the risk of predatory behavior from companies that are more interested in increasing profits than meeting the needs of their students. Additionally, current rates for course completion of online and independent study courses are quite low.[18] This may be due to the fact that most early innovations in this space have

focused on content delivery rather than social support and guidance services that are essential for student retention and engagement. It remains to be seen whether the trend toward unbundling higher education will create viable opportunities for mass customization of learning or simply create more predatory educational options in an increasingly fragmented landscape of higher education.

BIG DATA: PAVING THE WAY FOR MORE EFFICIENT AND ACCURATE HIRING PRACTICES

As our lives become increasingly mediated by digital exchanges, key details about our personal lives such as our habits, preferences, and relationships are more legible to third parties. This has given rise to many companies seeking to develop new business models based on the insights gleaned from big data. The rise of big data has resulted in innovative methods for interpreting implicit professional activity to provide insights into a job candidate's potential. The foundation of these methods rests on creating predictive models that identify patterns across large data sets but do not necessarily have an underlying explanation for why a given pattern, or set of data points, is significant (Barabas and Styslinger 2014).[19]

A growing number of companies are applying big data methods to create more efficient and accurate processes for matching qualified workers with company talent needs. Currently, most big data hiring products are geared toward helping employers identify workers with specific skills and competencies that are not immediately apparent from simply looking at a person's university degree. Such products could support a more refined ecosystem of micro-credentialing, or micro-signaling, in which a person's less formalized activities online are used to construct a more nuanced profile of his or her abilities and strengths. These profiles could then be used to evaluate a candidate's suitability for certain jobs. Such practices have the potential to provide pathways into

jobs for individuals who lack formal credentials such as a college degree. They could also create more efficient labor markets in which it becomes easier for employers and workers to find one another.

However, these practices could also lead to biased decisions that have disproportionately negative impacts on individuals who belong to protected social classes. Researchers Solon Barocas and Andrew Selbst argue that "data mining can reproduce existing patterns of discrimination, inherit the prejudice of prior decision-makers, or simply reflect the widespread biases that persist in society (2014).[20] The rise in big data practices has propelled a gold rush for "hidden gem insights" that emerge from data whose relevance may not be immediately apparent to the task at hand. For example, an employee of one big data firm described his team's excitement at discovering a correlation between the books listed on a person's Facebook profile and that person's performance as a chief technical officer in a tech company:

> There are a lot of things about demographics, tastes that are pretty interesting. For example, we found that one of the biggest predictors of someone doing engineering, graduating and becoming a good CTO at an Internet company in the Bay Area was that they had Ender's Game as one of their favorite books on Facebook. We think there are a lot of things that can be gained from [insights like] that.[7]

This correlation exemplifies the risks of looking for insights and patterns in data without establishing an explanatory rationale for why the emergent characteristic or trait is relevant. The above example is likely to yield an alarming number of false positives and/or false negatives because it bases job suitability on the tastes and lifestyle choices of the people currently in power.

It remains uncertain the extent to which emerging data practices interact with pre-existing biases in the

7 A. Ajaa. Personal interview. 11 Jul. 2014.

labor market. More work needs to be done in order to understand the discriminatory effects of big data recruitment for protected classes, such as women and underrepresented minorities. Although big data collection practices are increasingly pervasive, there is currently no legal framework in place to protect consumers from the adverse decisions informed by these methods.

CONCLUSION: A VISION FOR THE FUTURE OF WORKFORCE DEVELOPMENT

In light of these trends, how do we imagine an effective landscape of higher education would look in the year 2040? The pathways into specific careers would be more specialized and distinct than they currently are today. The current university system would remain intact, but it would be accompanied by many other options that would offer programs of varied duration, format, and price. New educational institutions would establish close partnerships with industry in order to develop curricula more directly relevant to the demands of specific sectors of the economy. Regulations would need to be put into place to ensure that corporatized models of higher education place learner needs at the center of their work. Data on student retention rates and post-graduation job attainment would be used to increase transparency on the quality of different educational programs.

There would be increased variety and fluidity between different career trajectories available to the average person. On-demand learning services would enable individuals to skill-up or pivot to new jobs more easily. This would lead to a workforce that contained workers with both more specialized and general skills sets. In addition, there would be a renewed appreciation for the social-psychological development

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