



The Promise of Education Information Systems

How Technology Can Improve School Management and Success

By Nathan Levenson and Ulrich Boser June 2014



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Introduction and summary

Technology has transformed the American economy. ATMs have revolutionized how people bank. The online travel service Orbitz has dramatically changed how we buy airplane tickets. Today, many people use their smartphones to purchase just about anything, from a taxi ride to groceries. But despite all its transformative power, modern technology has done little to change K-12 education. Fifty-year-olds walking through an average school today will recognize much from their days behind a classroom desk. Certainly some things have been updated. There would be a few smart boards. The principal might have an iPad. But on the whole, the scene would look closer to their childhood experience than a futuristic vision of education transformed by technology.

However, this might be changing. Many school district strategic plans and education conferences are aggressively embracing technology to improve teaching and learning. The pages of *Education Week*, the K-12 publication of record, are jam-packed with products, software, and consulting to bring technology to the classroom. In a recent issue, fully 40 pages were devoted to this topic. This so-called “classroom technology” includes blended learning, personalized learning, online courses for students, and professional development for teachers, among many other things.

As districts wrestle with tighter budgets and higher academic standards, a different kind of technology might create game-changing transformation in the education sector: management technology. As the name suggests, classroom technology aims to improve what goes on in the classroom. Management technology, on the other hand, is more indirect: Management technology helps school and district leaders make better decisions, run leaner organizations, and target funds to programs that help kids the most. In short, it helps those in charge of districts and schools manage better.

This report, which looks closely at the use of management technology in education, finds that most school districts fail to use these tools to improve their outcomes. In most cases, they lack both the technology and capacity to analyze their

data and figure out effective and cost-effective solutions to raising achievement and reducing costs. Moreover, as this report argues, a large part of the problem is that the fundamental design and culture of schools today are not in sync with these new approaches.

Finally, this report includes the following policy recommendations for how K-12 education can gain the same benefits from big data that many other sectors have. Before going any further, it must be noted that technology alone is not the solution. Computers, electronic devices, or the Internet alone will not create reform. In too many cases, experts have overpromised on technology and underdelivered. What's more, technology is dependent on people, culture, systems, and processes. In other words, management information systems are only as good as the individuals behind them. That said, technology can provide significant change, and our specific recommendations are highlighted here and examined in greater detail later in the text.

- **States and the federal government need to facilitate the development of actionable management information.** If state and federal reports used common definitions for the data they collect; if they made available easy exports of the data submitted; and if they adopted a uniform chart of accounts for costing—a type of budget dictionary—then the quality of data available to districts would increase without added cost or effort.
- **Districts should make small investments to fund technology-infused analytics.** Setting up a small annual fund of perhaps as little as \$50 per student in districts with up to 5,000 students and dropping to approximately \$20 per student in larger districts, for example, would bankroll a robust management information system and the staff needed to use it.
- **Bring talent, technology, and data to the decision-making table.** District CFOs should be enlisted as strategic partners doing more than just tracking spending decisions and play a much bigger role in ensuring that district leaders know what programs and strategies are effective and cost effective.
- **Link results to key decisions such as continued funding or staff promotion.** The fastest way to raise the importance of management information and its related data analytics is to tie crucial decisions to the outcome of these analyses.

Looking forward, districts will need to change. They face increased expectations, and in many cases, slowly sagging revenues. In light of these pressures, it is clear that better, smarter management technology can go a long way to improving education productivity.

The transformative potential of management technology

It is a given that technology offers the opportunity to change how teachers teach. Yet technology can do so much more—in fact, it can dramatically change the way in which schools are managed. What is needed is a *Moneyball* approach to education management. That book by Michael Lewis, and subsequent Academy Award-nominated movie, focused on how the Major League Baseball's Oakland Athletics used advanced data analysis to make player personnel decisions and build a winning team. A similar management approach in education—one that empowers school leaders to deploy technology in ways that dramatically improve management decisions and in turn productivity—can result in more learning for each dollar spent.

Other sectors and markets can help show the way, and management technology has revolutionized many industries. High-quality information systems have done everything from improving airline performance to transforming heart surgery. In fact, since 1995, the service sector has accounted for 75 percent of the increase in U.S. productivity, and fully 80 percent of the productivity enhancement from information technology has happened in the service sector.¹ People-intensive sectors have benefited most from using information technology. Consider Wal-Mart: The average big-box store customer does not think of Sam Walton—Wal-Mart's founder—as a tech visionary, but he built the largest American company, topping the Fortune 500, in large part through the use of management technology. Wal-Mart's low-price strategy is driven by extensive data mining, supply chain management, and inventory control.

Public schools are not retailers, airlines, or hospitals, of course. Schools do not choose their clients; they cannot be run like businesses. But districts and schools, too, can reap the benefits in higher student achievement and lower costs from a greater, more targeted use of management technology. The good news is these tools are low cost, ready to use, and can drive gains in less than a year. The bad news is that, in many districts, the culture, organizational structure, and career ladder are not well suited to easily embrace and utilize management technology. Hopefully, this will change as districts adapt to the new normal in education of rising demands and declining funds.

Some school districts have started taking advantage of management technology to the benefit of students and taxpayers. Nate Levenson, co-author of this report, worked in one such district: Arlington, Massachusetts. During Levenson's tenure there, he had the staff input by hand the reading scores for more than 2,000 students into a Microsoft Excel spreadsheet application. The process allowed Levenson and his staff to more easily identify highly effective teachers worthy of becoming instructional coaches, pinpoint staff that needed substantial help in teaching reading, and figured out which students needed extra help.

As a result, just a few years later, reading achievement skyrocketed. Off-the-shelf regression software costing just a few thousand dollars helped another district learn that its math intervention efforts were very effective for one type of student, but not for others. Finally, other districts have improved staff productivity by using an online tool that collects and analyzes how special education teachers use their time, leading to new schedules that increased instructional hours, reduced time devoted to meetings, and prioritized service delivery models aligned with best practices. The outcome: scores rose and staffing levels declined.

Why we need productivity reforms

Within education finance there is a simple truth: More education spending has not always promoted stronger student outcomes. As noted in previous Center for American Progress reports, after adjusting for inflation, education spending per student has nearly tripled over the past four decades.² But while some states and districts have spent their additional dollars wisely—and thus shown significant increases in student outcomes—overall student achievement has remained flat in many key areas.³ Moreover, it turns out that many districts could increase outcomes without increasing spending if they used their money more productively, and a 2011 CAP analysis showed that an Arizona school district could see as much as a 36 percent boost in achievement if it increased its efficiency from the lowest level to the highest, all else being equal.⁴

While education finance has simple truths, it is not a simple issue, and when it comes to school finance, equity matters, too—many students do not get the dollars that they deserve. And as a nation, we need to invest more in education, not less. In other words, we are not arguing that states should reduce their education budgets. In fact, in many areas, states and districts should be spending more, not less, on our schools.

Still, the push for productivity increases will continue—partly because revenues are declining. Blame the economy or the housing market or the recent debt crisis, but what is clear is that, in many areas, there are fewer education dollars to go around—so much so that 34 states are spending less per child in 2014 than they were in 2008.⁵ In some states, the lack of revenue has led to layoffs and furloughs. A shrinking budget in Philadelphia meant that in June 2013 the district had to lay off nearly 4,000 members of its staff.⁶ In most areas of the country, this situation is likely to become worse before it gets better, thanks to the fact that a weak housing market means lower property assessments, which in turn means lower education revenues.

At the same time, academic standards and assessments are getting more rigorous. Today, more than 40 states have signed up for the new Common Core State Standards, a state-led initiative to create a set of higher academic standards that

outline what students should know by the end of each grade in reading and math.⁷ These new standards promise to prepare students for either college or a career, and they set a far higher benchmark for student success.

Some educators have begun to implement important management reforms within this space. In an effort to increase outcomes and empower principals to make wiser spending decisions than those previously made by the central office, some districts, such as San Francisco and Baltimore, have moved to a weighted student-funding model in which dollars follow the student, rather than the program. Other states, such as Delaware, have looked to improve their purchasing systems, while Connecticut recently mandated a statewide chart of accounts in order to help jumpstart productivity gains.

Despite these laudable efforts, not nearly enough has been done. In fact, while education productivity appears to be on the decline, efficiency has tracked on an upward trajectory in most other fields. Between 1980 and 2009, for instance, labor productivity jumped nearly 80 percent.⁸ Some of these productivity improvements have been a matter of automation. Factory robots have become standard: one large SUV factory in China will have as many as 30,000 robots on its floors by the end of the year.⁹ This has worked to make manufacturing cheaper and more effective.

Certainly, schools are not factories and robots will not be teaching classes. But what has been just as dramatic—if not more so—when it comes to improving productivity, has been the advent of big data. Experts call this approach “analytics,” and it is a matter of using technology-driven information systems to make better, more targeted decisions. This approach has become ubiquitous for business, and today, for example, every major retailer uses detailed statistics to understand consumers’ behaviors.¹⁰ More than that, the use of large datasets to make better decisions has dramatically improved productivity. A report by the global management consulting firm, McKinsey & Company, estimates that a retailer employing a big data approach has the potential to boost its margins by more than 60 percent.¹¹

Consider the big-box store, Target. The company has one of the most powerful analytics departments in the nation—and the approach has gone a long way to boost the firm’s bottom line by increasing sales and reducing costs. The company is now able to predict—with 87 percent accuracy—that if a consumer buys cocoa butter lotion and at the same time a very big purse that could be used as a diaper bag, then the consumer is pregnant.¹² The firm will then use this data to guide their marketing and sales.

Here again, education is not a retailer, and some of the reasons that the schools and districts cannot create the same productivity gains as companies are structural. If education budgets are overwhelmingly devoted to staff costs, and given the knowledge-based nature of teaching, it can be very hard to replace staff with technology. But at the same time, technology can go a long way to improving the management of our nation's education system, an issue that is examined in the next section.

The state of management technology

Using technology to help run K-12 education is not a new idea. Over the past decade, many school systems have deployed technology outside the classroom. There has been a mini-boom in the use of technology to automate some school functions; for instance, most parents receive school announcements—such as weather-related closings—from robocallers. Notices to parents are emailed, not mailed. Parent conferences are set up through websites, not through notes sent via a child’s backpack. No longer do teachers call in sick at 5 a.m. to speak to a bleary-eyed, half-asleep secretary, who in turn wakes up lots of potential substitute teachers. Instead, much of this is done online.

Automation such as this is good, but it is not transformative. It is the same parent conference or substitute teacher—it is just easier to arrange today. Certainly, a few dollars might be saved, but reducing some secretarial hours will not bend the cost curve. The more transformative use of management technology supports analytics, not automation. Rather than automating the calling of substitute teachers, analytics would allow a district to find the root cause of why teachers fail to come to work, help pinpoint which schools and teachers need intervention, and implement changes to reduce the number of substitutes required on any given morning.

Richer, technology-driven information systems might also be used to calculate the impact on student learning when teachers are out, allowing a district to test multiple strategies for minimizing learning loss when a substitute is needed and eventually raise achievement. According to Duke University researchers, a teacher who is out of the classroom for 10 days during a school year reduces student math achievement by the same amount as would have been experienced by replacing a veteran teacher with a novice one.¹³ Finally, analytics could provide the tools necessary to track if any of the efforts put in place by a district or school to reduce absenteeism and learning loss are actually working as planned.

Managing school buses offers another great example of automation versus analytics. Up until a few years ago, many districts used huge wall maps brimming with pushpins to plan school bus routes. The last decade has seen widespread, but not universal, adoption of bus routing software. In many districts, however, bus routes did not get better—that is to say, there were not shorter rides or fewer buses as a result of the technology. Instead, only the automation part of the equation improved. Parents were more easily notified about pick-up locations and times via email instead of charts and schedules printed in the local paper. Again, good but not transformative. In the end, productivity only really dramatically changes when a district takes the time to actually cull and fully examine the data for insights.

One organization that partners with school districts, the Boston-based District Management Council, or DMC, has helped many districts implement and benefit from utilizing management technology. Specifically, DMC once worked with a Midwestern district with roughly 5,000 students that had long used bus routing software, but mostly to automate route list creation for its drivers. This saved several days of secretarial time each year, but not much else. Focusing on routing analytics, DMC pulled the data from the bus routing software and also conducted paper surveys with each bus driver. It then analyzed the data and organized the findings in an easy-to-digest format, which quickly provided the district with a number of fairly simple fiscal reforms it could choose to implement. The school administration saw, for instance, how some bus routes could be consolidated because actual ridership was much lower than the predicted ridership, and how some runs had more students in the morning than in the afternoon. This combination of data analytics and deep domain knowledge saved the district a significant amount of money, which in turn saved the jobs of five teachers.¹⁴

How management technology tools can improve student learning

The impact of management technology goes well beyond operations; it can transform the most core function of schools—improving student learning. Management technology can help schools do better for less in four ways:

1. Supercharging program evaluation so that districts expand what works and end what does not
2. Determining if key programs and strategies are being implemented as planned
3. Showing the way to greater efficiency to free up funds for new strategic initiatives and maintain current key efforts despite declining resources
4. Accelerating the shift toward a greater focus on results rather than activities, especially when promoting leaders

Now let's take a closer look at these somewhat divergent opportunities and see exactly how better information for school and district leaders drives more learning for students.

Supercharging program evaluation

It is important to underscore that program evaluation is just jargon for knowing what efforts work and what efforts do not. Although not a novel idea, it is nonetheless crucial—particularly when this paradox exists in nearly every school in the country: No one knowingly spends money on an effort that is not helping students. Yet, too many school programs are not effective, a fact that is borne out by chronically flat results.

Management information systems and their application can help end this paradox and build the foundation of improved program evaluation, as it has in other fields. There was a time not long ago, for instance, when some cardiologists were certain that stents were the way to go for most heart patients. Other doctors disagreed; they were certain that bypass surgery was best. Each was adamant in their position and

each saw proof in their daily lives. In the end, it was analytics that settled the argument. Interestingly, the answer was not black and white. For one type of patient, for example, those who are basically in decent health, stents are better and less expensive. However, for some less healthy patients, surgery turns out to be the best option.

Today, school leaders are a lot like the cardiologists of the near past—smart, caring, and certain of their ways. Too often, an education program is strongly championed by a longtime advocate who honestly believes it works well. But like the cardiac surgeons, these school leaders do not really know if the programs they so fervently support are effective or effective just for certain students. Lack of hard data does not imply a lack of debate or review. Budgets have been tight since 2008, but even in flush times, district leaders spent months each year agonizing over how best to spend their budget in order to do the most good for the most students.

The issue is that districts simply do not have the right data or the technology to examine the data that they do have. When that is the case, passion and persuasion tend to carry the day. As a consequence, the math department head defends the math extra-help program, the health director extols the value of nutrition instruction, and the English director explains the need for expanding the writing-help labs. However, take a moment and imagine how the budget conversation might go if everyone seated around the table knew for certain the impact of their programs, such as:

- Students in the extra help math program gained three months of extra learning on average
- On the first day of school, students were given the health curriculum final exam as a “pre-test.” Ninety-five percent of these students scored a 100 percent on the health final exam—even before the topic was even taught in class—indicating that they already knew the material and would learn nothing new this year
- Fifty percent of students assigned to the writing lab cut the class, and English grades failed to improve at all for those who did attend

Under this scenario, it is likely that the math program would be expanded, the health curriculum redesigned, and the writing lab closed or completely overhauled. Interestingly, the data cited above is real. It draws on the experience of one of the authors, Levenson, who spent time from 2005 to 2008 as a superintendent in Arlington, Massachusetts, where data analytics was widely utilized. Many programs there were monitored closely through the extensive use of pre- and post-testing data and combining data from multiple sources, such as attendance,

grades, discipline, and even home life, as shared by guidance counselors. But few districts, however, have this type of program evaluation information that can only be gleaned from robust data analytics.

What is important to keep in mind here is that school districts do not need expensive mainframe computers to figure out what is working. Districts can link student test scores to specific programs and strategies and then deduce what is working using regression analysis or other statistical tools to account for differences in a student's prior knowledge and demographics. IBM sells a powerful desktop analysis package called SPSS for about \$5,000, while a number of other tools such as Stata cost under \$1,000, and open source tools such as "R" are free.

Some districts take program evaluation a step further and link spending to this analysis in order to understand which programs are both successful and cost effective. Continuing with the Arlington example, officials there, after factoring in various achievement and spending data, were able to determine that the successful math program cost \$1,000 per student while the ineffective writing program cost nearly four times more per student. With that sort of cost analysis, the district decided not to tweak the writing lab but instead scraped it and recreated one modeled on the more successful and cost-effective math program. These are not hard decisions once the analysis is on the table. This is the power of using analytics for program evaluation.

Interestingly, Microsoft Excel software was powerful enough to provide Arlington with these insights. The technology tools are low cost and widely available. The skills to use them, though, may not be, but more on that later.

Data provides actionable details

Data provides information that managers need. Data can answer the crucial question: If a program is successful and cost effective, is it working for all students or just some? This type of parsing of data is leading a revolution in medicine and it might do the same in education. Just as the National Institutes of Health, or NIH, learned that effective cardiac treatment for patients with both diabetes and heart disease should be different from the treatment provided if only one of those conditions exists, likewise, K-12 program effectiveness can also be this finely detailed.¹⁵

It turns out that the same data used to analyze programs can also be used identify student traits linked to program effectiveness. This is the sort of information that can supercharge the push to personalize instruction, targeting interventions to specific student needs. In the Arlington math example, the district used low-cost analytical tools to discover that their effective math intervention actually was only effective for students who struggled with math concepts, but not for students who also had reading comprehension difficulties. These students needed something different.

A number of districts have also found that dropout prevention programs, for example, must be finely targeted to be effective. Some students need a small, safer learning environment; others need to be pushed harder, while still others may need intensive reading instruction. Few districts today analyze their dropout prevention efforts to determine which types of students their programs are actually helping. But armed with this information, the programs would become more personalized and effective.

The role of time

Costs associated with staff account for around 80 percent to 85 percent of most district budgets. Put more simply, districts spend almost all of their money on people. This means that managing staffing is key to increasing productivity, and districts that take a technology-driven information systems approach can make big productivity gains. DMC produced a tool called “dmPlanning,” which can provide some of the needed information to determine special education staffing levels based on student Individualized Education Programs, or IEPs, and district-set guidelines. Other companies, such as Caselite, have produced software for building cost-effective schedules for speech therapists, while Rediker Software, Inc. has tools for determining staffing requirements in high schools.

By collecting data from hundreds or thousands of teachers about how they spend their day, district leaders can gain a deep understanding of what goes on in every classroom and gauge how faithfully key initiatives are implemented. For example, Arlington officials were disappointed that their new hands-on elementary math program had not led to higher scores, especially in the areas of math concepts, which was, in theory, the strength of the new program. Like many districts, the head of Arlington’s math department had visited classes and talked to staff—all

of whom claimed to have followed the new curriculum. Before jettisoning the program, officials decided to collect very detailed data from teachers using online surveys. What they discovered was eye opening. More than two-thirds of the teachers were not spending the needed time on the hands-on portion of the instruction, favoring the white-board style of the past. Moreover, one-third of staff had mostly stuck to the old program completely. The district had no way of knowing if the new math program was effective, because as it turns out, it had not been given a true test.

The hands-on math example highlights a major challenge for managing a complex system such as a school district. The impact of individual teachers is enormous, dwarfing most system-level variables, but knowing what goes on in hundreds or thousands of classrooms, 30 hours a week, 36 weeks a year, is nearly impossible to accomplish without technology. Not everything a teacher does can be easily captured, and some key variables, such teacher expectations, a caring attitude, or content expertise, will not be measured through a management information system. But many curriculum implementation issues and pedagogical practices can be deeply understood through technology. Asking teachers to record onto an iPad or web-based tool what they do for a week, coupled with a strong analytical engine, can provide enormous insight for school and district leaders.

One such tool built by DMC asks teachers to log into an online calendar, where they are asked to enter details about their day. An elementary school teacher, for instance, might record that from 8 a.m. to 8:30 a.m. she conducted a whole-class read-aloud session, followed from 8:30 a.m. to 8:50 a.m. by a session where students worked in small groups on a vocabulary worksheet. A special education teacher might report that his day started with a two-hour IEP meeting followed by 45 minutes of co-teaching math for four students with IEPs. This large data set, sometimes more than 1 million pieces of information, describing a single week, is then analyzed.

In other words, using technology to track what staff do each day is another way to make better decisions. This is routine in the private sector. Take, for instance, the work of management expert Ben Waber.¹⁶ He will outfit employees in for-profit firms with a type of digital badge that tracks the people that an employee talks to over the course of a day. In his research, Waber has found, for instance, that people who sit at larger lunch tables have more colleagues, and so they are more effective employees. They were also better able to handle difficult events.¹⁷

When it comes to education, we see different but similarly surprising results. One large district that partnered with DMC, for instance, hired more than 40 social workers to provide extensive counseling and support to their students. After five years, the central office seemed pleased to have addressed this real need, but they wondered why principals often clamored for more counseling help. Through the use of a web-based schedule analysis system, they learned that the social workers had inadvertently become regulars at meeting after meeting, which consumed them with paperwork and prevented them from working with students. In fact, on average, they counseled children less than three hours a week. The district could, for example, reduce staffing by half, and still increase counseling for students by fivefold if they cut down on the meetings and paperwork.

Management information systems can confirm good news as well. During a budget debate, some leaders in this same large district felt that the instructional coaches spent too much time in their offices, and that their numbers should be cut back. Rather than just debate the issue, officials were armed with hard data indicating very productive coaches.

The role of benchmarking

One common thread across successful, highly productive organizations that use technology to improve management decision making is the ability to benchmark. Benchmarking is a tool for comparing how one organization does something compared to others. In many industries, it has spurred innovation. In the 1980s, for example, American silicon chip manufacturers thought they were awfully good at making computer chips. Nearly 99 percent of all chips manufactured passed final inspection. Only 1 in 100 needed to be scrapped. This level of success bred some complacency. When the technology firms Intel and IBM began benchmarking their results to others, especially to tech manufacturers in Japan, they learned that some companies rejected just 1 chip in 1 million, not 100—all at a lower cost per chip. This comparison created the urgency and the belief that vastly better ways of making chips were possible. In relatively short order, Intel and IBM adopted these better practices.

School districts have used benchmarking to identify opportunities for greater efficiency and provide the political backing to turn these opportunities into reality. Budget battles arguing for or against more nurses, custodians, assistant principals, or special education teachers, to name just a few examples, are often heated, gut-wrenching, and too often short on hard facts. Phrases such as “we need more”

and “we have enough” are hurled across the table, and quickly the conversation becomes a referendum on the value of the position itself rather than the level of need. Benchmarking staffing levels against like communities and applying basic analytical procedures to adjust for differences in enrollment, students with special needs, and other mitigating factors, can keep these discussions thoughtful and guide spending without all the unnecessary emotion.

At CAP, we have built a tool that allows districts to benchmark themselves against other districts in their state. We have called the project, “Education ROI,” and using statistical tools, we created specific productivity evaluations for more than 9,000 school districts across the United States. With the ratings, we also released an interactive that makes it easy for a district to compare their results against other districts, and we plan to update the data later this summer.¹⁸

Benchmarking can answer many hard-to-know K-12 management questions. How many students can a reading teacher teach? How many teachers can an instructional coach coach? How much meeting time is reasonable for a special education teacher? Smart people will disagree on what is best, but past practice and cultural norms often color their opinions. DMC came across one district that had concluded that its current practice of requiring speech and language therapists to have two days of meetings, along with the requisite paperwork, for each day of instruction for children was “reasonable.”

Nearly every official in the aforementioned district believed that there was not a minute being wasted during the school day, and if more services to students were wanted and needed, then more staff was required. Imagine, then, the surprise when officials learned that a nearly identical district had the reverse situation—two days of instruction for children for each day of meetings. The more efficient district in the above scenario also had good results along with the added benefit of happier parents and far fewer staff. Without comparative data analytics, past practice too often seems best and immutable. Buoyed by knowing what is possible, the first district is now methodically redesigning schedules and reducing staff, but not services to students.

Data analytics, and its reliance on hard data to guide management decisions, creates an ancillary benefit: a focus on hard data, especially student achievement. Districts that embrace data analytics, program evaluation, measuring cost-effectiveness, and benchmarking, typically create a cultural shift away from managing activities, such as implementing a new reading program, and toward valuing results, such having all third graders reading on grade level.

A growing number of districts are taking a step in this direction. Many now have dashboards or balanced scorecards to report and focus attention on results. The handful of districts that have seen big gains in closing the achievement gap between poor students and their financially better-off peers—districts such as Charlotte-Mecklenburg in North Carolina—have been very public with their achievement data, creating a hyper-focus on results. With student-leaning results visible front and center, promotions in these districts go to leaders who raise achievement, while ineffective teachers and leaders are either helped to improve or exited.

Robust management information systems, however, are needed to feed dashboards. As districts try to monitor their strategic plans, they find themselves in a vicious cycle. Districts lack the key data worth monitoring, and as a consequence, they write strategic plans that prioritize activities and not results. In a review of nearly 400 strategic plans from a wide cross section of districts, for instance, fully 65 percent of the strategic plans lacked any outcome measures.¹⁹ However, with better information systems, this can change.

If “so good,” why not “so common”?

Management technology can raise achievement, lower costs, and make hard decisions easier. It is a powerful tool, but not a very common one. Often, districts think that management technology sounds great, but it is just too expensive. However, the opposite is true. Very small investments can yield big savings and even bigger student gains. The payback is often seen in less than a year. What’s more, the upfront costs are small when compared to the typical array of new initiatives and historic programs hoping to improve student outcomes. So why then is something so beneficial so little used?

Three forces discourage the wide adoption of management information technology in school districts:

1. A culture that values sage “professional judgment,” which often accepts the opinions of experienced leaders as fact
2. Some educators and administrators lack the skills to collect and analyze data
3. An organizational structure that often keeps data analysts away from the decision-making table

These three factors combine to minimize the use of management information systems. Collectively, they create a world where key information is not readily available to decision makers as they meet, which in turn places too great a value on sage professional judgment, thereby reinforcing the cycle.

The quality and availability of data in many districts also prohibits meaningful analytics, but this is more a symptom than a cause. For example, in the majority of districts, which teachers teach which programs is not centrally tracked. In fact, many districts cannot produce accurate listings of the all the staff they employ because grant-funded staff, such as special education, Title I, and others, are housed separately and subcontracted staff are not tracked at all. Often human-resource departments and payroll have very different rosters of staff because they have separate databases that are updated on a different cycle by different departments using different information sources.

This is not a sign of inept managers but instead points to a system that is poorly designed for deep analytics. Paradoxically, the data are not all that clean, that is to say accurate and current, because few people are using it in a way that requires clean data. When sage professional judgment is considered a reasonable means of making decisions, there is no pressure to collect and store the type of detailed information need for deep analytics.

But in recent years, mountains of better data have become available. Many states now track achievement of individual students and measure a student's growth even if he or she changes schools or districts. At the same time, common formative assessments, end of chapter tests, and nationally normed reading assessments, measure critical skills as early as kindergarten. A number of districts have taken advantage of this treasure trove of information.

Indeed, many districts have a culture that values the guidance that analytics can yield. But yet they continue to rely on sage professional judgment because these districts lack the skill needed to convert the data into actionable insights. It is not that districts lack technology but rather that they lack the staff with the key skill sets required to use the technology. School districts need to know that big data can run on small computers and inexpensive software. Much of this work can be done with Microsoft Excel, and even specialized statistical analysis software that can run on simple laptops can be purchased for less than a few thousand dollars. So essentially the only missing elements in many districts to putting management

technology to work is sufficiently skilled staff—individuals with doctorates in statistics and research design, MBAs with cost accounting backgrounds, or others with an aptitude for and training in regression analysis and financial measurement. The good news is this is a problem that is easy to solve because these skills are readily available in the marketplace and needed in small doses.

The promise of new talent and programs

When it comes to technology and analytics, the tide is starting to turn. More districts are hiring staff with deep analytical skills and conducting detailed program and staffing cost-benefit analysis. The Strategic Data Project, part of the Center for Education Policy Research at Harvard University, has trained more than 100 data fellows since 2008 to bring this skill set into public schools.²⁰ The fellows start with deep analytical expertise often in the form of a Ph.D. in research methods or expertise in advanced mathematics. They then build upon their knowledge, skills, and talents with sector-specific training and field experiences.

Some districts, however, are in the fortunate position of not needing to look outside for talent. Instead, they just need to look at their current pool of talent a bit differently. There is no more glaring example of a missed opportunity than the common practice of districts failing to invite the district CFO to strategic planning sessions. These key individuals are too often missing from the table when new programs are being considered. A recent survey of nearly 400 school finance administrators reveals significant untapped potential expertise. According to the recent survey, 70 percent view themselves as strategic partners willing and able to be part of all key investment decisions and cuts. But 46 percent of these same CFOs report that other district leaders see their role confined to mostly the tracking of spending or finding funding after decisions have been made.²¹ To take full advantage of in-house skills, districts will need to invest some time in bringing their business officers up to speed on best practices in teaching and learning: 43 percent of CFOs responding to the survey indicated that a lack of depth of knowledge of academic issues and impacts was challenging or very challenging.

Recommendations

Each school district has its own unique culture, and certainly context matters greatly, but the ideas presented below will likely help many districts gain the benefits of better management information systems.

States and the federal government need to facilitate the development of actionable management information

Ultimately, school boards approve district budgets and they weigh the pros and cons of tough staffing and program decisions. They should expect and require deep data analytics to accompany most recommendations from senior district leaders. Since most of the data schools collect today is done at the request of state and federal agencies, these organizations can play a big role in easing—or complicating—the creation of actionable data sets. If state and federal reports used common definitions of the data they collect; if they made available easy exports of the data submitted; and if they adopted uniform chart of accounts for costing; then the quality of data available to districts would increase without added cost or effort.

Moreover, making the data collected available, with appropriate privacy protections, would also enhance benchmarking practices. Today, since the results shared do not factor in key differences, such as student demographics, benchmarking is a fairly difficult task. However, the Massachusetts Department of Elementary and Secondary Education has made some significant strides in this area. They report student achievement growth adjusted for prior achievement, making comparisons of teacher effectiveness, for example, much more relevant and actionable.

The federal government can also help, and as Harvard education studies professor Martin West notes, Washington should ensure that data systems funded with federal monies can connect programmatic data and fiscal data so that leaders can examine the productivity of school reform efforts.²²

Districts should make small investments to fund technology-infused analytics

School leaders cannot implement productivity-improving technology, such as robust management information systems, without the needed tools and talent. Small investments in technology can yield big gains for student achievement and the budget, but in tight times these types of expenditures can be hard to justify no matter how beneficial they may be. Politically, it can be hard to hire a central office data analyst, while at the same time cutting classroom teachers—even if such a new hire could ultimately save many teaching positions going forward.

Some districts, and many private-sector firms, set aside a fixed amount of money each year for smart but discretionary expenses such as maintenance or capital improvements to shield them from the budget debate. A small annual fund—amounting to no more than perhaps \$50 a year per student in a district of 5,000 students, and dropping to roughly \$20 per year per student in a larger districts—could be used to bankroll a robust management information system and the staff needed to use it.

Devoting just one-quarter of 1 percent of spending could fund a gold-standard analytics effort in many districts, which in turn would ensure that the remaining 99.75 percent of spending is doing the most good.

Bring talent, technology, and data to the decision-making table

Private sector organizations expect their CFOs to have deep domain knowledge and be critical strategic partners. These individuals are expected to identify opportunities to improve outcomes and efficiencies, and they are at the table for all strategic discussions. This is not often the case in education. Indeed, most district CFOs are viewed as people charged with primarily tracking spending, functioning more like an accountant rather than guiding spending decisions. Yet with some time and training along with shifts in district culture, CFOs could play a much bigger role in ensuring that district leaders know what is successful and cost effective.

At the same time, decision makers should insist on having the key data they need to make informed decisions. This will only be possible if management technology is embedded deeply into the fabric of daily district operations. Technology tools and specific analytical software are needed to track, on a student-by-student basis, which teachers and programs create above-average learning; to implement

budgeting systems that easily calculate per-pupil costs for specific programs and interventions; and to provide the ability to separate high student achievement based on a student's wealthy parents from his or her participation in effective teaching or programs.

Before staffing decisions are made, computerized schedules should maximize teacher time with students, and real-time analysis of how staff use their time should guide such decisions. Furthermore, no new program should be launched without first having the tools to track its impact, cost, and quality of implementation.

Link results to key decisions such
as continued funding or staff promotion

Perhaps the fastest way to raise the importance of management information and its related data analytics is to tie key decisions to the outcome of these analyses. For instance, rather than continuing a math program year after year simply because the director of the math department and many teachers believe its effective, requiring hard performance data as a condition of future funding would create the incentives necessary to collect, track, and make meaning of the math achievement data.

If promotions are based, in part, on raising student achievement in cost-effective ways, principal and central office advancement becomes intimately linked to the district's management information system. When high-stakes decisions are based on student growth, unit costs, and efficient staffing, then there will be pressure for accurate, timely, and relevant management information of this type and a virtuous cycle begins.

Conclusion

The education field paradoxically manages to continually change while, at the same time, stay tied to old practices and ways of doing business. This must change.

A host of factors will deeply change the nature of education, including lower tax bases, higher academic expectations, and changing demographics. One way for schools and districts to do more with less is through better information management systems. Only by knowing what is successful and cost effective will schools become more successful and cost effective. This is not a tautology: Only by knowing what exactly staff do in their classrooms can we know if their time is well spent, if new programs are being implemented as planned, and which practices are worth sharing because they lead to above-average gains. District leaders make the best decisions they can, given the information they have. With better information, they will make better decisions to the benefit of students and taxpayers.

About the authors

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Endnotes

- 1 Barry P. Bosworth and Jack E. Triplett, "Services Productivity in the United States: Griliches's Services Volume Revisited." In Ernst R. Berndt and Charles R. Hulten, eds., *Hard-to-Measure Goods and Services: Essays in Honor of Zvi Griliches*, vol. 1 (Chicago: University of Chicago Press, 2007), available at <http://www.nber.org/chapters/c0885.pdf>.
- 2 Ulrich Boser, "Return on Educational Investment: A District-by-District Evaluation of U.S. Educational Productivity" (Washington: Center for American Progress, 2011), available at <http://www.americanprogress.org/issues/education/report/2011/01/19/8902/return-on-educational-investment/>.
- 3 Bobby D. Rampey, Gloria S. Dion, and Patricia L. Donahue, "NAEP 2008: Trends in Academic Progress, NCES 2009-479" (Washington: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, 2009), available at <http://nces.ed.gov/nationsreportcard/pdf/main2008/2009479.pdf>.
- 4 Boser, "Return on Educational Investment."
- 5 Michael Leachman and Chris Mai, "Most States Funding Schools Less Than Before the Recession" (Washington: Center on Budget and Policy Priorities, 2013).
- 6 WPVI-TV Philadelphia, "3,783 Being Laid Off From Philadelphia School District," June 7, 2013, available at <http://abclocal.go.com/wpvi/story?section=news/local&id=9130566>.
- 7 Common Core State Standards Initiative, "About the Standards," available at <http://www.corestandards.org/about-the-standards/> (last accessed June 2014).
- 8 Frank Levy and Tom Kochan, "Addressing the Problem of Stagnant Wages," *Comparative Economic Studies* 54 (4) (2012), available at http://www.employmentpolicy.org/sites/www.employmentpolicy.org/files/field-content-file/pdf/Mike%20Lillich/EPRN%20WagesMay%2020%20-%20FL%20Edits_0.pdf.
- 9 Dexter Roberts, "The March of Robots Into Chinese Factories," *Bloomberg Businessweek*, November 29, 2012, available at <http://www.businessweek.com/articles/2012-11-29/the-march-of-robots-into-chinese-factories>.
- 10 Charles Duhigg, *The Power of Habit: Why We Do What We Do in Life and Business* (New York: Random House, 2012).
- 11 James Manyika and others, "Big data: The next frontier for innovation, competition, and productivity" (New York City: McKinsey & Company, 2011), available at http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation.
- 12 Duhigg, *The Power of Habit*.
- 13 Charles T. Clotfelter, Helen F. Ladd, and Jacob L. Vigdor, "Are Teacher Absences Worth Worrying About in the U.S.?" Working Paper w13648 (National Bureau of Economic Research, 2007), available at <http://ssrn.com/abstract=1037172>.
- 14 Please note that one of the authors of this report, Nathan Levenson, is the senior managing director of the District Management Council.
- 15 Stephanie Novak and Brooke Workneh, "NIH reports bypass surgery superior to less invasive stent procedure," *Medill Reports*, November 14, 2012, available at <http://news.medill.northwestern.edu/chicago/news.aspx?id=210813>.
- 16 Ben Waber, *People Analytics: How Social Sensing Technology Will Transform Business and What It Tells Us about the Future of Work* (Upper Saddle River, NJ: FT Press, 2013).
- 17 *Ibid.*
- 18 To access the interactive, see Center for American Progress, "Interactive Map: Return on Educational Investment," January 19, 2011, available at <http://americanprogress.org/issues/education/news/2011/01/19/8877/interactive-map-return-on-educational-investment/>.
- 19 The District Management Council, "Creating a Strategy: Alignment & Focus on Performance" (2011), available at http://www.dmcouncil.org/index.php/component/dms/view_document/102-creating-a-strategy-alignment-focus-on-performance?Itemid=0.
- 20 Strategic Data Project, "Overview," available at <http://www.gse.harvard.edu/sdp/about/> (last accessed June 2014).
- 21 Unpublished findings.
- 22 Martin West, "The Federal Role in Improving Educational Productivity: How Congress Can Reauthorize the Elementary and Secondary Education Act to Address Costs as well as Effectiveness" (Washington: Center for American Progress and American Enterprise Institute, 2012), available at http://www.aei.org/files/2012/03/05/-the-federal-role-in-improving-educational-productivity_171443905424.pdf.

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