CHAPTER 1.8

Big Data Analytics for Inclusive Growth: How Technology Can Help Elevate the Human Condition

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We often hear that growth is the answer to all our problems. However, growth alone will not suffice. Resolving the current challenges society is facing is not just about economic vigor: *it is about elevating the human condition.* In a world increasingly driven by behavioral economics, we must leverage big data analytics for *inclusive* growth, so everyone can make contributions toward growth and all sectors of society can benefit from the dividends and sense of purpose that result.

Economic growth corresponds to an increase in GDP. However, to avoid leaving part of the population—indeed the entire population of the Global South (Africa, Central and Latin America, and large parts of Asia)—out of the growth equation, we must add a qualitative measure that we describe by using the term *inclusive.* In considering what inclusive growth looks like, we note that it encompasses three essential components:

- **Education** that allows people to participate in disruptive industries and expanding markets, particularly data-driven services, whereby entirely new skill sets will be the catalysts to redeploy traditional ones.
- **Jobs** created by the free movement of goods, services, capital, data, and people, with all sectors of society able to add value to the economy.
- **Well-being,** consisting of prosperity, good health, and longevity, in an environment of public health and safety, sound policymaking, and prudent allocation of taxpayer resources for the public good without fraud, waste, or abuse.

The three pillars of inclusion are highly interdependent: we need a higher proportion of the population contributing to society, and to achieve this we need to improve education and well-being while simultaneously creating more jobs. Fortunately, technology is an enabler, a catalyst, and a propelling force that makes it possible to take action. We can now process huge volumes of data, and we now have enough affordable processing capacity to build the complex models that allow us to ask previously unimaginable questions as well as to answer those that were not previously answerable. The combination of these abilities—*big data analytics*—makes truly inclusive growth a genuine possibility for the first time in history.

THE TIME IS NOW: EXTRACTING THE VALUE FROM BIG DATA

By definition, *big data* exceeds the processing capacity of conventional relational database management systems. The amount of information stored worldwide topped 2.8 zettabytes of data in 2012; by 2020, this is expected to be 50 times larger than it is today. Dealing with that onslaught requires high-performance analytics, also known as *big data analytics.* By some estimates,

Box 1: Big data analytics for expanding access to education: Digital learning in Thailand

Beginning in 2010, SAS united with the National Science and Technology Development Agency (NSTDA) and other public organizations in Thailand to deploy SAS® Curriculum Pathways® in secondary schools throughout the country. The initiative, sponsored by HRH Princess Maha Chakri Sirindhorn, offers online lessons for the enhancement of academic skills and creative thinking. Sirindhorn—often referred to as the "Princess of Technology" because of her interest in employing science to promote Thailand's development—initiated the project to enhance information-age skills in a country that lags in reading, math, and science.

Thailand is now the largest user of SAS Curriculum Pathways outside the United States. Initially 10 secondary schools served as pilot sites; the software is now being used in 282 schools and counting.

"The adoption of SAS Curriculum Pathways by schools in Thailand aims to allow teachers and students to gain more lessons and enhance their teaching and studying processes," said Thaweesak Koanantakool, President of the National Science and Technology Development Agency. "Teachers will get new teaching concepts that focus on analytical thinking and stimulate further studying, while students can enhance their systematic thinking on science, mathematics, social science and history as well as [their] improving English skills."[1]

The intent is to empower the country's students for jobs in the digital economy. Driving economic growth and addressing the complex challenges of our global society will require calling on all minds, and programs such as this are ensuring that we tap into the potential of young minds around the world.

Note

1 The Nation 2012.

only 0.5 percent of available data are analyzed. What benefits are global communities missing because those insights remain untapped and trapped in the relational database systems of the past?

The emerging technology of big data analytics brings us to a tipping point. The power to analyze huge amounts of data gives us an unprecedented ability to make better, more insightful decisions in each of the areas needed for inclusive growth. With big data analytics, we are shifting from a world in which we *think* we know how to elevate the human condition into a world in which we *know* how to do this and we can *prove* it.

The needs are certainly considerable:

- Unemployment is a global problem. Could we proactively address it by identifying patterns and countering them at their source, using methods such as "predict to prevent" and "predict to prepare"?
- The food and water supply is not secure in many areas of the world. By expanding on emerging approaches to data for development (D4Development) to include D4Water, D4Food, D4Energy, and so on, can big data analytics identify the areas of greatest need and optimize the flow of resources to the right places?
- Developing nations do not yet have access to first-rate education. Can our digital resources change that through virtual self-learning platforms combined with common certification standards?
- Disease and natural disasters provide further setbacks to already-challenged nations. Can analytics level the playing field and bring stricken economies to competitive strength faster?
- Huge sums of money that could be spent on bettering the world are currently lost through waste, leakage, and fraud. Can big data analytics stop the drain and divert the money back where it belongs?

The answer to all of those questions is now "yes," thanks to the modern ability to tap into vast data sources and use complex models. We can now find solutions to extremely complex problems when it matters the most and uncover new ways to address global issues and foster inclusive growth. Big data analytics breaks free of conventional limitations, helps us influence the impact of actions in advance, and makes it possible to do things never before conceived.

The sense of urgency is strong—all of the data that exist today will represent just 10 percent of the total in three years. That is a truly transformative force that can be addressed only by analyzing the meaning of all those data, and it is also the reason that big data analytics is the path forward to inclusive growth. Returning to our formula for driving inclusive growth, we note that education spurs job creation, and education together with jobs lead to societal well-being. In today's digital age, it is data that will drive all three forward to the desired outcome of inclusive growth. This chapter examines each of these components in turn.

OPPORTUNITY: EXPANDING ACCESS TO EDUCATION

Given the pace of change in the world today, a lack of progress is the equivalent to a decline. The "brain race" means that countries need to run simply to stand still. Technology is the equalizer, and knowledge is the way to outcompete.

During times of transformation, it is inevitable that society will experience a gap in the type of skills needed to remain competitive. For example, as the Industrial Revolution began, when more farmers than factory workers were available, it took time for the populace to

be retrained and catch up to the needs of the age. The same is true in our current digital revolution—over time, these new digital jobs will be the catalysts to redeploy the more traditional roles. But at the moment, we are experiencing a lag because a digital economy requires people versed in science, technology, engineering, and math—STEM skills, precisely the skills that are currently lacking.[1]

When it comes to education, the need is global but the greatest potential for transformative change is in the Global South. The populations and emerging markets of these countries offer immense untapped potential for economic growth and investment—but they are the same regions often lacking in educational and information infrastructure.[2]

One solution lies in using online curricula and other forms of distance learning, which can spread proven techniques across borders. For example, SAS® Curriculum Pathways® enhances student achievement and teacher effectiveness by providing web-based curriculum resources to educators and students in grades 6 through 12 (Box 1). Content can be accessed online from multiple platforms and mobile applications.

Since 2008, the Curriculum Pathways software has been available free around the globe. In 2013, 42,000 schools, nearly 120,000 teachers, and 10,000 home-school users have taken advantage of this software in the United States alone. Online learning can be the great equalizer, bringing formerly disenfranchised people into the technology ecosystem and equipping larger portions of the world population to play a part in the data-driven economy.

But online learning is not the only application of analytics in education. Big data analytics can also be employed to improve educational outcomes in brick-and-mortar schools. For example, educational value-added assessment systems (EVAAS) use multivariate, longitudinal modeling to go beyond mere classroom-level analyses: they assess the effectiveness of districts, schools, and teachers, and provide continually changing projections of future student performance and needs. EVAAS is flexible enough to account for factors such as student and teacher mobility, team teaching, and changes in educational policies and assessment standards. EVAAS also balances the role of school and home factors in educational success. The tool is based on the underlying belief that all students can learn and deserve to make appropriate academic progress each year, regardless of their prior achievement levels.[3]

With better education comes expanded access to jobs, the second component in the formula for inclusive growth.

OPPORTUNITY: EXPANDING ACCESS TO JOBS

In this time of economic transition, new jobs *are* being created. But are we ready to fill them? If data are the new oil—the fuel of the information economy—the new oil barons will be the data scientists and knowledge workers, and the world will need plenty of them. By 2018, the United States is projected to have 190,000 unfilled analytics positions and a shortage of 1.5 million managers and analysts skilled in big data.[4] According to the research firm Gartner, by 2015, more than 85 percent of Fortune 500 organizations will be unable to effectively exploit big data.

In measuring access to jobs, big data analytics can serve as an early warning system, analyzing social and economic indicators and alerting governments to looming problems (see Box 2). And big data analytics can also get economies back on track when things do go wrong. In France, job seekers who collect unemployment benefits are receiving assistance

Box 2: Big data analytics for expanding access to jobs: Using social media to add depth to unemployment statistics

A recent study from the United Nations' Global Pulse initiative uses linguistic analytics to demonstrate how government agencies can predict to prevent joblessness.

Analysts collected anonymized digital data from social media, blogs, forums, and news articles related to unemployment, and then performed sentiment analysis to categorize the mood of these online conversations. The topics and moods of the conversations were then correlated to official unemployment statistics.

The research revealed that a rise in chatter about postponing vacations, increasing the use of public transportation, and downgrading one's automobile could indeed predict an unemployment spike. In the United States, hostile moods increased four months before a spike in unemployment; in Ireland, confusion and anxiety increased three months prior to such a spike.

"Using a powerful new data source—global social media—SAS and UN Global Pulse demonstrated how advanced analytics can provide real-time insights for policymakers and improve the ability to manage disruptive events," said UN Strategic Communications and Partnership Officer Anoush Tatevossian. "The initiative examines how new types of data can strengthen official statistics on how global crises affect people."[1]

Social media analysis will not replace official statistics, but it can add rich insights. For example, official statistics may tell us that the number of children enrolled in school in a developing region is declining, and the public chatter may tell us *why* children are being pulled out of schools (to work in the local markets for food, to protect the village from civil unrest, etc.).

More information about this and other data for development projects is available on the UN Global Pulse site at http://www.unglobalpulse.org/.

Note

1 SAS 2013b.

Box 3: Big data analytics for well-being: Tracking infectious disease

After the SARS outbreak of 2003, the Department of Health in Hong Kong modernized its analytics to link many different systems for a better flow of information. In essence, the department took massive amounts of diverse data and linked them together in a social network that took into account how people interact and where.

Once these social networks are mapped, the department can identify hotspots to forecast where disease is likely to spread next. Where an outbreak originates determines how it will affect the population, so predicting infection paths shows where and how to deploy resources for maximum effectiveness.

The department is now better prepared to fight the next health emergencies, including a more recent outbreak of Dengue fever. Similar analytics approaches are now being used around the world.

Source: Hagström 2014.

customized to their unique situations. Pôle emploi, the social service agency for employment in France, must comply with national legislation while also taking regional and local needs and requirements—such as industrial, agricultural, or service industry zones, seasonal employment, and so on—into account. Managing risk and quality across this complex web of factors is a problem well suited to big data analytics. By permitting highly localized approaches to serving the unemployed, Pôle emploi is using its limited resources more effectively, offering greater flexibility and personalization along the pathway to employment and fast-tracking their clients' re-entry into the workforce.[5]

At every stage of the jobs cycle, big data analytics has the power to address unemployment—from creating new sources of jobs to predicting patches of joblessness and preventing job seekers from falling through the cracks as they seek to rejoin the working population.

OPPORTUNITY: ENHANCING WELL-BEING

When it comes to enhancing well-being, the opportunities before us are immense. The healthcare industry is only scratching the surface of the value that lies within all the available data. Even tiny improvements in terms of percentages can yield big numbers. Consider staggering statistics such as the US$1 trillion of waste in the US healthcare system, nearly 80,000 preventable deaths a year, and another 1.5 million people injured by medications. An analytics project that delivers even a 1 percent improvement can make a huge difference in costs, care, and peoples' lives.[6] And a healthier population frees more people to contribute to driving economic growth.

"One day we'll look back at this time and say, 'We were there when health care really began to change,' said Mark Pitts, Vice President of Enterprise Informatics, Data and Analytics at Highmark Health. 'We were there when we reached that tipping point of technology and our understanding of medicine, the human body and human psychology such that we really transformed the world.' I don't think I'm overstating the opportunity we have to make history and make all of our lives better."[7]

Big data analytics has much to offer in advancing the practice of healthcare toward the triple aim of better health, better care experience, and lower costs. The potential is mind-boggling. Masses of genomic data, clinical trial data, electronic health records, claims data, research study data, and more—terabytes and petabytes of data—can be brought together to reveal important discoveries and support better operational and medical decisions in both private and public healthcare.

For example:

- CBG Health Research, a public-sector research organization in New Zealand, created the HealthStat research tool, which enables primary health organizations to identify trends—such as flu or gastroenteritis outbreaks—in real time. In turn, individual practices can compare their cases with others around the country to improve treatment effectiveness. Gaps in healthcare can be identified and dealt with faster than ever before, keeping more people healthy, active, and contributing to the economy. In addition, the published data add to our collective knowledge and enable better policy decisions, which can benefit marginalized populations.[8] Another example of real-time tracking is shown in Box 3.
- Also in New Zealand, the Ministry of Social Development is using data to design targeted programs for at-risk populations. Two-thirds of the agency's total liability was attributable to those who entered the welfare system under the age of 20—plainly, empowering young people with confidence and life skills reduces the cycle of long-term benefit dependency. Without the insights uncovered by big data analytics, this population might continue to be underserved.[9]

Of course, well-being goes beyond personal health. Individuals may be healthy but belong to societies plagued by disease, corruption, or unrest. The developed nations of the Global North—North America, Europe, and East Asia—have one-quarter of the world's population but control four-fifths of the world's income. Conversely, the Global South—with three-quarters of the world's population—has access to only one-fifth of the world's income.[10] As a result, the nations of the Global South begin at a disadvantage and struggle to compete. Since

the people of the Global South suffer disproportionately from sickness and disease, social progress begins with boosting basic human health before any other ills can be addressed.

Armed with the knowledge produced by big data analytics, organizations can make changes and create programs to ensure that people are not sidelined by poor health. With predictive insights, public-sector programs can ultimately make the concerns of forgotten or underserved populations more visible and address concerns before they become even larger threats to public health. Two examples are presented here:

- After Typhoon Haiyan devastated the Philippines in 2013, analytics helped aid workers prioritize assistance levels and supply distribution. The International Organization for Migration incorporated social media data with geographic and real-time data to better understand the unique needs of each region hit by the typhoon. As a result, they could pinpoint what locations were hardest hit and what supplies were needed most, learning, for example, that hospitals in the badly damaged coastal city of Guiuan were running out of diesel for their backup generators. Big data analytics made relief efforts more accurate and responsive, which in turn made the country more resilient in recovering from the disaster, reduced suffering, and saved numerous lives.[11]
- More than 90 percent of the 33 million people living with HIV/AIDS reside in developing nations with limited access to treatment. The Clinton Health Access Initiative (CHAI) uses analytics to create updated forecasts of demand for medications for HIV/AIDS, malaria, and tuberculosis, which has led to greater availability and the ability to negotiate lower prices on the drugs. CHAI also analyzes global HIV treatment cost drivers, shares forecasts and models with the United Nations Programme on AIDS and the World Health Organization, and develops treatment models in partnership with health ministries around the globe to identify how best to spend limited resources. CHAI's analytical models also show countries how they can handle stepped-up treatment plans without overwhelming existing medical capacity, and simulate how changes in services in one hospital or region might impact others. Looking at these issues in the same way that a Fortune Global 500 company would—by using analytics—is a much more effective way to make health policy decisions, because the answers are rooted in math that is complex as well as objective.[12]

Fortunately, big data analytics can empower public-sector organizations to use their data to "predict to plan" and "predict to prevent" rather than "fail and fix." In other words, rather than patching holes and closing loopholes, big data analytics allows us to proactively identify the conditions that can give rise to fraud, risk, and security breaches—as well as to many other public welfare challenges. If social programs that promote well-being are to be adequately funded, stopping leakage caused by fraud and waste is essential. Box 4 presents an example of how a government is fighting fraud in order to direct money toward programs that will propel society forward.

In summary, big data analytics can transform public-sector services into the proactive and effective programs citizens deserve. Early and proactive interventions have proven to save substantial tax dollars while at the same time improving the quality of life. Ultimately, big data analytics will drive inclusive growth by enabling more people to join in adding value to the economy.

Box 4: Big data analytics to stop leakage: Ensuring funding for social programs

Ensuring well-being encompasses fighting fraud and waste so that much-needed funds are available for social welfare. One very expensive problem is carousel fraud, which is the theft of value-added tax (VAT) by a network of criminals in which fraudsters import goods VAT-free and sell the goods to domestic buyers while charging them VAT. The sellers then disappear without paying VAT to the government.

Belgium is fighting this type of fraud through its Special Tax Inspectorate with an advanced analytics tool that identifies at-risk companies and extracts relevant data from the unwieldy cluster of data gleaned from community transactions, company data, social media data, and so on.

Hybrid detection has allowed Belgium to use multiple complex modeling techniques to practically eradicate this VAT fraud. Belgium's VAT losses came to €1.1 billion in 2002, but by 2012 the country had reduced that figure by 98 percent and continues to use hybrid detection techniques to save billions of euros.[1] This money can now be put to good use, such as driving inclusive growth, instead of being lost to fraud.

Note

1 SAS 2013a.

CONCLUSION

Big data analytics can be used in two powerful ways: to prevent and to create. One is about stopping the undesirable from happening—in this case, people falling through the cracks of society. The other is about fulfilling desires—by providing prosperity for all. Achieving inclusive growth will require both.

Big data analytics is leveling the playing field and creating the environment that allows the three prerequisites for inclusive growth—education, jobs, and well-being—to flourish. In addition to creating vast

Box 5: Key takeaways

- The pillars of inclusive growth are *education, jobs,* and *well-being.*
- Big data analytics provides the ability to process huge volumes of data, and affordable processing capacity enables us to build complex models.
- This new generation of models allows us to ask previously unimaginable questions and answer previously unanswerable ones.
- Big data analytics can level the playing field by providing faster, fact-based foundations on which to make decisions.
- Big data analytics can answer questions and uncover solutions that governments and nongovernmental organizations have not yet envisioned.
- With its ability to reduce costs and improve outcomes, big data can create much-needed jobs and GDP growth.
- Governments should ensure that their citizens have the skills needed to succeed in a data-driven economy.
- Big data can create more developed economies, give voice to the unheard, and improve public welfare.

employment opportunities, big data analytics has the ability to prevent fraud and corruption, stop the spread of disease, reduce waste, collect and analyze the voices of citizens, spot emerging trends, uncover hidden relationships, and identify breakthrough insights to help open up new industries, to name but a few of its abilities.

Anticipating, mitigating, or preventing risks to public health, safety, and security will require new levels of connectivity among knowledge sources and across organizations. By combining traditional data sources with open-source intelligence captured from new sources such as social media and the Internet of Things, public-sector agencies can gain a powerful vantage point to see issues as they are emerging—and to shift the focus from investigating what happened to preventing what is about to happen. As UN Secretary-General Ban Ki-moon remarked at a General Assembly briefing in 2011:

> … at a time when our need for policy agility has never been greater, our traditional 20th century tools for tracking international development cannot keep up. Too often, by the time we have evidence of what is happening at the household level, the harm has already been done. … The irony is that we are actually swimming in an ocean of real-time information.

Inclusive growth is humane growth, in which success for one does not come at the expense of another, and does not require any trade-off with quality of life. By bringing analytics to the masses, we can help emerging economies better capitalize on the influx of new data resources to create insights that propel society forward for all. If we leverage our emerging technology to promote education, jobs, and well-being, we have the recipe for inclusive growth (Box 5).

All of these things are within our grasp. At the very least, there is certainly no longer a technology excuse to let any group go unknown or unheard. We can no longer say "we did not see" or "we did not know" that unfulfilled needs and inequality existed, and we can no longer say that we did not know what to do about it. The power to analyze huge amounts of data means everyone can be taken into account. Everyone can add value. Everyone can be included.

NOTES

1 Hagström 2012.

2 American University, Center for the Global South, http://www1.american.edu/academic.depts/acainst/cgs/about.html.

3 Wright 2010.

4 Manyika et al. 2011.

5 SAS 2014b.

6 Dulin et al. 2013.

7 SAS 2014a.

8 SAS 2014c.

9 SAS 2014e.

10 Steger 2009.

11 SAS 2014d.

12 SAS 2010.

13 Ban Ki-moon 2011.

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