

Schools and Software: What's Now and What's Next



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EXECUTIVE SUMMARY

Do we know what software tools school systems actually want? Demand-side analyses typically reflect the loudest voices in the market that companies are eager to please—in the case of education technology, the largest urban districts with the largest technology budgets. But half of the nation’s 48 million public school students attend approximately 3,700 small- to medium-sized school systems.* These school systems face some of the same struggles as large districts in delivering high-quality blended learning and running effective and efficient central offices. They also face distinct challenges in the marketplace, as they find themselves unable to afford large enterprise solutions or powerless to push suppliers to customize to their particular needs.

To answer the question of what these school systems want, we surveyed education leaders in 30 small- to medium-sized public school systems that each serve between approximately 2,500 to 25,000 students to shed light on developing education technology trends and desires. Many of these 30 school systems are operating at the leading edge of technology integration. As such, this sample does not reflect the status quo across all systems of a similar size, but rather points to where we think such systems are headed as technology inevitably improves and becomes more affordable and accessible.

K–12 software has long been a source of aggravation and disappointment. But many of the school systems we surveyed believe software can be used strategically to improve student achievement and overall organizational performance. More and more, school systems are hiring technology for sophisticated jobs like blending learning environments, supporting data-driven practices, and recruiting and supporting teachers.

In the interviews with leaders in each of these 30 school systems, we heard about the following trends in technology usage and demand among small- to medium-sized school systems:

ACADEMIC SOFTWARE

- **Schools and students suffer when software vendors don’t cooperate.** School systems want to use a suite of online-learning programs, but vendors are focused on developing their own proprietary products. This leaves school systems with the challenge of creating compelling and integrated student experiences from a patchwork of programs that don’t talk to one another.

* Patrick Keaton, “Local Numbers and Types of Public Elementary and Secondary Local Education Agencies From the Common Core of Data: School Year 2010–11,” National Center for Education Statistics, November 2012, <http://nces.ed.gov/pubs2012/2012326rev.pdf>.

- **Can learning software delight both students and teachers?** Schools are clamoring for online-learning programs that let teachers choose what students work on *and* automatically adjusts to student needs, even though most online-learning programs do only one of these things well. Significant ambivalence remains over how much control teachers and students actually want or need.
- **Building trust with educators is essential.** The inability to extract meaningful data from online-learning programs can negatively impact perceptions of product quality and limit educators’ trust in these programs. Information about the effectiveness of online-learning programs should also be communicated with context around how they are used in classrooms. Efficacy studies should shift their focus from “what works” to “what works, for which students, in what circumstances.”
- **The next generation of effective and intuitive online learning.** Future opportunities exist for education technology companies to create products with a better mix of student and teacher control, natively Common Core-aligned content, and more intuitive design that requires less product training.

BUSINESS AND OPERATIONS SOFTWARE

- **Schools get more attention than the back office.** School systems generally appear more focused on academic- and school-related software than business and operations solutions. The school systems surveyed also were more likely to use software mandated by other agencies for back-office functions.
- **The (small) customer may be right ... but will not drive supply.** Early-stage and thinly resourced software companies cannot afford to heavily customize their products for smaller customers, and small- to medium-sized school systems have limited resources to pay for such changes. Therefore, these school systems often face a tradeoff between comprehensive, legacy enterprise solutions that can be difficult to use, disparate point solutions that do not talk to one another, or large enterprise applications that are designed and priced for much larger entities.
- **Better solutions created by schools, for schools?** A few charter management organizations (CMOs) are leading the charge to develop more integrated solutions for human resources, finance, and operations through in-house development or in partnership with existing vendors. Successful software vendors outside of the K–12 market, such as Workday or Zenefits, might also contemplate serving schools down the line.

Public school systems' human resources and finance systems are so complex, however, that such vendors may shy away from the K–12 space.

SOFTWARE AND DATA INTEGRATION

- **Message to K–12 software vendors: There is no “I” in “team.** Many K–12 software programs offer limited value on a stand-alone basis and must be integrated with other software, typically from different vendors, to realize their full potential. Software integration challenges are primarily “cooperation” issues, not technical issues per se. Thus, school systems and investors should demand cooperation at the outset.
- **A few software products to rule them all.** Student information systems (SIS), human resources information systems (HRIS), and domain management or identity management systems (e.g., Active Directory, Google Apps Administrator) are “sources of truth” because of the critical data that they collect. They sit at the center of most software integrations. These “hub” platforms create a highly centralized architecture around which nearly all other programs must be integrated—automatically or manually. Such dominant platforms wield strong influence and school systems can become locked into these vendors as a result.
- **Room for one more?** New hubs may emerge that upset the current balance of power in software architectures. For example, the school systems surveyed are adopting Google Apps for Education either alongside or in place of Active Directory and Microsoft Exchange, which have historically been the default solution. New “hub” categories may be created altogether as well. For example, several school systems are exploring talent management solutions (e.g., software that facilitates teacher evaluation, coaching, and professional development) that, in the future, could potentially sit alongside the SIS, HRIS, and identity management products as a fourth major platform.
- **Manual integration costs schools.** Manual integration across various software platforms and programs causes major headaches and inefficiencies for school systems. Automated provisioning of software licenses and single sign-on technologies are slowly addressing some of these pain points. Neither of these, however, helps to integrate data coming out of disparate software systems. As a result, some school systems are implementing data marts or data warehouses, and a number of CMOs are actually attempting to build data solutions in-house.

- **School systems will pay for help with their data.** Education technology companies that help school systems analyze and manage data—like BrightBytes, Clever, Education Elements, LearnSprout, MasteryConnect, and Schoolzilla—are drawing significant interest from both customers and investors, which potentially signals healthy growth ahead for this segment of the education technology market.

IT MANAGEMENT AND HARDWARE

- **IT departments are becoming more strategic and valued by their school systems.** In school systems pursuing blended learning, chief information officers and other key IT leaders increasingly possess hybrid backgrounds that combine deep technology and instructional expertise. IT departments are becoming less siloed within school system organizations and are playing a more active and strategic role across the enterprise, especially with respect to teaching and learning.
- **Next stop, the cloud.** Small- to medium-sized school systems have shifted or are in the process of shifting to cloud-based software to support instruction and operations. This stands to make IT management and workflow more efficient, but presents new hurdles in terms of data privacy and challenges the existing paradigm of central control over IT systems.
- **Wanted: Minimum, viable devices.** School systems pursuing blended learning are looking for affordable, manageable, and reliable devices to support their instructional models and online assessments. Chromebooks appear to be gaining traction along these dimensions, but remain limited by the inability to support software that must be downloaded, such as early versions of assessment systems like Northwest Evaluation Association's (NWEA) Measures of Academic Progress (MAP).
- **BYOD is the future.** As more students and staff own consumer mobile and computing devices, school systems will be more likely to move toward device agnostic and bring your own device (BYOD) environments. This in turn will require that schools implement new networking, device management, and security solutions.

By highlighting the particular trends and burgeoning demand across these school systems, we hope that investors and vendors will find new opportunities to target neglected pockets of the market, and small- to medium-sized school systems will work together to spur products that are better suited to systems of their size.

Schools and software

What's now and what's next

SHIFTING DEMANDS: HOW SMALL- TO MEDIUM-SIZED SCHOOL SYSTEMS ARE CONSUMING EDUCATION TECHNOLOGY

In prior decades, technology in schools and central offices supported compliance with state and federal reporting requirements or provided basic student information storage. Today, an increasing number of schools are hiring technology for far more sophisticated jobs: blending learning environments, supporting data-driven practice, and running their organizations more efficiently.¹

Besides the stunning technological progress we have witnessed in the last decade, several catalysts are driving school systems to reconsider their technology strategies. First, schools are looking for more streamlined and automated workflow solutions to expedite processes such as registering students for school, managing talent pipelines, reporting academic data, and communicating with families. Second, school systems are upgrading their broadband and hardware in order to implement the Common Core State Standards (CCSS) assessments—which use computer-based testing on an unprecedented scale.² Third, school systems are increasing their use of cloud-based software, which is enabling IT departments to shift their focus from managing on-site data centers to supporting teaching, learning, and operations. Finally, school systems are integrating technology into new models of instruction through blended learning—the delivery of online learning inside brick-and-mortar schools. Nationally, an estimated 75 percent of school districts offer some online or blended options.³

The education technology market supporting these shifts is large and growing. The Software & Information Industry Association (SIIA) projects that the size of the overall PreK–12 market in 2013 for non-hardware education technology products and services reached an all-time high of \$7.97 billion.⁴ There is no arguing that a wealth of tools is available to school systems trying to meet the host of emerging 21st-century needs.

Within this shifting and expanding marketplace, few have analyzed the alignment—or lack thereof—between the supply of education technology products and the particular demands of what we will refer to as “small- to medium-sized school systems,” which are school systems that

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each serve approximately 2,500 to 25,000 students. Although these school systems may not always dominate national headlines, they are significant in the landscape of U.S. education. Fifty percent of the nation's 48 million public school students attend approximately 3,700 small- to medium-sized school systems.⁵ Understanding these school systems' particular needs provides an important lens on how the education technology market does or does not cater to school systems of this size.

We interviewed 30 small- to medium-sized public school systems—both districts and charter management organizations (CMOs)—across the United States to understand how these school systems are shifting to using software to support both academics and operations. Our interview subjects included multiple members of school systems' leadership, instructional, and IT teams in order to identify these school systems' successes and pain points and to look around the corner to anticipate their future technology needs. *Appendix A* provides a series of “software maps” illustrating the range of software tools that a subset of these school systems uses currently.

These 30 school systems, listed in *Table 1*, represent diversity across geography, size, community, and student demographics. Rather than surveying a random sample of school systems of this size, however, the sample leans toward early adopters of technology, both in terms of school operations and instructional software. Operating at the frontier of technology implementation, these school systems' stories can hopefully lend key insights for similarly sized school systems that are just now dipping their toes in education technology waters.

Besides the size of their student bodies and budgets, what sets small- to medium-sized school systems apart? As customers, these school systems often make stark tradeoffs in implementing solutions compared to their larger counterparts. “We face two choices for our size organization. I either way overpay for something, or I use Excel,” said Shaun Bryant of DSST Public Schools, a CMO in Colorado. In other words, school systems often trade off between very low-tech options, like tracking student progress on spreadsheets and expensive, relative to their budgets, higher-tech products, with few options in between.

Moreover, even when smaller school systems have the budget to pay for technology solutions, they find that the search costs of finding the right products remain high. As Superintendent Jeff Baier of Los Altos School District in California observed, education technology products resist clear categories. “The tech scene is a bit like the wild west right now,” he said. “All of the

Table 1. Small- to medium-sized school systems surveyed

SCHOOL SYSTEM	TYPE	AREA	HEADQUARTERS	GRADES SERVED	NUMBER OF STUDENTS SERVED	% FREE OR REDUCED-PRICE LUNCH	% WHITE	% BLACK OR AFRICAN AMERICAN	% HISPANIC OR LATINO
Achievement First	CMO	Urban	New York, NY	K-12	8,168	85%	1%	74%	24%
Albemarle County Schools	District	Suburban	Charlottesville, VA	K-12	13,263	28%	70%	11%	9%
Alliance for College Ready Public Schools	CMO	Urban	Los Angeles, CA	6-12	10,000	93%	2%	8%	90%
Aspire Public Schools	CMO	Urban	Alameda, CA	K-12	13,630	67%	7%	16%	66%
Distinctive Schools	CMO	Urban	Chicago, IL	K-8	2,497	87%	5%	33%	56%
DSST Public Schools	CMO	Urban/ Mixed	Denver, CO	6-12	2,724	64%	23%	19%	48%
Education Achievement Authority	District	Urban	Detroit, MI	K-12	8,682	83%	1%	95%	3%
Educational Enterprises, Inc.	CMO	Urban/ Mixed	Milwaukee, WI	K-8	988	53%	30%	21%	41%
FirstLine Schools	CMO	Urban	New Orleans, LA	K-12	2,802	95%	1%	95%	3%
Galt Joint Union Elementary School District	District	Suburban	Galt, CA	K-8	3,792	65%	36%	2%	56%
Grand Rapids Public Schools	District	Suburban	Grand Rapids, MI	K-12	17,000	83%	20%	36%	36%
Green Dot Public Schools	CMO	Urban	Los Angeles, CA	6-12	10,000	96%	1%	20%	79%
Highline Public Schools	District	Urban/ Mixed	Burien, WA	K-12	18,378	70%	25%	11%	37%
IDEA Public Schools	CMO	Rural	Weslaco, TX	K-12	16,742	82%	2%	2%	94%
KIPP LA Schools	CMO	Urban	Los Angeles, CA	K-8	3,056	89%	0%	31%	68%
LA Recovery School District	District	Urban	Statewide, LA	K-12	33,523	86%	2%	95%	3%
Lebanon School District	District	Urban	Lebanon, PA	K-12	4,819	79%	36%	6%	55%
Lindsay Unified School District	District	Rural	Lindsay, CA	K-12	4,130	80%	6%	0%	91%
Los Altos School District	District	Suburban	Los Altos, CA	K-8	4,468	5%	50%	0%	7%
Milpitas Unified School District	District	Urban/ Mixed	Milpitas, CA	K-12	10,033	39%	7%	3%	22%

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Minnetonka Public Schools	District	Suburban	Minnetonka, MN	K-12	9,739	7%	88%	3%	3%
Noble Network of Charter Schools	CMO	Urban	Chicago, IL	6-12	9,069	89%	1%	51%	43%
Quakertown Community School District	District	Suburban	Quakertown, PA	K-12	5,322	27%	87%	2%	6%
Reynoldsburg City Schools	District	Suburban	Reynoldsburg, OH	K-12	6,204	46%	50%	37%	5%
Riverside Unified School District	District	Urban/ Mixed	Riverside, CA	K-12	42,560	64%	25%	8%	59%
Rocketship Education	CMO	Urban	San Jose, CA	PreK-5	5,129	83%	2%	2%	82%
Summit Public Schools	CMO	Urban/ Mixed	Redwood City, CA	9-12	1,605	26%	22%	3%	50%
Uplift Education	CMO	Urban	Dallas, TX	K-12	9,760	69%	5%	20%	66%
Utica Community Schools	District	Suburban	Sterling Heights, MI	K-12	28,507	30%	88%	5%	2%
YES Prep Public Schools	CMO	Urban	Houston, TX	6-12	7,981	83%	43%	16%	39%

* See **Acknowledgements** for a complete list of the interviewees from each school system.

companies are solving for ‘X’ but developers are not always clear what ‘X’ is or what it should be.” Although leaders from school systems large and small might agree with Baier’s observation, smaller school systems lack the resources to vet a wide array of products to find the best solution for their needs. As Tracy Epp of Achievement First, a CMO that operates in Connecticut, New York, and Rhode Island, explained, her team has struggled to filter for quality. “The marketplace is saturated with a lot of bright, shiny objects,” she said. “It’s hard to evaluate what are high-quality, truly proven products.”

If small- to medium-sized school systems successfully navigate this “wild west” and make procurement decisions, many then perceive that they do not receive the same level of attention and support from technology providers as their larger, higher-paying counterparts. As Bill Kurtz of DSST Public Schools said, “Vendors aren’t going to make any money on the smaller clients, so it’s hard to get them to listen to our needs.” Of course, this is a reality that arises in any marketplace, wherein companies are motivated to cater to their highest-paying customers. As one education technology company’s CEO explained, a client who was demanding hundreds of thousands of dollars in custom changes turned out to be his company’s 468th largest customer; answering to these smaller school systems’ demands will not always take priority.

As an exception to this, some CMOs have managed to work with vendors to build customized products to meet their very particular needs, with the underlying assumption that those products will eventually gain traction with other school systems demanding similar solutions. Not every vendor, however, is willing to embark on such bold, expensive, and risky projects. From the vendor perspective, such collaboration can be risky when a school system is unclear on their software requirements or when their needs are so customer-specific that it is difficult to create a broader, more generalizable solution.

Given that these school systems will never, on their own, be the largest customer with the loudest voice in the market, pooling demand among smaller school systems would, in theory, make sense. But even among those school systems that appear to share similar pain points, aggregating demand across such school systems is rare. There are a few examples of institutions, like the Puget Sound Educational Service District and the KIPP Foundation, which support multiple school systems and may license software across their networks. Among the 30 school systems in our sample attempts to pool demand remained few and far between.⁶ As a result, in addition to bringing greater transparency of the small- to medium-sized education technology market to vendors and investors, we hope this research may help school systems identify missed opportunities to band together to demand particular products or solutions.

Small- to medium-sized school systems may actually offer a promising market for some software providers. The distinct needs and more limited purchasing power among smaller customers are not phenomena unique to the education market. For example, in the private sector, small to medium-sized businesses (SMBs) represent a distinct and growing customer base in the technology services market. Trends in network complexity, growth of cloud services, and bring your own device (BYOD) environments are driving the U.S. SMB technical support market to grow to a projected \$25 billion by 2016 at a compound annual growth rate of 14.4 percent between 2012 and 2016.⁷ Software companies have stepped in to gain a foothold in the SMB market, with products like Dropbox, MailChimp, and SurveyMonkey, which offer intuitive products with easy integrations at affordable price points that SMBs are able to pay.

The small- to medium-sized education technology market is smaller and more challenging for vendors, who must win customers at higher rates on far less capital compared to the SMB market. Some vendors, like Alma, a new student information system (SIS) and learning management system (LMS), have focused on systems of this size in K–12 education. Because of limited market size, however, education technology sales teams often organize around larger customer opportunities.

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As school systems wrestle with these unmet demands, some are stuck with imperfect workarounds on top of legacy products, others are piloting new products, and others are building solutions in-house.

Beyond inspiring school systems to perhaps better pool their demand, our hope is that by highlighting the particular demands in a subset of these school systems, entrepreneurs will seize opportunities to cater to this segment of the market with innovative and sustainable business models.

SHIFTING DEMANDS: A CLOSER LOOK AT WHAT'S NOW AND WHAT'S NEXT

Even though the education technology market is booming, our interviews across these 30 school systems revealed a number of areas where software products are not meeting practitioners' needs.

As school systems wrestle with these unmet demands, some are stuck with imperfect workaround solutions built on top of legacy technology systems; others are piloting new, emerging products; and still others are attempting to build solutions in-house.

The following sections summarize key developments and gaps in the education technology market, provide examples of products and services that are trying to fill those needs, and look ahead—or

see “what’s next”—to potential market trends. These sections are sorted into four categories: academic software, business and operations software, software integration and data storage, and IT management and hardware.

ACADEMIC SOFTWARE

Academic software providers are flooding the market with new products that allow schools to deploy an array of blended-learning models—that is, instructional models that combine online learning and brick-and-mortar environments. The majority of the 30 school systems interviewed constitute early adopters of school models that leverage technology to deliver and personalize learning. Many use a sophisticated array of academic software products in their classrooms and schools. The actual software functionality that these school systems are demanding, however, remains difficult to pin down and differs by academic model. Moreover, the perception of the quality of online-learning programs varies greatly depending on how well the software both aligns to the standards and micro standards that schools are aiming to teach and how well it supplies data to educators. These market dynamics can be divided into three categories described

below: the degree of control that teachers and administrators want over academic software, the degree of trust that educators and administrators have in various software products, and the role of professional development involved in implementing new software products.

Assignability versus adaptability within academic software

When it comes to control, teachers and administrators across the 30 school systems seem to be walking a fine line between demanding assignable versus adaptive academic software. Assignable software allows the teacher to choose what online activities students will tackle. This is important in school models where the teacher is in charge of targeted standards-based instruction and intervention. Still, an “assignable” approach risks the teacher becoming the bottleneck in blended-learning environments in which the teacher is unable to assign digital content in an effective and efficient manner for each individual student.

Adaptive software adjusts automatically to individual student strengths and needs, a potentially effective approach when teachers do not want to be involved in assigning content, such as in learning lab environments or consumer applications where the program steps in to “teach” the student. In blended classrooms, however, adaptive content may diverge from what is being taught in class. Moreover, some teachers struggle in implementing adaptive software. “Letting a kid just work on a computer is uncomfortable for many educators. This makes it challenging to give students flexible choices over their learning,” said Caryn Voskuil of Rocketship Education, a CMO that operates in California, Wisconsin, Tennessee, and Washington, D.C. Further adding to this tension is the question some practitioners have as to where the student fits in. “We put a huge premium on adaptive software because of the differentiation value it offers. But what do we sacrifice in terms of student ownership?” said Nikki Herman of the Education Achievement Authority (EAA) of Michigan, an independent state school district that operates the lowest achieving five percent of schools in Michigan.⁸

The adaptability versus assignability debate poses both deep philosophical and technical questions about the role of software in the learning environment. School systems currently appear to be asking for both. As Liz Arney of Aspire Public Schools, a CMO that operates in California and Tennessee, said:

Teachers want it both ways, the ‘black box’ of individualized paths and modular content they can assign at will. I don’t want teachers spending inordinate

The adaptability versus assignability debate poses deep philosophical and technical questions for learning software.

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amounts of time on computers creating individual paths for students. I want software to be more targeted and lighter weight so that teachers are not re-organizing curriculum inside a program, but they can use programs to best meet the needs of their students in a cost-efficient way.

Chris Liang-Vergara, formerly of FirstLine Schools, a CMO in Louisiana, described his vision of this balance:

You have your diagnostic and adaptive engine but if you want to [you can] assign the lessons as your own playlist ... that makes [the software] more curriculum compatible and teacher-friendly. The software should not be the students’

only experience with the content, and teachers need to be able to integrate it with other lessons and activities they are doing. So the architecture of the system needs to reflect this happy medium.

Jake Firman of DSST Public Schools likewise spoke of balancing the two. “We want the adaptability around the content and modality most relevant for a student. Ideally, the tool would provide that option but then the teacher could manually override,” he said.

Assessing the quality of academic software

Whether content is adaptive or assignable, school systems put a high premium on quality in terms of products with a proven track record of driving student outcomes. Based on our interviews, a number of products proved most popular across these school systems’ blended classrooms and schools: for example, 12 school systems were using Khan Academy, nine were using ST Math, seven were using DreamBox Learning, six were using i-Ready (with additional school systems expressing interest), six were using *READ 180*, six were using Compass Learning, six were using Accelerated Reader, five were using Achieve3000, five were using Think Through Math, and three had recently adopted Lexia Reading.

Although these clusters of usage suggest some consensus around which vendors stand out in the “wild west” of education technology, school systems were still cautious about declaring clear winners. In part, this is because vendors are reluctant to share student performance data with their customers. As Superintendent Cary Matsuoka of Milpitas Unified School District in California reflected on his district’s implementation of numerous software programs across the district, he said, “I would have toned down rhetoric around data-driven instruction. I don’t say that anymore because our experience is that it’s nearly impossible to get the data out of our software platforms.” Emmile Brack of Aspire Public Schools explained her frustration with

this same dynamic: “Software vendors need to not be [difficult] about us accessing our own data. It’s our data. Why do we have to negotiate for it?” Similarly, Firman pointed out that when he is assessing potential products, access to data is one of the primary filters by which he makes his decision. “It’s really important that we have a content provider that doesn’t hold our data hostage,” he said. Some schools are trying to solve this problem through negotiating contract agreements upfront. For example, KIPP Bay Area Schools, a CMO in California, typically structures its software license agreements to ensure automated read access to all student learning data as a standard contract provision.

Because of this dearth of meaningful data coming out of academic software, numerous school systems’ leaders described a lack of trust in the quality of online-learning programs. As John Caesar of Lindsay Unified School District in California said:

We can’t just put learners into somebody else’s box for 45 minutes and trust they have learned. Learning programs offer the opportunity to deliver and personalize skill-based and declarative knowledge, but the real learning comes together in the art of teaching where these skills are integrated into real life contextual creativity and problem solving.

Herman of the EAA of Michigan pushed further on what current data from many online-learning programs can and cannot tell her about the effectiveness:

We can see activities, the time spent, we can see final mastery, we can see the questions that students are getting right and wrong ... but it never answers the ‘why’ question. Why did the student not learn this? What is the prerequisite skill that they are missing?

Some programs *do* provide data on what students are working on, and in what particular areas students had to be pointed back to earlier concepts. Educators, however, want more transparent, granular, diagnostic information on the particular micro standards that are hindering student progress.

Beyond simply providing teachers with better information, Liang-Vergara believes that having transparent data is vital to helping educators trust software: “Programs need to be able to show what the student really did to build that trust. Nobody really has this but ST Math comes close by replaying animations of what [the] student did.” Liang-Vergara also sees data transparency as a temporary necessity to get educator buy-in: “They [educators] don’t necessarily need this level

“...our experience is that it’s nearly impossible to get the data out of our software platforms.”

of transparency forever. If the teacher builds the trust over the early part of implementation, they will then trust the reports.” Conversely, Greg Klein of the Rogers Family Foundation, which supports schools in Oakland, Calif., pointed out that online-learning programs are dynamic and can evolve and change over time, but their reputations may not change accordingly. Schools sometimes miss when “untrusted” programs improve and evolve to serve an important need.

Trust gaps are compounded by the fact that most of the school systems surveyed are deploying multiple online-learning programs in order to satisfy different student needs and use cases. There is no single magical program that does it all. Because vendors are focused on their own individual products, school systems are left with the unenviable task of stitching disparate programs together in an integrated and coherent way. As Mark Finstrom of Highline Public Schools in Washington said, the value to schools implementing blended learning is in accessing an entire “suite of tools,” while vendors are trying to maximize their individual interests and fail to see the ‘big picture.’”

Beyond just building trust, the “why” that Herman described also reflects a broader gap in reliable market information on how various products perform in different circumstances, for different students. Practitioners have looked in vain for use-case analysis of what products work for what students and when. As Richard Harrison of Uplift Education, a CMO in Texas, said:

Most of the decisions live in the binary world of ‘is a student doing well or not.’
... The pitfall is that they’re focused on the students that didn’t do well. They’re not really looking at what is making students do well. Analytics would say—what are the data points that would tell you why a student is trending one way or another?

Of course this information is not necessarily in the best interest of vendors to share because in demonstrating that they are particularly adept at serving certain students, they are admitting that their products do not work for all students in all circumstances.

Many school systems reported using educational software to do a wide variety of jobs within their blended-learning environments. For example, at Rocketship Education, one leader described that online-learning programs are used for independent work, whole-group instruction, remediation, collaboration opportunities, homework, corrective instruction, and progress monitoring. Having identified these distinct “cases,” the school system now sorts different software products according to what cases they do or do not support. For example, Rocketship Education has found that some programs are great for remediation but require too much supervision for homework. This use-case information, however, is either not conveyed clearly by developers, or vendors are trying to build products that do everything for all students, rather than sorting themselves across different use cases.

Rocketship Education's use-case analyses reflect what other researchers have also observed in the field. For example, a recent study by the Bill & Melinda Gates Foundation, "Teachers Know Best," investigated what teachers want out of digital-learning tools and identified a range of both teacher- and student-centered purposes. These purposes included delivering instruction directly to students, diagnosing student learning needs, varying the delivery method of instruction, tailoring the learning experience to meet individual student needs, supporting student collaboration and providing interactive experiences, and fostering independent practice of specific skills.⁹

Finally, there is often unreliable alignment among different online-learning programs, even though these programs purport to address the same set of Common Core standards. Moreover, online-learning programs' assessments may not measure progress in a consistent manner. For example, some academic software providers tag a single lesson with five standards, but there is no way for educators to figure out which of the five standards the student may have struggled with or succeeded in. This makes it impossible to say that program "X" is trying to measure the same thing as program "Y." Many school systems—like Milpitas Unified School District, KIPP LA Schools, a CMO in California, and Distinctive Schools, a CMO in Illinois—are bypassing this problem altogether by using a separate student assessment system, like i-Ready or Northwest Evaluation Association's (NWEA) Measures of Academic Progress (MAP), to track overall learning growth. Other school systems are hiring dedicated staff to extract and analyze academic data from multiple online-learning programs in an attempt to square these disparate measures and gain deeper insights into where students are excelling or struggling.

Professional development for academic software

School systems expressed deep frustrations with the professional development offered by most vendors. These complaints reflect the divergence between how customers are using software products and how vendors think they should be used. Although vendors often complain that customers don't properly use their products, the customers see a different side to the story. "Vendors' implementation and utilization training must begin by identifying where schools are at and where they want to end up, as opposed to a standardized training focused on how they would like you to use the program," said Kyle Anderson of Educational Enterprises, Inc. (EEI), a CMO that operates in Wisconsin, Arizona, and Missouri. Liang-Vergara echoed the same sentiment: "We need to achieve a happy medium for how the product was designed and what the schools know about their kids." Much like the tension between assignable versus adaptive software, vendors' emphasis on fidelity is often perceived as hindering teachers from doing their jobs how

“We need to achieve a happy medium for how the product was designed and what the schools know about their kids.”

they see fit. As Liang-Vergara said, “The supplier needs to be clear upfront about whether there is flexibility for implementation.”

Some school systems are going so far as to try to reshape the content of vendor professional development sessions, which often constitute precious hours for teachers. Arney of Aspire Public Schools said, “They want to change the instructional setting and tell us how to use it. You need to respect how we use it. Otherwise, people aren’t going to hear it.” To this end, Arney herself often edits vendors’ pre-packaged professional development plans to suit her teachers’ needs. “I’m really hands-on with the trainer so that they don’t waste teachers’ time or say things that are counter to our instructional program,” she said. Alternatively, some schools avoid

using vendors’ professional development altogether when they can, because it can drive up the price of the software. Many vendors, however, require that school systems participate in some form of professional development or training.

This dynamic may also feed back into distrust of what little data schools are able to extract from software programs. “Teachers acknowledge they’re not implementing [programs] with fidelity, and so then why would they trust the data?” said Amy Pouba of KIPP Chicago Schools, a CMO in Illinois. As a result, Pouba explained, teachers fear that they are receiving false negatives from the performance data. “Because we don’t execute with total fidelity,” she said, “my concern is that the data is just not accurate.”

On the other hand, vendors offer clear guidance on how their products should be used to increase the chances of success. Vendors have legitimate concerns when their products are being used for purposes for which they are not intended. The field in general needs to better distinguish between design flaws in academic software and flagrant misapplications of programs. It is not a design problem when customers take a proverbial hammer and find that it works poorly as a screwdriver.

ACADEMIC SOFTWARE: WHAT'S NEXT?

The academic software market will change as content demands under the CCSS continue to evolve and as school systems become clearer on what they want software to do for them. Looking ahead, the market may shift in the following ways:

Striking a better balance between adaptive and assignable software. School systems are clamoring for online-learning programs that combine assignable and adaptive elements in more compelling ways. Satisfying educators on this front may require overhauling existing providers' software architecture and offer an advantage to new providers who can offer both assignable and adaptive content.

Supplying more native Common Core content. In spite of the Common Core controversy, school systems in states still signed on to the Common Core are demanding online-learning programs that offer “native” Common Core content, which was designed to align specifically with the CCSS (rather than content that pre-dated the Common Core and has simply been re-tagged to align with these newer standards). For example, LightSail, a tablet-based literacy tool, Lexia Learning, a technology-based reading program, and i-Ready, an English language arts (ELA) and mathematics software program, can all be classified as native Common Core products. The Bill & Melinda Gates Foundation's study, “Teachers Know Best,” echoed this sentiment. In the study, respondents stated that alignment with college- and career-ready standards—including the CCSS and the Next Generation Science Standards—and teachers' lesson plans were the most important criteria when choosing instructional resources, both digital and non-digital.¹⁰ Unfortunately, content in one software program can be aligned to the CCSS, but still deliver and assess that content differently from another Common Core-aligned program, which perpetuates data and analysis challenges.

Sorting academic software by use-case, rather than by features and functions. The academic software market needs new information to help customers make purchasing decisions. Use-case data would prove far more useful to consumers than the lists of features and functions that suppliers typically provide. Use-case analyses might also provide more relevant information to education technology consumers than findings from long-term research studies that take years to complete. Publications and tools that help practitioners sort through content providers—such as EdSurge's product profiles, the Clayton Christensen Institute's Blended Learning Universe profiles, Education Elements' rating system, or Graphite's teacher reviews—might start highlighting particular use-case analyses or powerful correlations that emerge in the data. These analyses could reframe the question of “what works” to “what works, for which students, in what circumstances.”

Offering more intuitive software products. The apparent misalignment between how vendors want their products to be implemented and the ways in which some schools are actually using the products suggests a need for more intuitive software. Such software would require less product training and allow professional development time to focus on teacher practice and student learning. As one software provider said, “Well-designed programs shouldn’t need a ton of PD ... I didn’t need PD to learn how to use my iPhone, it’s intuitive.”

Offering instructional models, rather than one-off content solutions. School systems are piecing together a variety of academic content software. This produces a messy patchwork of tools. To address this, Mike Dronen of Minnetonka Public Schools in Minnesota said, “We need more ‘models’ as opposed to these disjointed tools that basically digitize the current paradigm. It’s not one tool that will break through, it is a combination of tools to make this happen.” Looking ahead, given that school systems are actually looking for suites of products, rather than singular content, vendors need to provide more compelling integrations with other software. Otherwise, schools might start buying comprehensive “instructional models”—such as New Classrooms—instead of just one-off content programs.

BUSINESS AND OPERATIONS SOFTWARE

Business and operations software programs support everything from finance to payroll to talent and facilities management, all of which keep school systems running smoothly. Based on our interviews, however, school systems appear to be more focused on academic and school software than on business software. Across the board, the small- to medium-sized school systems surveyed lacked well-integrated, cost-effective back-office solutions; many even continue to rely heavily on Microsoft Excel or QuickBooks for basic finance and accounting tasks.

In part, the struggle to find solutions relates to the size of these school systems. As Bill Kurtz of DSST Public Schools said, “We’re in between markets. We can’t call Oracle, but things like Sage are much too small for us. Mid-market players in between are incredibly messy and none of the tools talk to each other.” Size may also matter for CMOs that are still scaling. The team at Distinctive Schools, for example, is not prioritizing purchasing a human resources information system (HRIS); with 250 to 300 employees, the benefit doesn’t seem to be worth the cost. Its own back-of-the-envelope estimate is that five years into its existence—or once it reaches 500 employees—will be when it seeks an HRIS.

A lack of software integration can cause major inefficiencies, although better solutions are not always cost-effective. For example, at KIPP LA Schools, hourly employees must manually update

their hours in Google Docs, and then the payroll administrator must enter those numbers into the payroll software by hand. But school system leaders felt that automated time clocks to expedite this process were initially too hefty of an investment, totaling \$15,000.

The variety of logins across different operations software also causes headaches. As Harris Ferrell of Achievement First said, “If you’re in operations at the school you need to know HR, finance, reporting, SharePoint, etc. All are different logins, [and you] need to remember what’s captured and reported from where.”

School systems are also locked into legacy operations software at the “hub” of their operations systems. In some cases, school systems are forced by state or county regulations to use legacy human resources or accounting software to plug into state-level systems with outdated or non-existent interfaces. For example, Uplift Education has to enter human resources information manually into the state’s health-care system because the older system, which the state mandates the school system use, will not accept electronic feeds.

But even without these external policy constraints, school systems have locked themselves into legacy software by building workarounds in the past from which they struggle to migrate away. For example, Grand Rapids Public Schools (GRPS) in Michigan uses an integrated finance/HRIS system that the district wanted to improve. GRPS hired developers to build workarounds so that the product could better meet the organization’s needs. These workarounds, however, made it difficult to implement new software updates, and third-party developers are reluctant to do additional customizations that the district staff wants. Migrating to a new solution would be very expensive for GRPS and, in its view, there are no obviously superior alternatives.

Finally, no system has managed to build automatic integration between its HRIS and other human resources, finance, and academic software. Aspire Public Schools has made the most progress on this front (see *Appendix A*) in terms of overall software integration and using technology to implement robust teacher evaluation and support processes. But few school systems surveyed have been able to even minimally link their HRIS to their SIS, much less stitch together broader talent management solutions. In part, these challenges are borne out of school systems’ intricate processes in which they remain entrenched, rather than a failure on the part of providers. Public school systems’ human resources processes are incredibly complex, and customers tend to demand software that meets their unique needs as opposed to changing workflows to better align with products.

“We’re in between markets. We can’t call Oracle, but things like Sage are much too small for us.”

No system has managed to build seamless integration between its HRIS and other human resources, finance, and academic software.

As with academic software, these various and costly integration pain points result in difficult market dynamics: some school systems operate imperfect, siloed systems, and others seek out, or even build, integrated back-office solutions.

Integrated business solutions

To address their operational needs, school systems have pursued a range of solutions along the spectrum of horizontally integrated, less functional solutions on one end versus dis-integrated point solutions with better functionality on the other. At the far end of the integrated spectrum, IDEA Public Schools, a CMO in Texas, uses Skyward, an enterprise resource planning (ERP) solution that is commonly used in Texas schools, for HRIS, finance, and many other related functions. Misty Martin of IDEA Public Schools said, “[I like the convenience] of Skyward. But it’s difficult to map our processes to the capabilities of the system.” Although Skyward offers numerous horizontally integrated modules, integrating other third-party tools—such as SchoolRecruiter, a tool for applicant tracking, screening, interviewing, and hiring—remains challenging. Similarly, Quakertown Community School District in Pennsylvania uses a horizontally integrated program called Keystone. The district has taken a number of human resources processes off paper and has automated benefits enrollment online through Keystone’s employee portal. Although Keystone does not currently integrate with Quakertown Community School District’s talent and recruitment systems, the district said that it has been able to exert a high degree of influence on making the software work better or differently and has found that the company is responsive to its user community.

Other school systems use more piecemeal approaches, such as adopting a range of point solutions and then trying to integrate from there. For example, DSST Public Schools uses a wide range of human resources and operations tools and then uses QuickBase, an Intuit business management software, and the QuNexct ODBC software connector for Quickbase, to move data between disparate applications.

Alternatively, a few of the CMOs surveyed have invested in even more fully-integrated products to bridge the gaps in their business systems:

- **KIPP LA Schools** is currently in the process of implementing a solution that is being developed by Paybridge, a national provider of integrated payroll services. The new product will connect human resources, payroll, applicant tracking, and performance management across the organization. In developing this new product, KIPP LA Schools’

team evaluated three vendors for payroll and human resources (ADP, Paychecks, and Paybridge) and three vendors for performance management (ADP, Cornerstone, and Paybridge). Ultimately, it chose Paybridge to develop the entire suite.

- **Uplift Education** also adopted a brand new HRIS system this year called Total Education Administrative Management Solution (TEAMS). Prologic, an education software development firm based in Austin, developed TEAMS. The system integrates across numerous human resources and operations tasks, but does not have a performance management module and requires a manual sync with PowerSchool. Because TEAMS has built out functionality for tracking student data, however, Uplift Education is contemplating whether it might be possible to eventually replace PowerSchool with TEAMS so that its HRIS and SIS operate through a single system. Because a key functionality of current SIS products is state reporting, Prologic would need to spend significant resources to track ever-changing state reporting requirements and to constantly modify its SIS to remain compliant with these reporting standards.

Business and operations software: What's next?

Currently, the business and operations software market provides few compelling products and integrations. This generates opportunities for companies to create new platforms (e.g., strategic talent management) or new permutations of existing systems (e.g., combining elements of the HRIS, finance, and SIS systems). These opportunities include:

Building or automating integrations. One clear gap in the business and operations software market is a product that connects disparate systems. School systems like DSST Public School, Aspire Public Schools, and IDEA Public Schools employ software developers to write code and integrate products themselves. Data warehouses and reporting platforms, like Schoolzilla, or companies that specialize in software integration, like Clever, might also consider filling this gap in back-office software solutions.

Offering more affordable back-office software. Leading operations solutions providers outside of education should consider investing in K-12 product managers who understand school systems' unique needs and offering meaningful education discounts to make their products more broadly available to small- to medium-sized school systems. Existing products that “do it all”—such as Workday, which merges human resources, payroll, and accounting—are often not affordably priced for small- to medium-sized school systems today. This leaves a large swath of the market untapped.

SOFTWARE INTEGRATION AND DATA STORAGE

As described in the prior sections, to meet both academic and operational needs, school systems are generally choosing to use a wide array of software products, which make strong integration between products a necessity. Many K–12 software programs offer limited value on a stand-alone basis and must be integrated with other software, typically from different vendors, to realize their potential. As such, software integration is a key priority for school systems managing numerous software programs at once. Integrating across products, however, is one of the most challenging aspects of implementing technology in schools.

For example, a school system that has purchased software to manage teacher recruitment will have to re-enter manually all data for any teacher that is hired, unless the teacher recruitment system is integrated with the HRIS. Many other basic processes also require integration: new teachers need to be set up with e-mail addresses, enrolled in benefits programs, assigned to classes, and so forth, each of which can require separate software integrations. For student-facing software, every new software program needs to be integrated to the SIS and tied back to student IDs. These integrations need to be flexible so as to adjust if students enroll or un-enroll in a school, or if class schedules change for students or teachers. As the burden of manual integrations and data transfer increases, school system efficiency decreases. Key tasks begin falling through the cracks and jeopardize the integrity of student and staff data. As Mike Teng of Rocketship Education said, “So many of the issues with running our schools come back to student identification.”

The alternative to onerous manual integrations would of course be an automated process by which data from one program synced with other programs, and programs effectively talked to one another. Automating software integration, however, proves challenging, in large part because of the competitive dynamics among software providers. Comprehending these challenges requires an understanding of the basic architecture of how schools typically arrange and connect disparate systems. As many of the software maps in *Appendix A* illustrate, school systems’ technology systems tend to follow “hub-and-spoke” structures, in which key software platforms (“hubs”) are connected to multiple other software applications (“spokes”). In such school systems, the hub often represents the single “source of truth” from which all other integrations draw and supply information.

The three main software hubs in most school systems are the SIS, which holds each student’s unique ID and other personal and demographic data; the HRIS, which holds each employee’s unique ID as well as other personal and credentialing data; and the domain management or identify management system, which administers network credentials for applications like e-mail and manages user permissions. HRIS data typically ends up being duplicated in a school systems’ SIS, whereas the SIS data is not typically entered into the HRIS.

A variety of players occupy these spaces. *Table 2* lists which SISs the school systems surveyed use as their hub on the school management side.

Table 2. Student information systems (SISs) used by the school systems surveyed

PRODUCT	NUMBER OF SCHOOL SYSTEMS SURVEYED (OUT OF 30) THAT USE PRODUCT
PowerSchool	15
Illuminate	5*
Aeries	2
Infinite Campus	2

** Several other school systems expressed interest in purchasing Illuminate's SIS product or were actively evaluating it as an option.*

How does this hub-and-spoke architecture help to explain the painstaking manual integrations that many school systems must currently undertake? First, the hegemony of certain platforms, or “hubs,” can impede integrations between vendors. Because school systems, over the years, have built all of their integrations on top of one central “source of truth,” school systems’ leaders perceive the cost of changing hub software to be incredibly high. Thus, hub software vendors wield disproportionate power vis-a-vis their school system customers and other software vendors. One CMO technology director said, “We are locked into [our SIS], but only use it for pieces and try to work around it when necessary. ... Sometimes we have to hack into our own systems to get our data out.” The “lock-in” effect is compounded as school systems invest in additional customizations and integrations in an attempt to improve functionality.

Second, technically speaking, providers at the “hub” would need robust application programming interfaces (APIs) to facilitate smooth integration. APIs are sets of programming instructions and standards that allow software to communicate. By “opening” its API, a company effectively allows other companies to build automatic integrations on top of its product. But historically, many K–12 providers have demonstrated weak commitment to APIs. Software companies generally take one of three approaches to APIs. Some companies offer open, publicly-available APIs that any customer or third-party vendor can use. Other companies offer closed APIs to a limited set of partner companies. Still others may offer only custom API services at an additional cost, but otherwise offer no API at all.

“Sometimes we
have to hack into
our own systems to
get our data out.”

Creating an open API that outside developers can access reflects a given software company’s technical and strategic decisions. On the one hand, open APIs may pose legitimate security issues for software providers. But for many “hub” software providers, limiting access to their API is a strategic choice, rather than a technical hurdle that they cannot overcome. These software providers may be reluctant to partner with other vendors for fear of ceding competitive advantage among “spoke” products with which only their hub software integrates. For example, some SIS companies want to protect their gradebook software and therefore make integrations to newer third-party gradebooks difficult. This competitive advantage makes good business sense: being too open could cost companies economic value and commoditize their products. This, in turn, might cause investment in the education technology space to dwindle. Still, every school system surveyed spoke to the enormous time and cost burden brought about by products that do not automatically integrate; companies and investors alike should aim to find new ways to lessen this burden on schools, as it stands to benefit students in the long run.

Other logistical dynamics further frustrate automated integration. Vendors resist allocating the programming talent and resources to develop APIs when this does not typically yield an immediate financial return. This is especially true of education technology start-ups, many of which are “spokes” that operate on extremely limited capital. APIs, which can be expensive to build, are often not a priority for vendors that are focused on putting their own products in the hands of customers.

Additionally, software integrations are easier to build when there is a common set of standards for how data is defined, such that it can be shared on an apples-to-apples basis. Yet, due to disparate regulatory systems and political debates about what these standards should be, no standard today has been adopted widely by “hub” vendors across the education system. For example, if high school graduation rates are defined differently in different school systems, then this jeopardizes the program’s ability to exchange reliable, comparable data.¹¹ Programs even ascribe to different data fields for information as basic as grade level (e.g., denoting kindergarten as either “K” or “0”). Industry groups, like the Ed-Fi Alliance and the SIF Association, as well as the federal government’s Common Education Data Standards (CEDS) program, are attempting to define common sets of data standards on which school systems can rely. But these common standards have yet to be universally adopted by vendors or school systems.

Finally, although school systems are currently focused on their struggles to manage and connect the data going *into* their systems, retrieving useful data—that can be stored and analyzed in meaningful ways—is even more difficult. This problem is a result of the disparate assessment

data that different academic software programs measure and produce. But school systems' struggles to combine data also highlights the fact that there is no single place in a traditional hub-and-spoke system where data can live and be analyzed independent of the SIS, nor are there common data standards to allow teachers to compare data from different systems.

As school systems try to tackle these software and data integration challenges, a number of vendors are attempting to ease the pain of connecting disparate systems. These include provisioning solutions that automatically assign software licenses to students; authentication solutions that allow students to log in to multiple software programs with a single set of credentials; and data warehouse, or data mart, solutions to provide platforms where data from different systems can live.

TOOLS FOR PROVISIONING AND AUTHENTICATION

One pain point of integration is the provisioning of software licenses to each student in a class, school, or district. Outside of the enterprise, customers often sign up for new direct-to-consumer applications using “self provisioning”—that is, setting up a new account by plugging in their e-mail address, other personal information, and a password on social networking, banking, or dating sites.

But each time a school system works with a new software vendor, or as students come in and out of a school system or change their schedules, a similar provisioning process needs to occur. Unlike the consumer world, instead of simply using e-mail addresses as students IDs, students are identified by *two* unique identifiers: their student ID from the SIS and their networking ID from the domain management (or identity management) system, which are typically Active Directory or Google Apps Administrator. The student ID ensures that students can access the appropriate software for their class, school, or grade and the networking ID verifies their identity.

School systems are looking for an automated way to provision accounts at scale. Without automated processes, school systems have to manually update student records in vendor interfaces, e-mail vendors with roster file updates, or expensively write and maintain custom structured query language (SQL) extracts—that allow for dynamic data extraction—for each vendor.¹² For example, at KIPP Chicago Schools, the central office uses a time-consuming method of maintaining a master spreadsheet for each school and can copy and paste columns of the information vendors need to license their products. Other school systems are attempting to build “same sign-on” programs by developing naming conventions for usernames and password to create consistency across various applications, but this is likewise time-consuming. For example, the IT department at Los Altos School District has built a process in-house for manually provisioning usernames and passwords that can be used as a universal login. To do this, the staff members must develop username and password conventions that satisfy all programs and that

“Right now students are being asked to remember different passwords for different tools... Vendors just need to agree on one username and password format.”

can generate unique IDs. They then upload those files separately into each relevant software system because there is no automatic sync. This process is complicated, however, by disparate program requirements: some vendors require username uniqueness across a district, others across a state, and others across the entire user base.

One company, Clever, has stepped in to try to automate some of these processes. Clever automates the secure transfer of student information between authorized parties (from a school to a vendor). Clever replaces manual, vendor-specific processes, such as e-mailed CSV files or vendor-specific bulk transfers, which are often insecure, inconvenient, or both.¹³ Nine of the 30 school systems surveyed are working with Clever to automate integration between third-party software and their central SIS platforms. Many of those customers are pleased with the integrations that Clever can offer, but want the company to integrate across more products. At KIPP Chicago Schools, the IT department has gone so far as to hire a “provisionist”

to perform Clever’s function for programs with which Clever does not yet integrate.

Still, some remain skeptical that Clever can change the game of integration. As Finstrom of Highline Public Schools explained, Clever does not integrate with all the programs that his district is using, nor does it currently increase the availability and utility of the data that schools can access from various programs.

Single sign-on solutions

A second pain point of integrating across disparate systems is in how students log in to access various programs. As Rafael Gallardo of Highline Public Schools said, “Right now students are being asked to remember different passwords for different tools.” This can lead to data being compromised, thereby breaking the important link between network IDs and student IDs. On one program, Gallardo observed that students were resetting their usernames and deleting student ID numbers. “We lost track of who they were,” Gallardo said. “Vendors just need to agree on one username and password format.” Alternatively, school systems could commit to buying only products that use a particular format, but this would severely limit the tools at their disposal.

A single sign-on program simplifies the login process by providing users with a single set of credentials—username and password—to access multiple software programs. A number of companies and platforms are stepping in to fill this need. *Table 3* lists which provisioning and single sign-on solutions the school systems surveyed currently use. The most common solution among school systems was to custom-build a single sign-on process by using Active Directory

for authentication, which is used by 12 of the 30 school systems, in conjunction with student information drawn from the SIS. Seven school systems also reported using Google to automate single sign-on to software programs with which it partners, including Khan Academy and Hapara. If Google is not integrated with a school system’s SIS, however, then it is difficult to figure out which students to provision software licenses to because the SIS contains all of the teacher and student data.

Table 3. Provisioning and single sign-on solutions used by the school systems surveyed

PRODUCT	NUMBER OF SCHOOL SYSTEMS SURVEYED (OUT OF 30) THAT USE PRODUCT
Active Directory*	12
Google Apps Administrator*	7
Clever	9
Education Elements	4
OneLogin	1

** School systems using Active Directory or Google ID’s must custom-build integrations with their SIS if they choose not to partner with a third-party, like Education Elements or Clever, to facilitate this process. Some school systems use Google ID as a single sign-on solution, but do not integrate with the SIS.*

Data warehousing

Even if school systems are able to automate provisioning and sign-on at the front end, retrieving meaningful data from these programs and storing and analyzing that data in a single, centralized place remains challenging. School systems using numerous content providers struggle to capture student performance information across programs and platforms and to analyze this data in an actionable way. As Chris Haid of KIPP Chicago Schools said, “I still spend a lot of time figuring out how data gets migrated from program to program.” On the back end, data analysis and reporting remain challenging, both because data from different programs does not integrate easily, and because software programs rarely produce useful, actionable data for educators.

Keeping track of data is especially tricky because of the difficulties in preserving data integrity between systems, particularly in the current hub-and-spoke paradigm. As David Easterby of YES Prep Public Schools said:

The SIS is the center of the universe and any time you build a custom system, it does its own independent pull and then builds its own data around it to get the

“I still spend a lot of time figuring out how data gets migrated from program to program.”

functionality that you want. If the SIS changed the data, then potentially everything else could break. The worst thing is not a hard failure, but a soft failure [in which] a small amount of data isn't right. And that is hard to catch.

Because of this risk in manipulating data, a number of school systems simply use their SIS systems as a data warehouse, even though these platforms were not designed to host large amounts of academic data or perform sophisticated analytics. For example, Milpitas Unified School District's SIS, Aeries, functions currently as the district's de facto data warehouse.

Some school systems are finding value with a minimalist approach of deploying a separate business intelligence tool, like Tableau, to sit on top of the SIS and create more useful and actionable reports. Other school systems are creating entirely separate data warehouses to provide more sophisticated analytics. Schoolzilla, a data warehousing solution that spun out of Aspire Public Schools, can draw data from over 40 academic and operational sources and uses Tableau as a reporting tool. Overall, eight school systems report using Tableau through a direct purchase or through Schoolzilla. Additionally, six of the school systems use a product called DataDirector, a web-based data and assessment management system.

Dissatisfied with the data warehouses and data dashboards on the market, some CMOs have built their own data systems in-house. For example:

- **Aspire Public Schools** created Schoolzilla, mentioned above, which is now available to school systems nationwide. It is the most mature of these tools and operates as a web-based data collection, organization, and reporting platform built using Tableau's reporting functionalities. Four school systems surveyed (in addition to Aspire) are now using Schoolzilla.
- **YES Prep Public Schools**, a CMO in Texas, is using a homegrown data mart called the “common data platform” to host all of its data from across the school system.
- **Touchstone Education**, a CMO in New Jersey, is also building a lightweight data management solution with Tembo to combine data from different sources and generate data reports. As its team said, “We didn't want to build a data warehouse and now are building something flexible and cheap that can be used by others.”
- **IDEA Public Schools** is in the process of building a new data warehouse solution based on Sharepoint that will replace a previous custom-built product called LightBulb. As Cody Grindle of IDEA Public Schools explained, this next iteration of LightBulb will

filter for useful data from various online-learning programs. “Every blended-learning application has its own reporting, but we want to pick the best data and turn it back to schools,” he said.

Software integration and data storage: What’s next?

Schools are increasingly tired of painstaking and costly integration among disparate applications. Importantly, software integration challenges are primarily “cooperation” issues, not technical issues per se. Thus, school systems and investors should demand cooperation at the outset. Even in the absence of a concerted demand for cooperation, however, the market appears to be shifting in a number of key directions:

New platforms may emerge at the “hub”: The coming years likely will witness intense competition in the platform space. The “vacant real estate” available to new platforms is limited (see **Appendix A**) and defining new platform categories is difficult. The ascension of several new hub platforms, however, could significantly impact the software integration landscape. Will new “hubs” emerge to upset the current market dynamics? A few possibilities are on the horizon:

- **Google Apps for Education.** Nineteen school systems reported using Google Apps for Education, which offers a new approach to authentication and potentially tighter integration with software distributed through Google Play. Google has announced a new product, Classroom, which weaves together Google Docs, Google Drive, and Gmail to help teachers create and organize assignments. K-12 schools’ rapid adoption of Google Apps will likely lead to more opportunities for third-party companies that enhance the functionality of Google Apps for the K-12 market.
- **LMSs.** LMSs have not gained as much traction in K-12 as they have in higher education, with programs like Blackboard and LoudCloud. School systems, however, may adopt products like Instructure’s Canvas or Google’s Classroom in order to put more courses online and use more digital content and resources.
- **Professional development platforms.** Several school systems underscored the importance of personalized professional development as a component of teacher evaluation efforts. Companies like BloomBoard, a platform that delivers customized professional development, are trying to address these needs. Although the market remains nascent, tools like BloomBoard can integrate across talent management, professional development content, and student outcome data in new ways, in turn redefining the “hub” around which systems integrate.

- **Platforms built one integration at a time.** A different approach to winning over this platform space is ticking off integrations one-by-one. For example, Education Elements, a company that helps districts design and implement personalized learning, offers school systems provisioning and single sign-on solutions for a growing number of online-learning programs. Clever likewise appears to be marching upmarket with the release of its own single sign-on solution, Instant Login. A number of school systems are also building single sign-on solutions themselves with Active Directory and using a standard API to integrate with their SIS.¹⁴

School systems will increasingly seek out sophisticated and reliable data analysis and management solutions.

Education technology companies that help school systems analyze and manage data—like BrightBytes, Clever, Education Elements, LearnSprout, MasteryConnect, and Schoolzilla—are drawing significant interest from both customers and investors. Developing effective data solutions, however, may be contingent on a number of factors. These include 1) whether academic software providers share meaningful and useful data with their customers, 2) whether common data standards emerge to create consistencies in how data from discrete programs are reported and analyzed, and 3) what achievement data will look like as schools transition benchmarks and item banks to align to the CCSS. Currently, dashboards produced using programs like Tableau tend to include SIS student and achievement data, but are severely limited by the incomplete performance data that online-learning providers are willing or able to share with their customers.

Schools may rely on limited data from programs they trust. Alternatively, customers may stop valuing a platform that can integrate *all* data. For example, as Sabrina Pence of FirstLine Schools said:

Our theory of action is to keep it as simple as possible. Teachers shouldn't have to manipulate data to use it. ... We've made i-Ready our main source of real-time formative data ... that's our data point. If teachers want to go back to other programs, they can, but that's not the main source. We aren't as interested in integrating the data from all programs. I am most interested in what is easily usable by our teachers.

Other schools may turn to assessment platforms to filter online content.

Some platforms can themselves provide a filter for academic software content by serving as an assessment platform, a recommendation engine, or both. For example, one company, Knewton, has created a platform that allows third-party publishers to build proficiency-based adaptive learning applications and uses data analytics and on-demand assessments to sort and connect resources to students. Khan Academy, better known for its free online video repository, is also working hard to build rigorous assessments that could theoretically filter third-party content on a common, integrated platform.

The market may call for integrated solutions, rather than modular systems.

Many of the current inefficiencies of software integration reflect customers' desire to use a wide array of content providers rather than a single integrated curriculum and student information program. The tradeoff of this modular content approach, of course, is that other systems—in particular SIS and LMS architecture—have not caught up to a modular vision. Full-time virtual providers, however, such as K12 Inc., offer fully integrated systems with a single platform and curriculum. Although these systems do not offer the flexibility in curriculum design that the school systems surveyed appear to value, such highly integrated systems may actually be poised to challenge the hub-and-spoke SIS hegemony. None of the school systems we profiled have adopted single-provider systems like K12 Inc. Early adopters instead appear to be opting for modular solutions that they have to patch together but that allow for customization. Down the line, however, mainstream customers may be more inclined to purchase reliable, fully integrated systems.

Student-facing data will be increasingly important. School systems' growing emphasis on personalization ultimately may place a greater premium on integrated solutions that are more student facing. "What do kids see? ... I want our kids be able to tell me what they need to do to do well in a class. [That is] the key to self-direction and owning what they are doing. ... We need to give them a view as to what the whole year looked like," said Jon Deane of Summit Public Schools, a CMO in California. Liang-Vergara echoed this sentiment: "I've become much more aware of personalization in a more student-centered and student-driven way. I look more for what's enjoyable, the data that is student facing. ... Right now programs don't do this very well at all."

IT MANAGEMENT AND HARDWARE

As most school systems in this sample shift or consider shifting their systems to the cloud, they are contemplating both the benefits and drawbacks of cloud-based solutions. The move to the cloud offers school systems a chance to save resources and maintain focus on instruction rather than on database management and software updates. Brack of Aspire Public Schools said, "I have to say I wasn't super enamored with the cloud until I saw the cost-benefit analysis. ... [Now] we are trying to go cloud-based with our applications. Our hedgehog is not database or application management. Our job is to support teachers and principals."

Cloud-based solutions also stand to improve teacher and student workflow. For example, as mentioned above, in over half of the school systems interviewed, the staff or students were using Google Apps' productivity suite. Cloud-based solutions can also shift the terms on which students engage and help systems move toward a more anytime, anywhere approach to learning.

“I wasn’t super enamored with the cloud until I saw the cost-benefit analysis.”

As Jackie Sigua of Los Altos School District said, “We like cloud access because it promotes a lot of collaboration and kids can access their work anywhere. You can’t say the dog ate my homework.”

Still, the cloud poses new challenges to school operators, both in terms of ceding control to third-party hosts and maintaining student privacy in compliance with the Family Educational Rights and Privacy Act (FERPA), the Children’s Online Privacy Protection Act (COPPA), and applicable state regulations. Significant uncertainty exists currently among both school systems and software vendors

about how to address student privacy in cloud-based applications. That said, cloud-based software solutions are not inherently less secure than applications that school systems host in-house. School servers can be hacked, teachers can lose their laptops, and under-resourced IT departments are not always expert in security or have the opportunity to educate all school system employees in best practices.

Additionally, many school systems lack the infrastructure and bandwidth to support a shift to the cloud. Although moving to the cloud can relieve IT departments of managing data centers, it has not done away with network and device maintenance challenges. Legacy software products may still have strict device requirements, which limit the devices available to schools and require network professionals to engage in time-consuming updates and workarounds. Trying to run legacy software across entire school systems on subpar networks can be complex and introduces performance and frustration issues. The proliferation of computing devices—at both school and home—are also presenting new opportunities and challenges as schools navigate hardware procurement and device-usage policies on the ground.

A new supply of products and services, as well as new staffing strategies, are emerging to shape school systems’ transition to cloud-based products and services. New hardware solutions that compete on affordability are likewise seeing uptake as more school systems integrate technology across their classrooms.

Data privacy

Data privacy is a growing concern among school systems and technology providers alike. There was no consensus across the 30 school systems interviewed as to how to tackle data-privacy challenges. Two federal statutes—FERPA and COPPA—as well as state-specific privacy legislation, all set out a variety of rules about how and what student data can be shared with software vendors. A number of the school systems we interviewed mentioned that data privacy appears to be getting more attention, but there are still many unresolved issues. Some school systems

are simply choosing not to host certain student information in the cloud. For example, one school district's special education department does not use Google to host confidential documents. As the director of technology said, "We don't know where it gets read or where it ends up."

School systems are also concerned with creating secure networks while still maintaining student access to useful Internet resources. At least two school systems have turned to a company called Securly to help manage and secure their networks. Securly is a cloud-based web filter that tries to solve the problem of "over blocking" in schools by allowing educators to safely use learning tools such as Google, YouTube, and Wikipedia in the classroom. School systems' leaders said that Securly worked well with Google Apps and that the protections extend to students when they work online from home. In addition, Securly's temporary "white list" allows teachers to provide one-time student access for particular websites as opposed to going through the technology department to unblock the sites.

"We like cloud access because it promotes a lot of collaboration and kids can access their work anywhere. You can't say the dog ate my homework."

IT management: Outsourcing and recruiting talent

Technology talent management is changing to reflect the new and growing role of technology solutions across the enterprise. As school systems' IT management becomes more strategic, basic data center, networking, and device management tasks are increasingly being outsourced to third-party vendors. Talent within school systems' IT teams is also shifting to include more instructional expertise and, in some cases, more sophisticated software development capabilities.

Despite the upside of time and cost savings, a number of school systems cited control and access to their data as key concerns in moving to the cloud. As Aron Michalski of FirstLine Schools said, "Even if we stay cloud-based, we need to stay on top of what we still have control over." For example, Michalski cited the importance of maintaining direct read access to their data without restrictions; maintaining the ability to schedule tasks on a third-party server more than once a day; and maintaining some degree of control over the database import mechanism so that various programs can be synced. "We need to integrate in both directions," he said.

Some school systems are also turning to third-party solutions to host and manage their IT services. For example, Aspire Public Schools hosts its SIS, PowerSchool, with the third-party provider Computer Logic Group (CLG). According to Brack, "One of [the] best moves we

“IT is becoming more strategic and meeting more frequently with the instructional team.”

[Aspire Public Schools] made was for CLG to host PowerSchool. It improved performance and uptime.” In a similar vein, Highline Public Schools works with a company called MicroK12 to manage hardware procurement with vendors. As Finstrom said, “I’m looking for MicroK12 to build the relationships with a suite of vendors and providers.” EEI has taken this a step further and outsourced all of its technology services to a company called Caspian Technologies, which is E-Rate certified. Notably, this means that even though E-Rate would not typically cover a chief technology officer to oversee school system IT, EEI can use E-Rate funds to subsidize this service and focus its internal energy on instruction rather than IT management.

Even as school systems offload IT services and data center management to third-party providers, internal IT teams are becoming more nimble and responsive to new challenges in blended-learning environments. To achieve this, school organizations are breaking down the barriers that have typically separated IT and curriculum departments. As Ira Socol of Albemarle County Public Schools in Virginia said, “I work closely with our IT department and principals so that we’re all on board to support this work together. ... I don’t technically reside in any particular silo and this is very intentional.” Similarly, Vireak Chheng of Alliance College-Ready Public Schools, a CMO in California, hosts “Making-IT-Happen meetings” to bring together teams across the organization. “IT is becoming more strategic and meeting more frequently with the instructional team,” Chheng said.

Human capital appears vital to bridging IT and instructional departments in blended-learning environments. School systems are seeking more IT leaders with instructional expertise and are increasing the depth of programming experience on their staff. Leaders across these school systems—such as Jon Deane, chief information officer at Summit Public Schools, Chin Song, director of technology at Milpitas Unified School District, and Matthew Peskay, chief of innovation and technology at KIPP LA Schools, to name a few—bring combined instructional and technology expertise to their work of guiding blended-learning implementations. Additionally, eight of the 30 school systems surveyed have at least one full-time developer on staff. As Teshon Christie of Highline Public Schools said, “Having a developer is mandatory for districts with a tech plan and blended-learning focus. ... [It] is like having an additional \$500,000 in your budget.” Christie noted, however, that attracting talent in this arena can be challenging: “App developer is one of the hottest jobs around.”

Hardware choices

The proliferation of cloud-based school software is matched by a wide array of devices that schools are currently using. Many of the school systems surveyed are moving into multi-device environments with a focus on hardware manageability and cost. These are two dimensions along which affordable products like Chromebooks have an advantage; 10 of the 30 school systems surveyed have adopted Chromebooks in recent years, and a number of these systems praised the ease of deployment, management, and efficiency gains they have witnessed as a result. As Song said, “With Chromebooks, the time to boot up a computer and launch software goes from 5.5 minutes to less than a minute. It buys me 18 days of school.”

A few school systems, however, mentioned durability concerns about Chromebooks and other inexpensive devices. School systems are also finding that some of the instructional programs that they use limit their hardware choices. Another frequently cited drawback to Chromebooks was that some assessments, such as the older (and more commonly used) versions of NWEA’s MAP, require downloads, rather than browser-based programs, which Chromebooks don’t support. Some school systems have responded by choosing only cloud-based software instead of buying more general-purpose devices. As Amanda Rychel of Distinctive Schools said, “Now a major piece of the [software] vetting process is that the software needs to work on all devices.”¹⁵

Amidst these hardware debates, five school systems surveyed are embracing the proliferation of devices by trying to build fully device agnostic environments. For example, Vince Scheivert of Albemarle County Public Schools said, “We support Mac, PC, Chromebook, iPads. You name it. If it’s out there [we support it].” This does present challenges in terms of the programs that a system can support, however. Scheivert said, “Anything that requires Java or Flash I hate. . . . You can’t do this [device agnosticism] if it’s going to be built on programs that require other programs.” Device agnostic programs, of course, are also more expensive for vendors to develop.¹⁶

Five of the 30 school systems also reported building BYOD environments, permitting students to bring laptops, tablets, and smartphones to school to access school applications. Some school systems, however, expressed worry about maintaining security in a BYOD environment. As Sigua of Los Altos School District said, “We do not currently support BYOD, as it’s a security and management issue. We would need to account for each device to ensure that it receives the proper filtering, anti-virus protection and security settings before allowing them on our network.” Others, however, are moving ahead by building parallel networks. For example, two other school systems interviewed run guest networks, which students, families, and community members can log on to from their own devices.

IT management and hardware: What's next?

As cloud-based technology and hardware products improve rapidly, school systems will see major gains in efficiency, but may face new challenges. Looking ahead, we anticipate a number of trends in the IT and hardware space:

Cost-effective devices will continue to gain market share. As technology strategies evolve, school systems are demanding cheap, minimally viable devices that can meet changing needs. Apple has been successful in selling iPads to school districts—especially after bond offerings or other voter-approved levies—but high prices and concerns over device management may cause difficulties for Apple over time. Short of floating bonds every three years to buy devices, school systems will need either low-cost devices that can be funded out of existing operating budgets or more durable devices with longer replacement cycles. Chromebooks are successfully pursuing the first strategy, and in one leader's words, showing a "huge uptake" among school systems. Still, many school systems use Microsoft's Active Directory for networking and Windows devices. Therefore, Microsoft may still have opportunities to make inroads in the K-12 education space with its Office 365 (cloud) and Surface (mobile) products. Disruptive innovation theory offers one explanation for this evolution in the hardware market: lower-cost products are poised to disrupt the traditionally relatively high-cost devices that school systems have used.

BYOD environments stand to grow, and with them, the need for networking solutions to support them. Pressure will continue to build on school systems to move toward device-agnostic and BYOD environments as the number of consumer devices owned by both students and staff proliferates. The shift will create opportunities in areas like mobile device management, network security, and network traffic optimization.

New talent pipelines may emerge for IT and instructional professionals. As IT departments increasingly outsource lower level functions and play more strategic roles in teaching and learning, the need for staff with combined technology and instructional expertise will grow. This may generate a need for training or residency programs geared toward honing combined IT and instructional expertise.

School systems will require better data privacy guidance. As more school systems migrate to the cloud, data privacy has received significant attention from media outlets and state legislatures alike. School systems need better guidance on how to broker vendor terms of service agreements that protect their students' privacy but still provide valuable performance data. School systems will need to educate teachers and community members on both the importance of data privacy and the benefits of data-driven blended learning that make cloud-based systems a reasonable investment.¹⁷

CONCLUSION

Is the education technology market meeting the needs of small- to medium-sized school systems? In many ways the proliferation of cloud-based education software products has dramatically shifted the education technology market toward more affordable and accessible products from which smaller systems can benefit. These products offer real savings that allow school systems to offload basic IT tasks. Still, small- to medium-sized school systems may not be able to afford enterprise or custom software solutions that fully meet their needs. New technology is also presenting these school systems with new challenges and costs—like software integration, data analysis, and workflow management, to name a few.

If technology companies, investors, and schools share an interest in driving better results for students, the booming education technology market cannot rest on its laurels. The gaps in the current market represent significant pain points for teachers and administrators and divert attention away from teaching and learning. Until technology providers start cooperating by opening their APIs to integrate across disparate products, proprietary interfaces will force costly integrations on school systems. Until better integrations and coherent data standards facilitate reliable data transfer from academic software programs, the education technology market will face an uphill battle of gaining the trust of educators trying to implement these products to drive student learning.

Looking ahead, the gaps identified in this paper reflect key market opportunities. Enterprising developers and existing companies should build new solutions to fill these gaps. Investors should likewise pay attention to the current inefficiencies hindering school systems and fund companies that not only show growth potential, but also promise a better-integrated user experience for students and teachers. Finally, school systems should proactively inform vendors about how they use software and hardware on a day-to-day basis; for smaller school systems, this may mean pooling their demand to yield products that fit their specific needs. If supply and demand can better align in these ways, we just might be able to match the software to the school.

NOTES

- ¹ Many of the school systems in our sample are operating at the leading edge of technology integration among small- to medium-sized systems. As such, this sample does not reflect the status quo across all systems of a similar size, but rather points to where we think systems are headed as technology inevitably improves and more schools turn to new solutions.
- ² The State Education Technology Directors Association (SETDA) recommends that all future machines purchased for testing purposes have minimum specifications of a 1.3 GHz processor, 2 GB RAM, and an 80 GB hard drive. By 2017–18, SETDA has established a goal of 1 Mbps per student—up to 100 times the SBAC recommendation. See Christine Fox, John Waters, Geoff Fletcher, and Douglas Levin, “The Broadband Imperative: Recommendations to Address K–12 Infrastructure Needs,” SETDA, 2012, http://www.setda.org/wp-content/uploads/2013/09/The_Broadband_Imperative.pdf.
- ³ John Watson, Amy Murin, Lauren Vashaw, Butch Gemin, and Chris Rapp, “Keeping Pace with Online and Digital Learning,” Evergreen Education Group, 2013, http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-lr.pdf.
- ⁴ These figures represent an increase of 2.7 percent from last year’s estimate of \$7.76 billion and 6.4 percent over the three years of the SIIA survey. See John Richards and Rhonda Struminger, “2013 U.S. Education Technology Industry Market: PreK–12,” SIIA, 2013, http://www.siiia.net/index.php?option=com_docman&task=doc_view&gid=4801&Itemid=318 (accessed June 3, 2014).
- ⁵ Patrick Keaton, “Local Numbers and Types of Public Elementary and Secondary Local Education Agencies From the Common Core of Data: School Year 2010–11,” National Center for Education Statistics, November 2012, <http://nces.ed.gov/pubs2012/2012326rev.pdf>.
- ⁶ One anomaly to this lack of pooling demand is a cooperative in Minnesota of 150 schools, with 42 member districts, including Minnetonka Public Schools. Among other things, these schools have banded together to negotiate a lower price on bandwidth across their region. As Michael Dronen of Minnetonka Public Schools said, “My influence within the co-op is proportional to how open I am to be influenced.”
- ⁷ “SMB tech support market will achieve double-digit growth through 2016,” Parks Associates, February 7, 2013, <http://www.parksassociates.com/blog/article/pr-feb2013-smb> (accessed May 13, 2014).
- ⁸ Mary Esselman of the EAA of Michigan also explained that the school system aims to use technology to enhance project-based learning with real-world relevance. These technology use-cases are not adaptive per se, as they often require the design energy of educators on the ground because project-based, real-world functionalities are not readily available in most off-the-shelf online curricula.
- ⁹ “Teachers Know Best: What Educators Want from Digital Instructional Tools,” Bill & Melinda Gates Foundation, April 2014, <http://collegeready.gatesfoundation.org/Portals/0/Documents/Teachers%20Know%20Best/Teachers%20Know%20Best.pdf>.
- ¹⁰ “Teachers Know Best.”
- ¹¹ Attempts to standardize across these data metrics include the Ed-Fi Alliance’s standards—which draw on the U.S. Department of Education’s Common Education Data Standards, input from state education agencies, local education agencies, vendors, and teachers—as well as the now dis-assembled entity inBloom, a cloud-based student data infrastructure platform. These efforts, however, have not taken hold at a sufficient scale to reshape demand for more standardized product interfaces or data.
- ¹² “Clever School District Whitepaper,” Clever, 2013, <http://assets.clever.com/documents/clever-district-whitepaper.pdf>.
- ¹³ “Clever School District Whitepaper.”
- ¹⁴ As Todd Silvius of Quakertown Community School District put it, “Anything that can be tied to Active Directory for single sign-on is pursued.”
- ¹⁵ To vet potential software providers, Distinctive Schools uses Education Elements’ technology selection guide to inform its software procurement decisions. See Kawai Lai, “Selecting Digital Content for Your School: A How-To Guide,” Education Elements, April 24, 2013, <http://www.edelements.com/selecting-digital-content-for-your-school-a-how-to-guide/> (accessed May 23, 2014).
- ¹⁶ The drawback that some schools see to building multi-device environments is that teachers and students must be trained to use different tools. As one team member from Green Dot Public Schools, a CMO in California, said, “Right now we’re in a world where we ‘need’ both laptops and tablets. This doesn’t work . . . too much training [is] needed.”
- ¹⁷ There are a host of technical and political data privacy issues over the use of cloud-based technology in public schools. See Joel Reidenberg, N. Cameron Russell, Jordan Kovnot, Thomas B. Norton, Ryan Cloutier, and Daniela Alvarado, “Privacy and Cloud Computing in Public Schools,” Fordham Center on Law and Information Policy, December 13, 2013, <http://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1001&context=clip> (accessed May 23, 2014).

APPENDIX A

Software maps of school systems surveyed

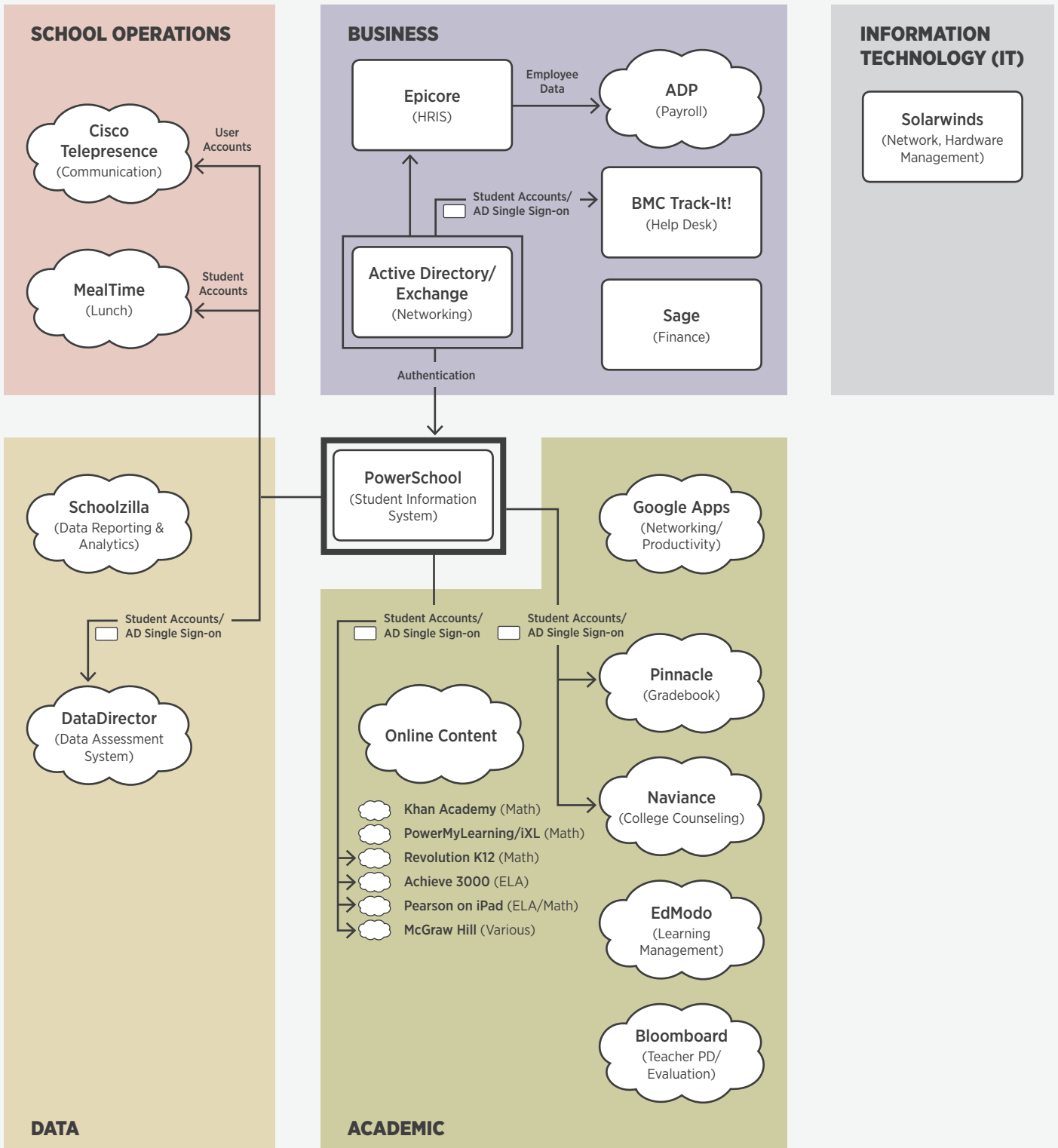
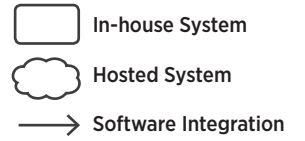
The following software maps attempt to illustrate the range of software programs each school system is using, as well as each school system's general approach to software integration. The information captured is self-reported by the school systems at a point-in-time. The maps may not reflect software used in individual schools or classrooms that is not centrally procured. In some cases, the maps have been simplified to make them easier to view.

Alliance College-Ready Public Schools

Los Angeles, CA

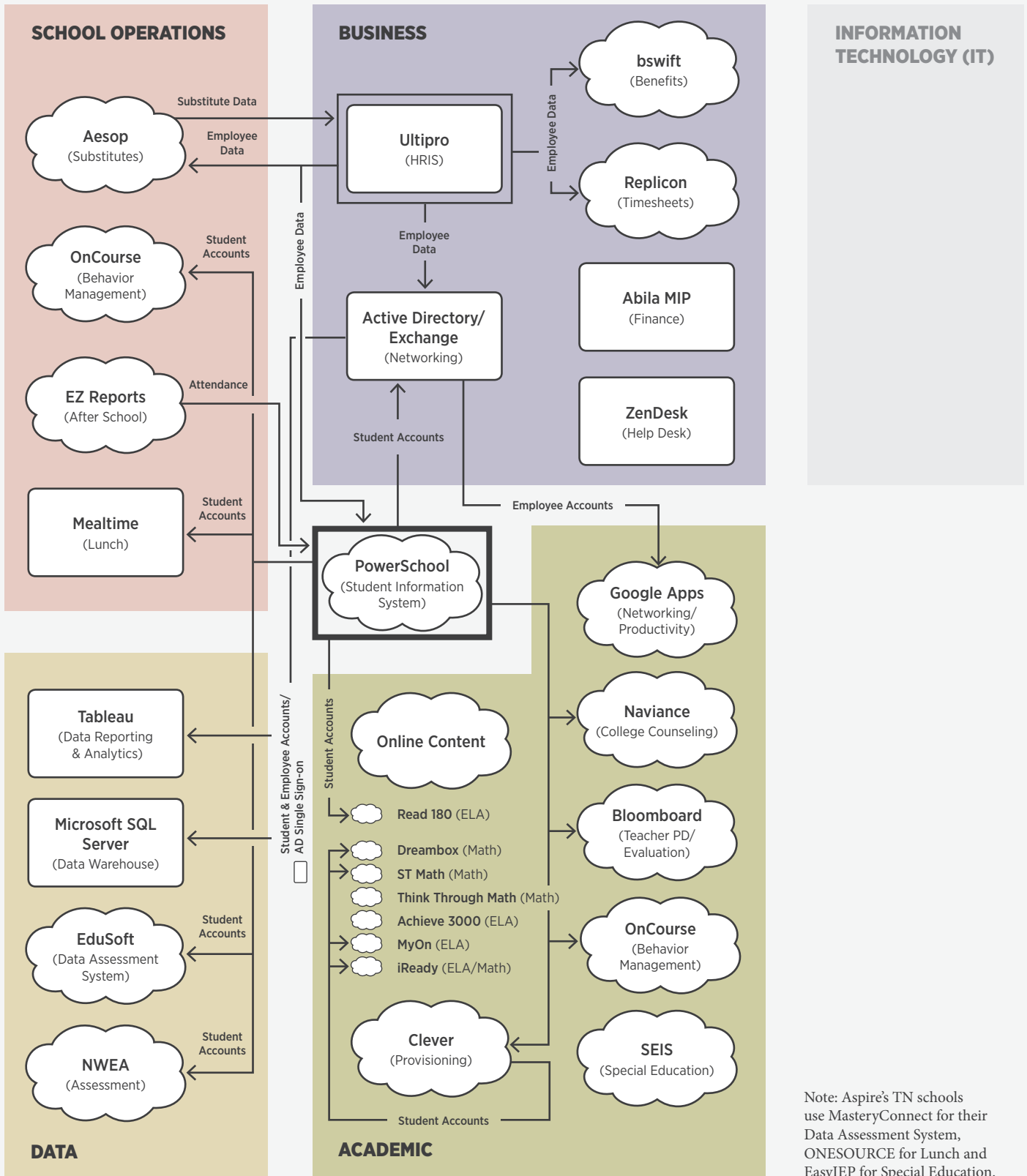
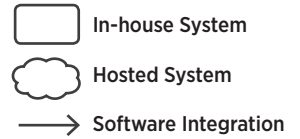
6-12; 22 schools; 10k students

Created 2/4/14



Aspire Public Schools Alameda, CA

6-12; 22 schools; 10k students
Created 9/10/13




Note: Aspire's TN schools use MasteryConnect for their Data Assessment System, ONESOURCE for Lunch and EasyIEP for Special Education.

Distinctive Schools

Chicago, IL

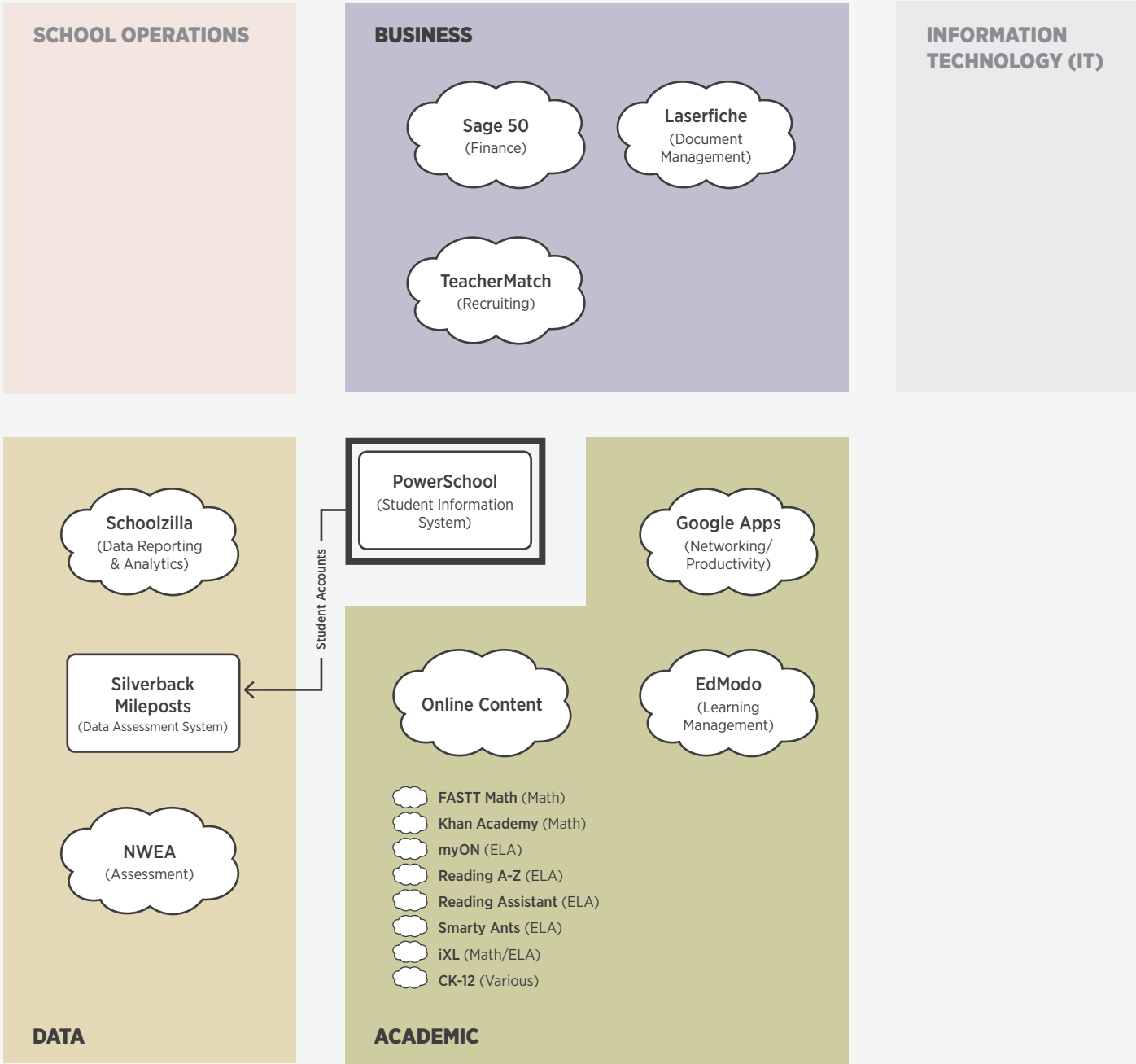
K-8; 5 schools; 2.5k students

Created 11/8/13

 In-house System

 Hosted System

 Software Integration

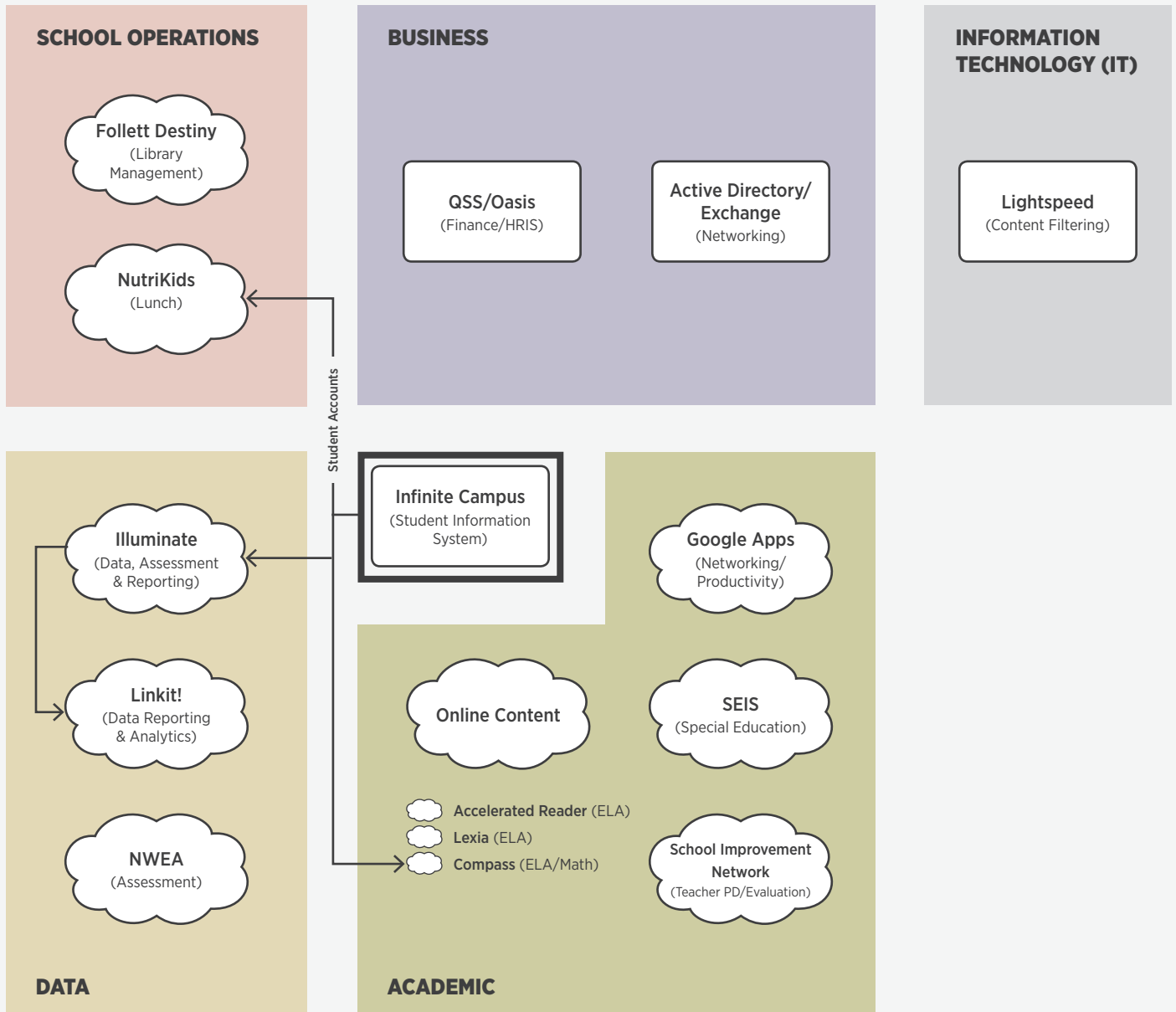
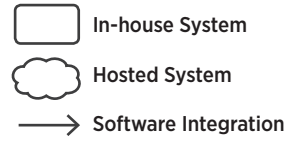


Galt Joint Union Elementary School District

Galt, CA

K-8; 8 schools; 3.7k students

Created 2/11/14

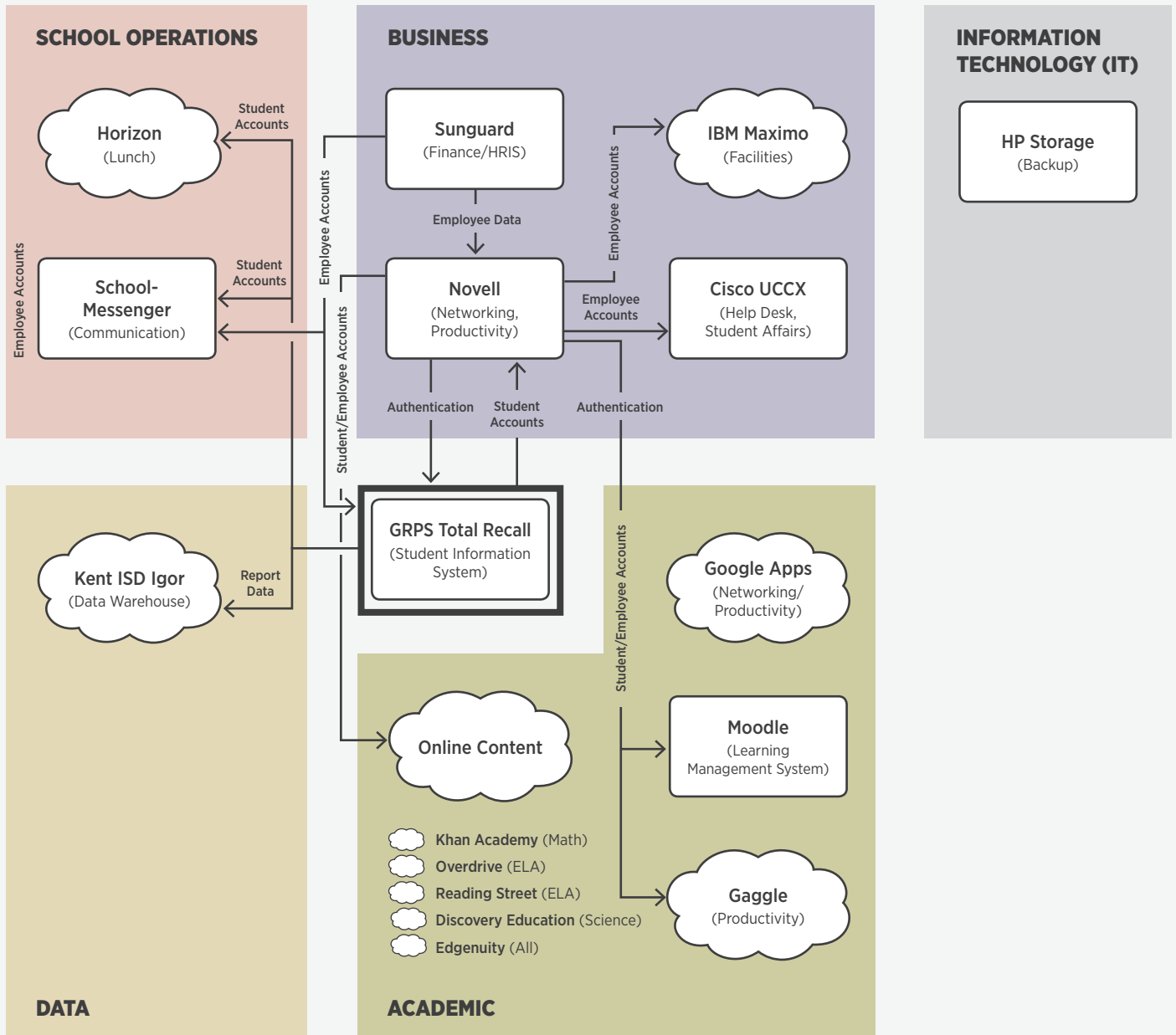
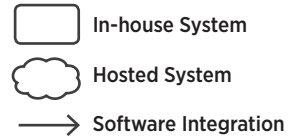


Grand Rapids Public Schools

Grand Rapids, MI

K-12; 41 schools; 17k students

Created 11/22/13

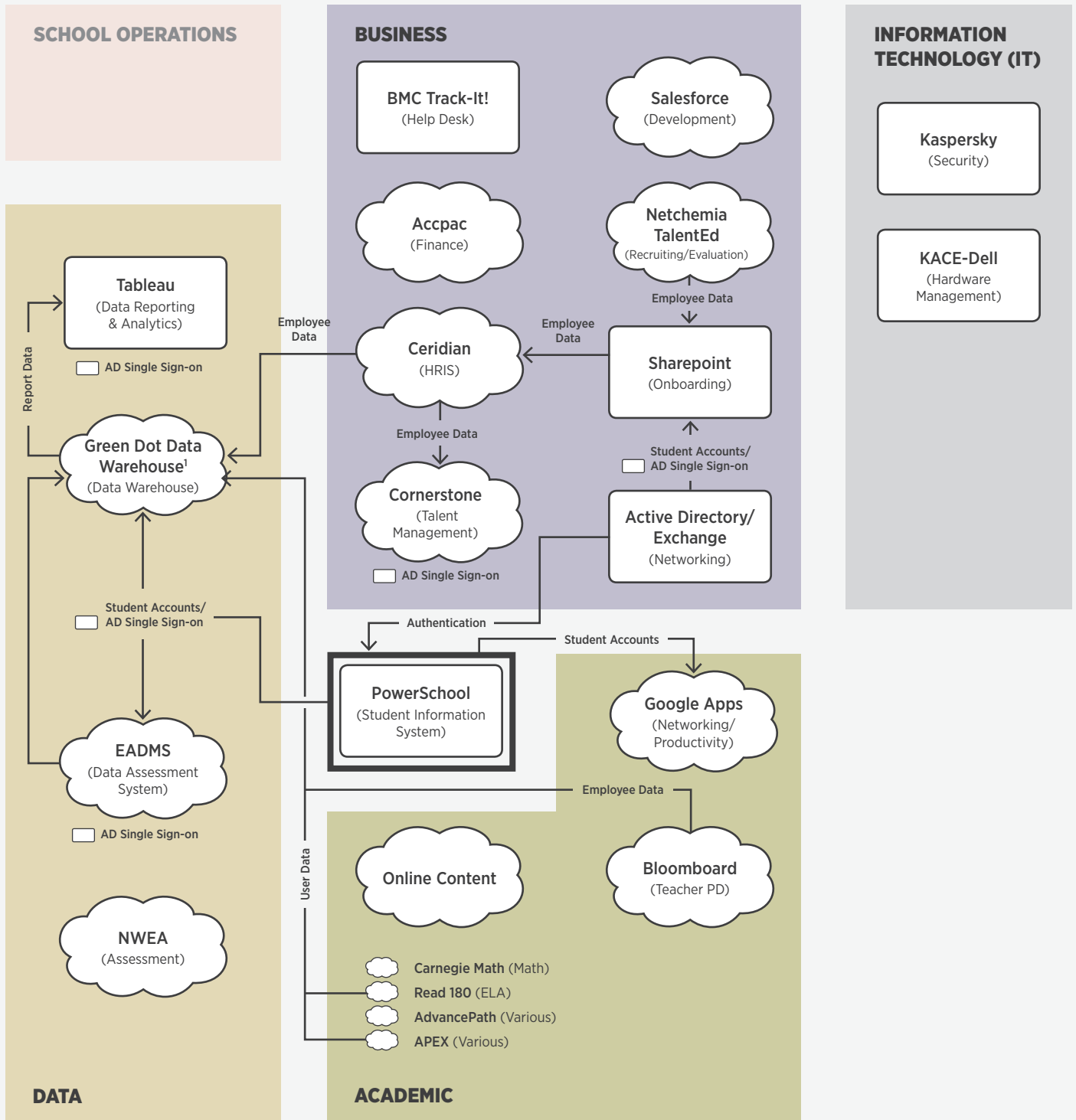
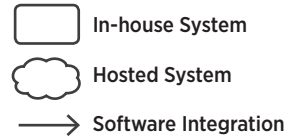


Green Dot Public Schools

Los Angeles, CA

6-12; 19 schools; 10k students

Created 9/26/13



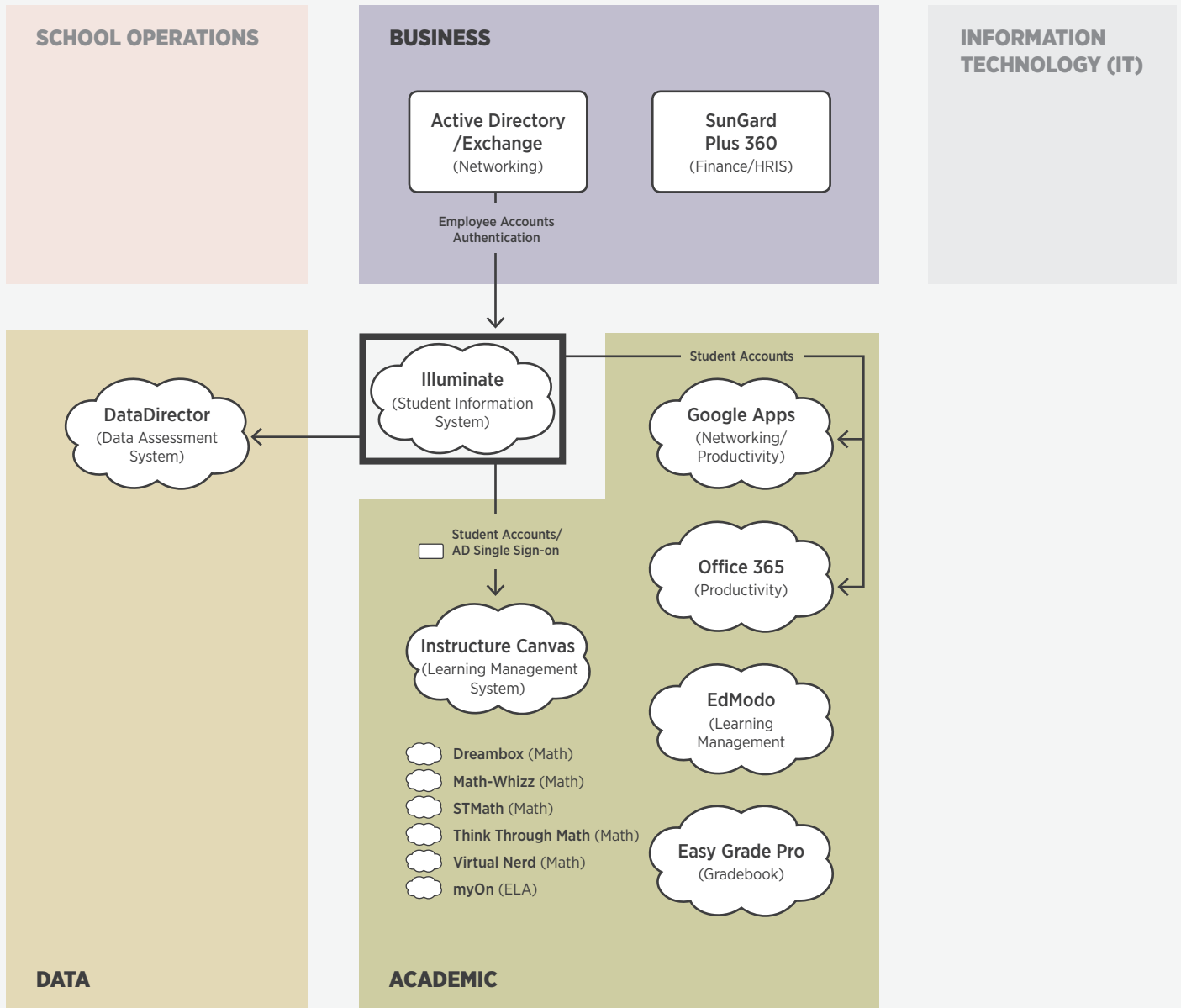
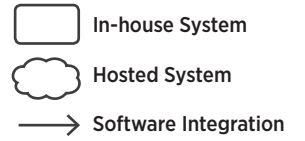
¹ Google Apps, Active Directory/Exchange, KACE-Dell, Kaspersky, and Track-It! are also integrated with the Green Dot Data Warehouse. These arrows are not represented to simplify the graph.

Highline Public Schools

Burien, WA

K-12; 40 schools; 19k students

Created 10/31/13

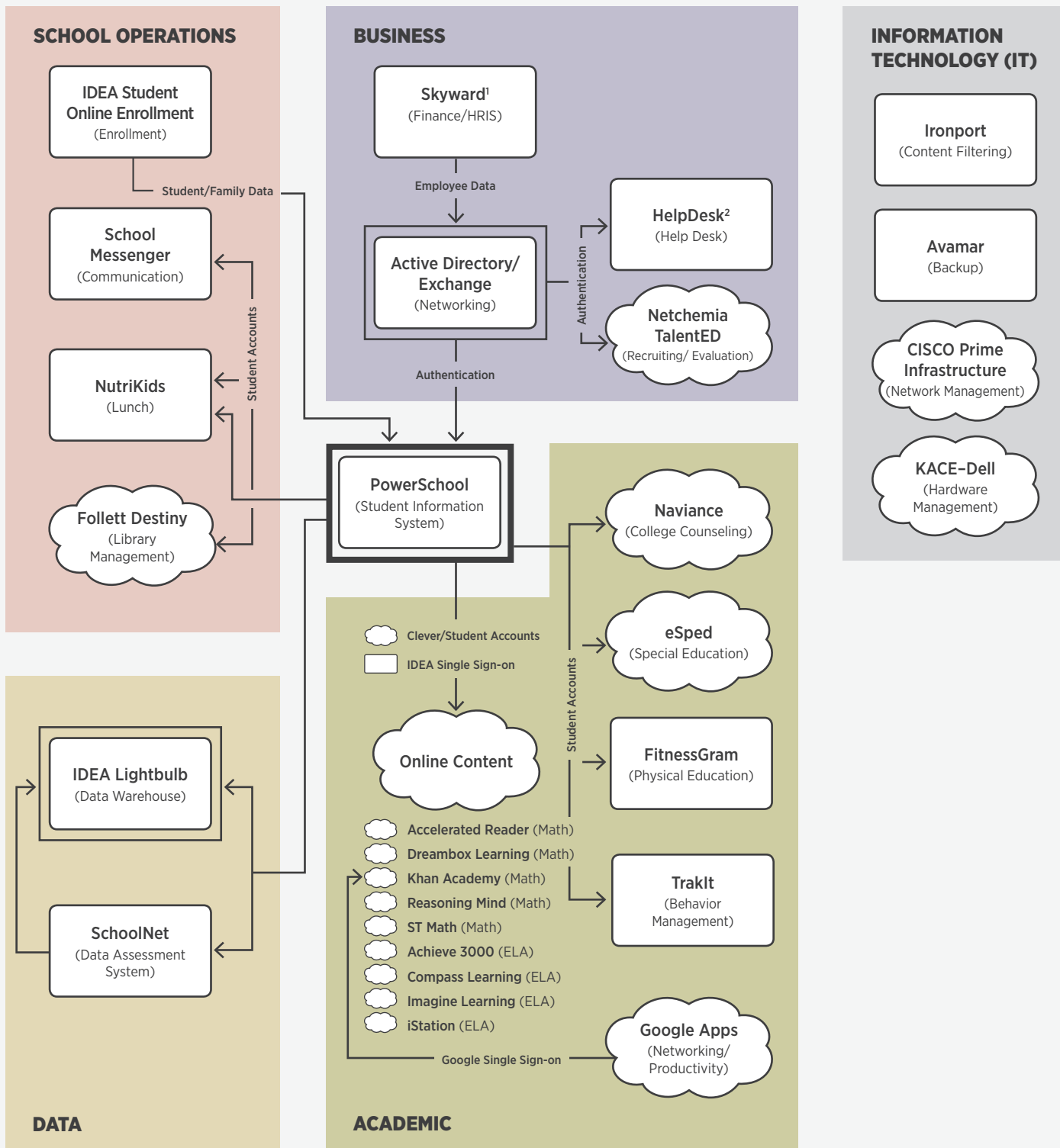
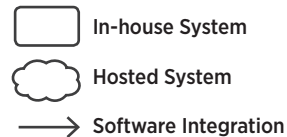


IDEA Public Schools

Weslaco, TX

K-12; 30 schools; 14.8k students

Created 10/27/13



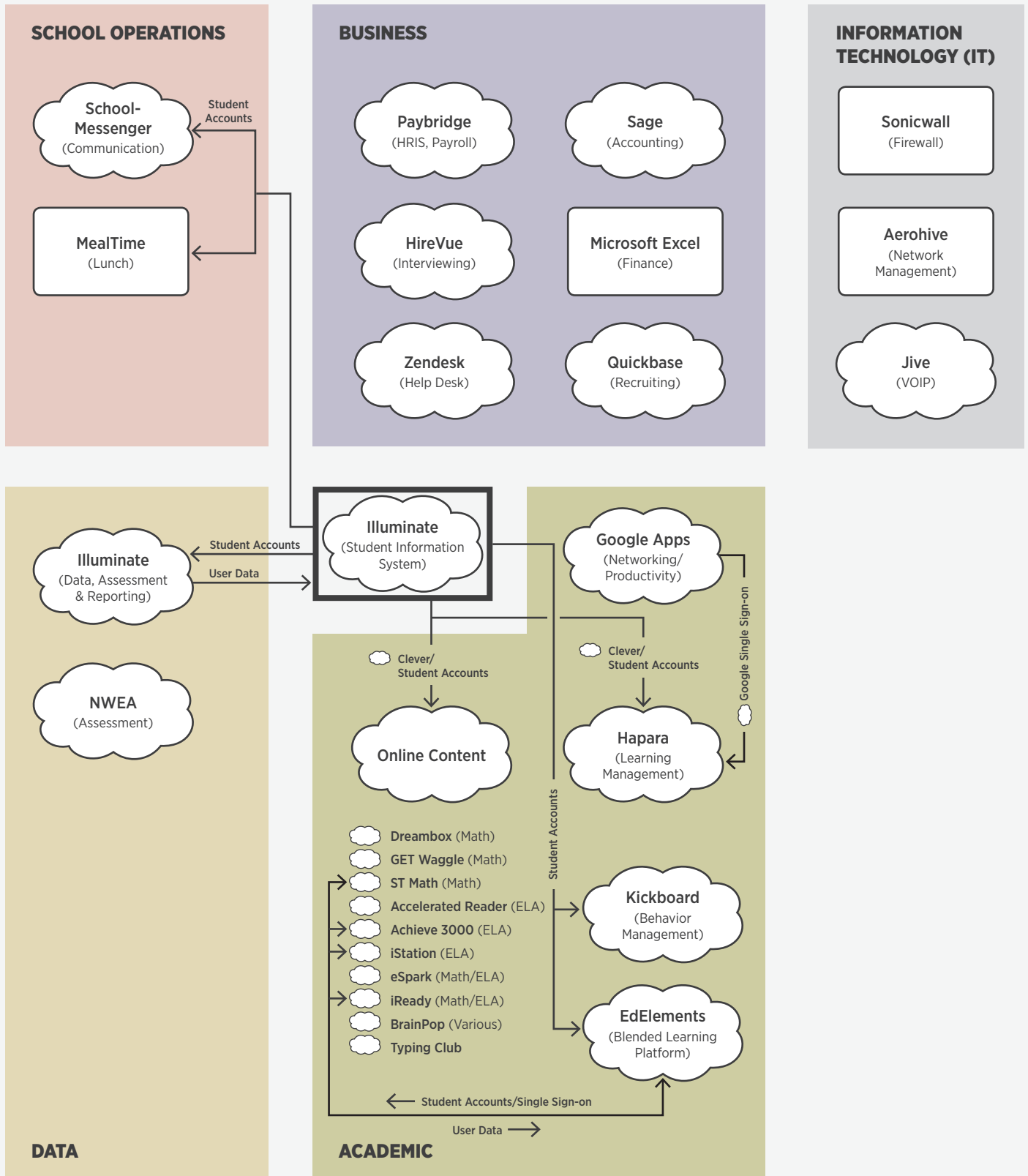
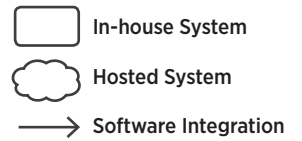
1 Skyward services include recruiting, HRIS, hourly-time tracking, payroll, position control, finance and accounting, and budgeting.
 2 HelpDesk services include human resources, IT, maintenance, payroll, and marketing.

KIPP LA Schools

Los Angeles, CA

K-8; 9 schools; 3k students

Created 11/25/13

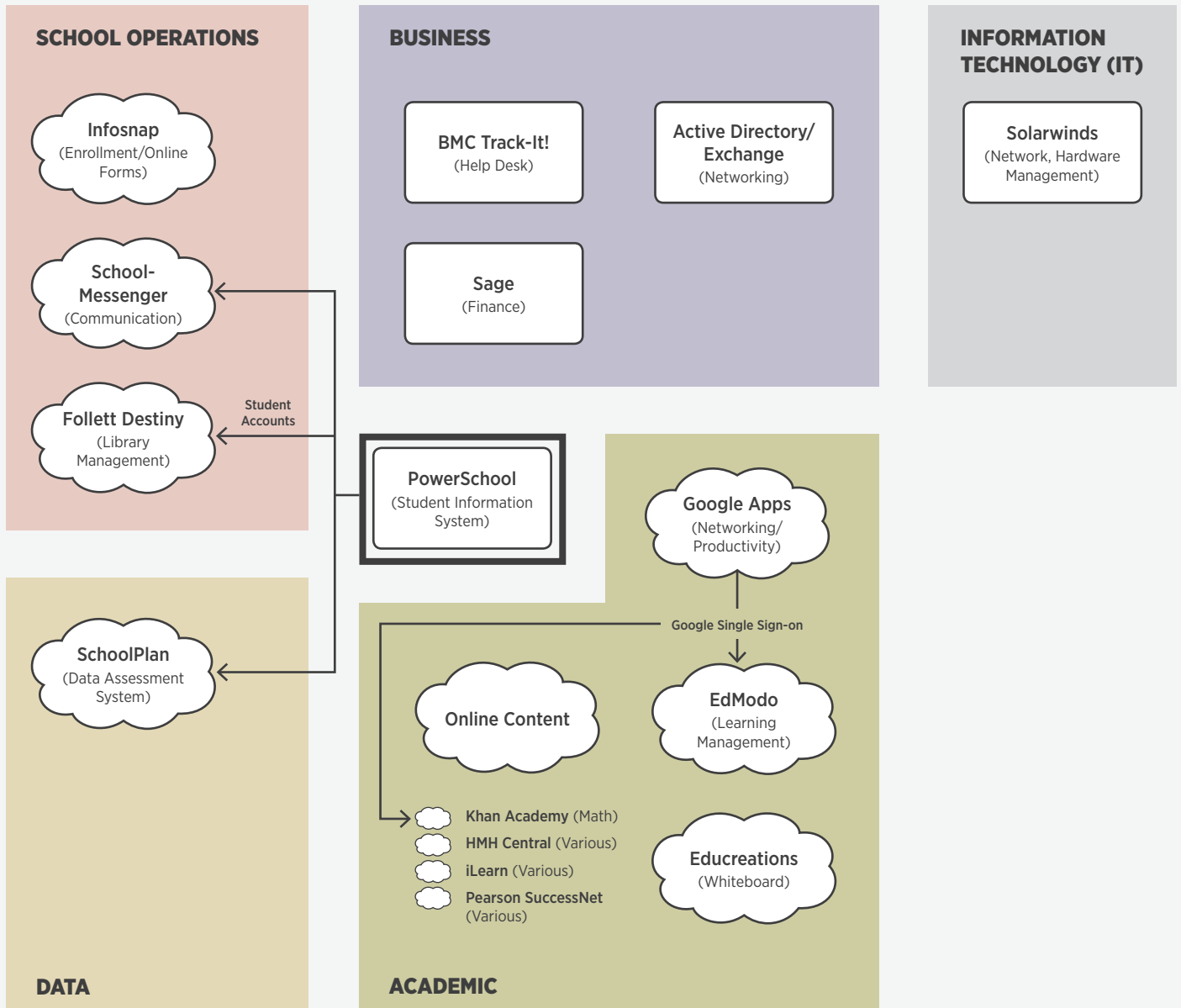
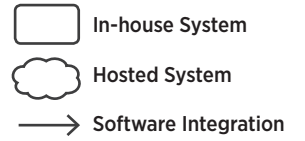


Los Altos School District

Los Altos, CA

K-8; 9 schools; 4.5k students

Created 9/17/13

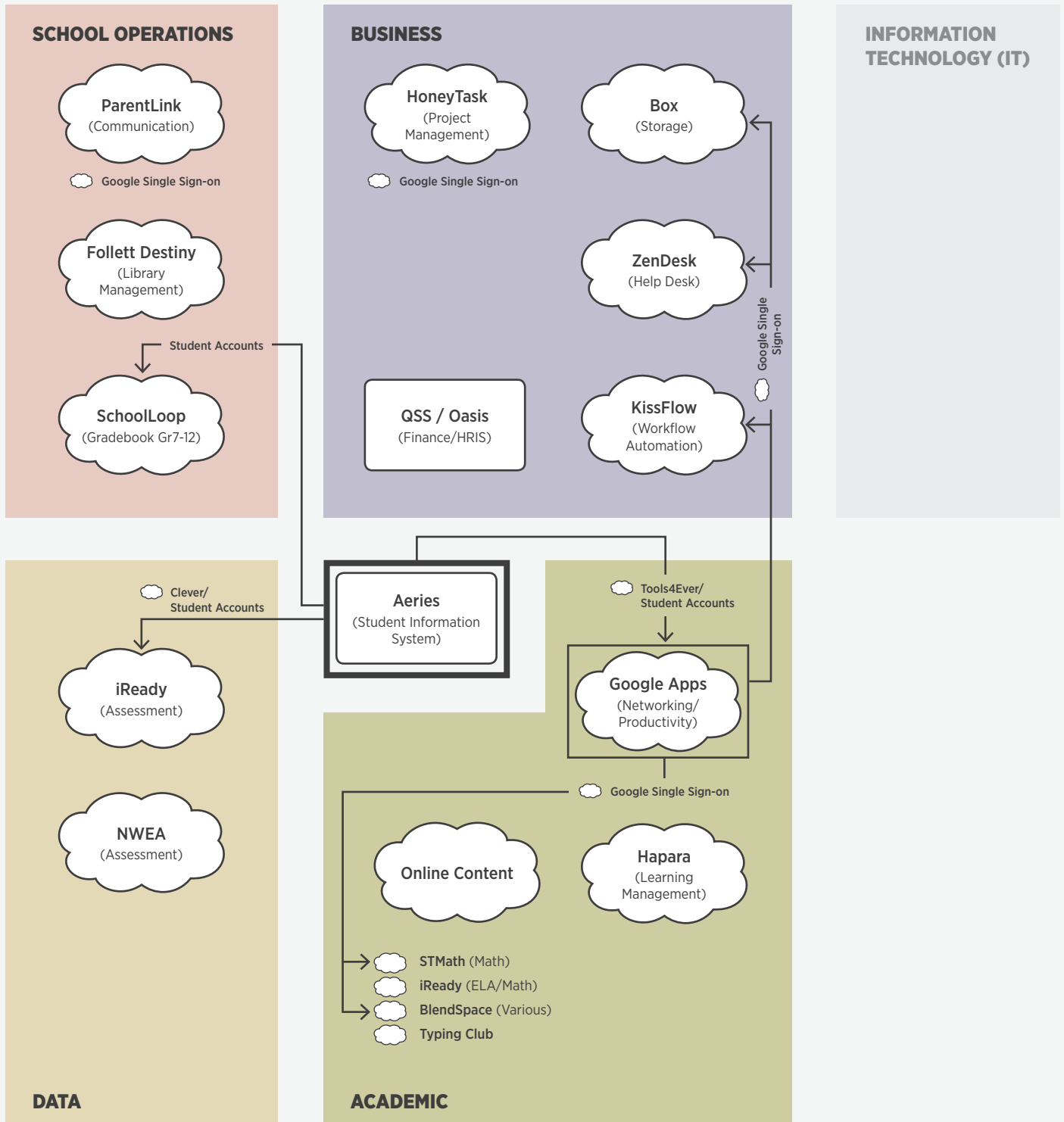
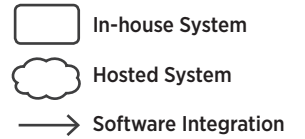


Milpitas Unified School District

Milpitas, CA

K-12; 14 schools; 10k students

Created 11/17/13

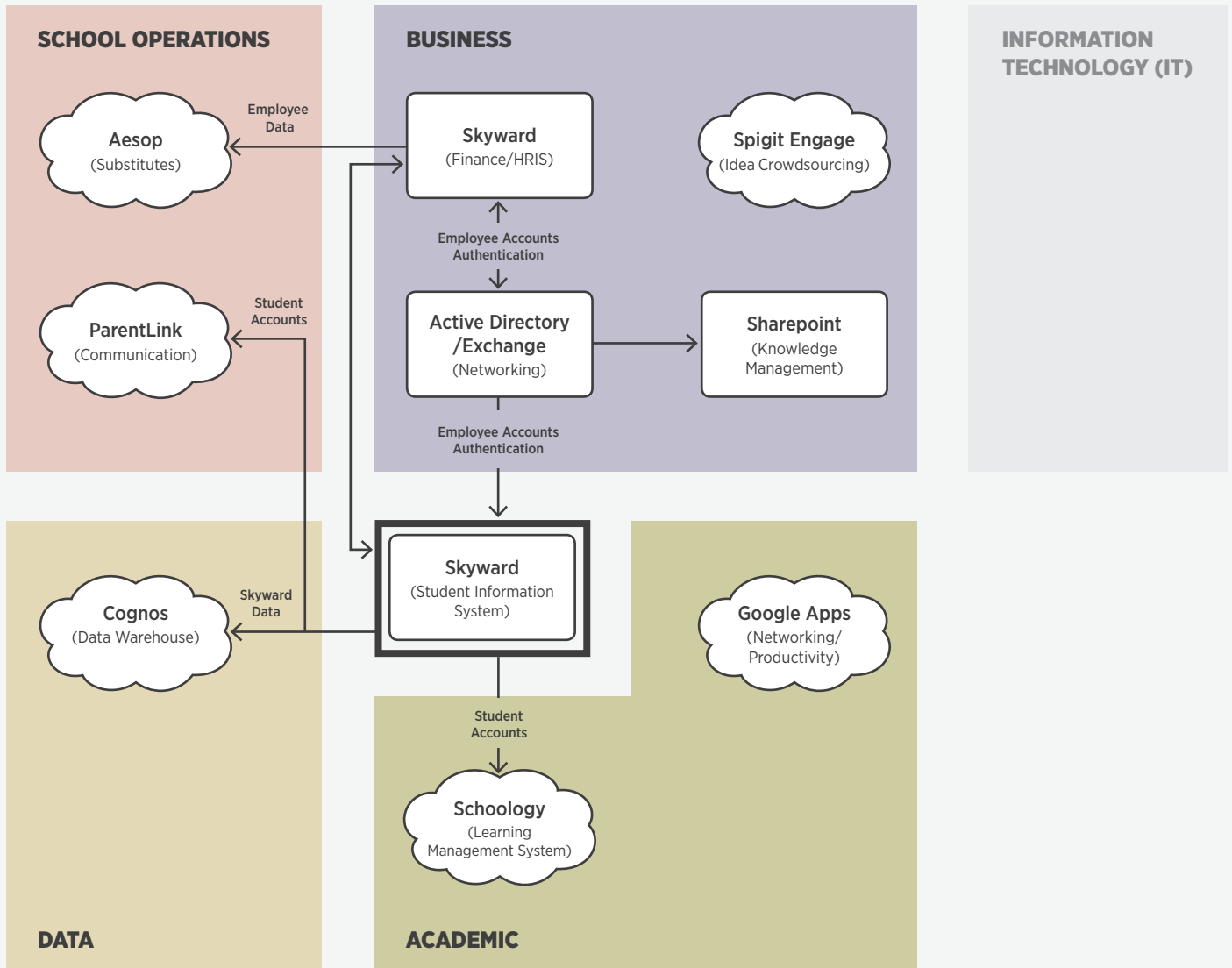
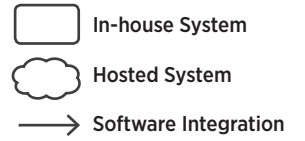


Minnetonka School District

Minnetonka, MN

K-12; 9 schools; 10k students

Created 11/26/13

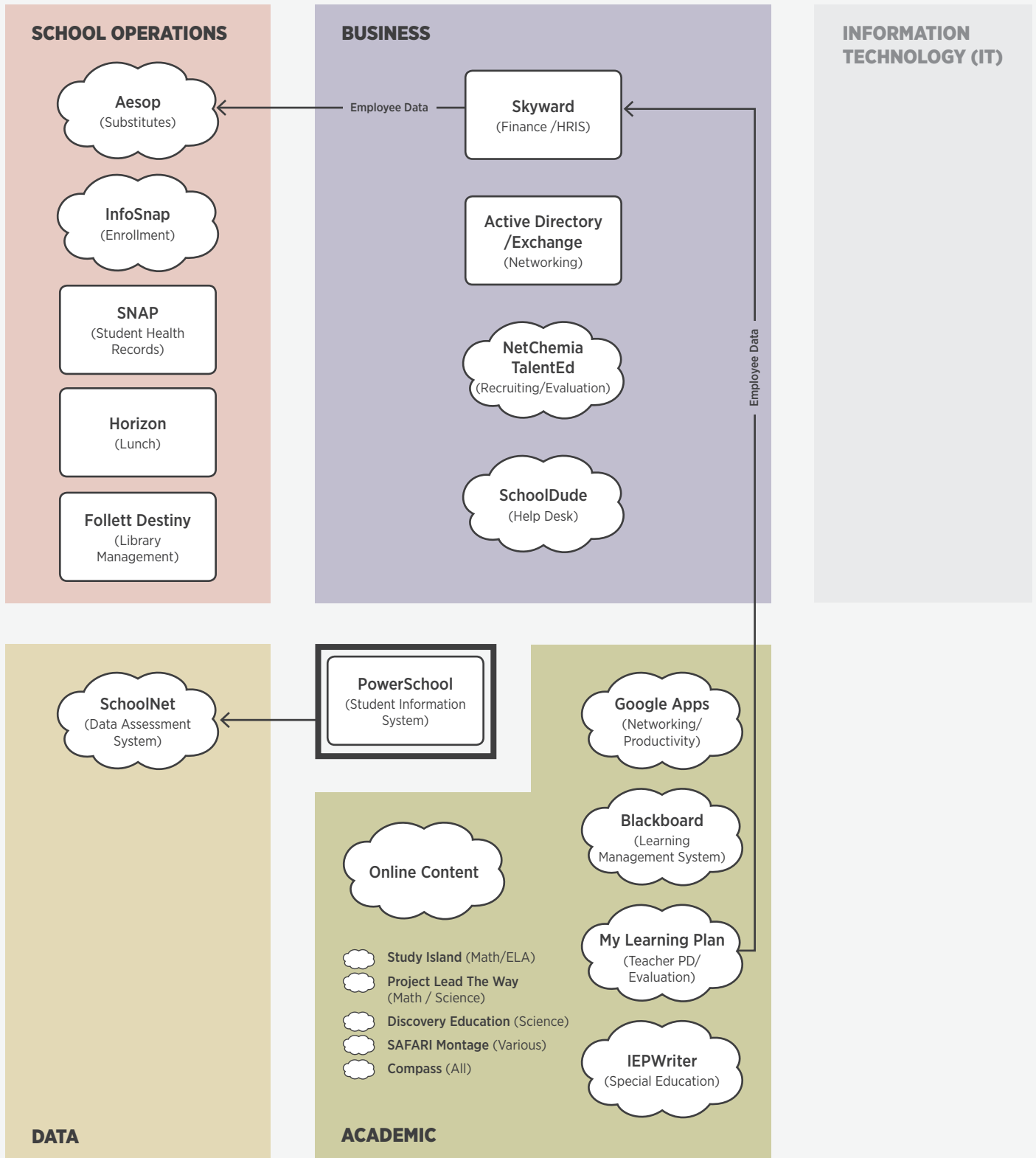
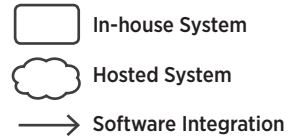


Quakertown Community School District

Quakertown, PA

K-12; 11 schools; 5k students

Created 12/4/13

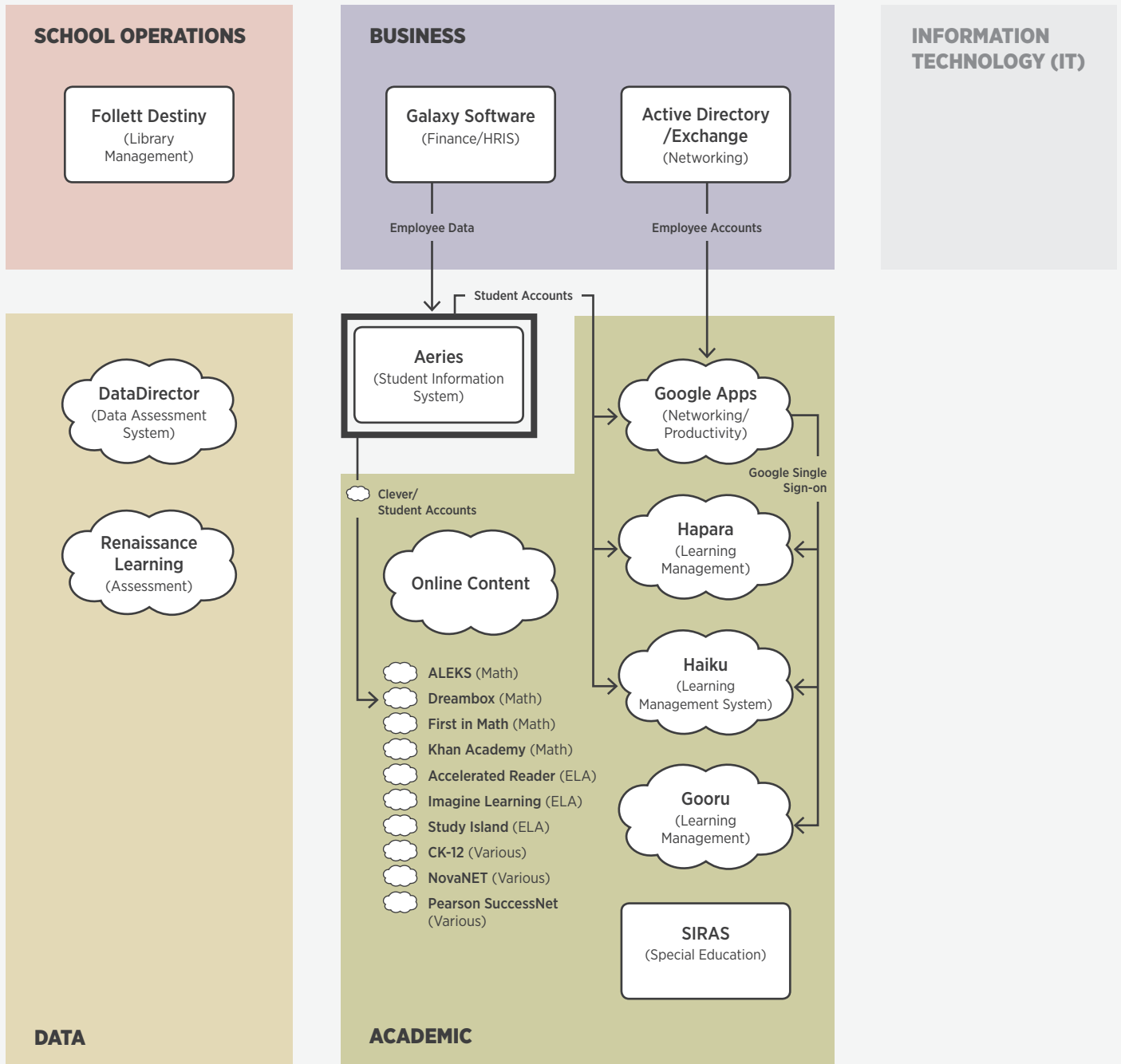
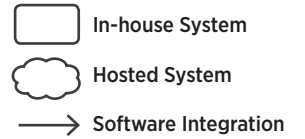


Riverside Unified School District

Riverside, CA

K-12; 43 schools; 43k students

Created 10/31/13

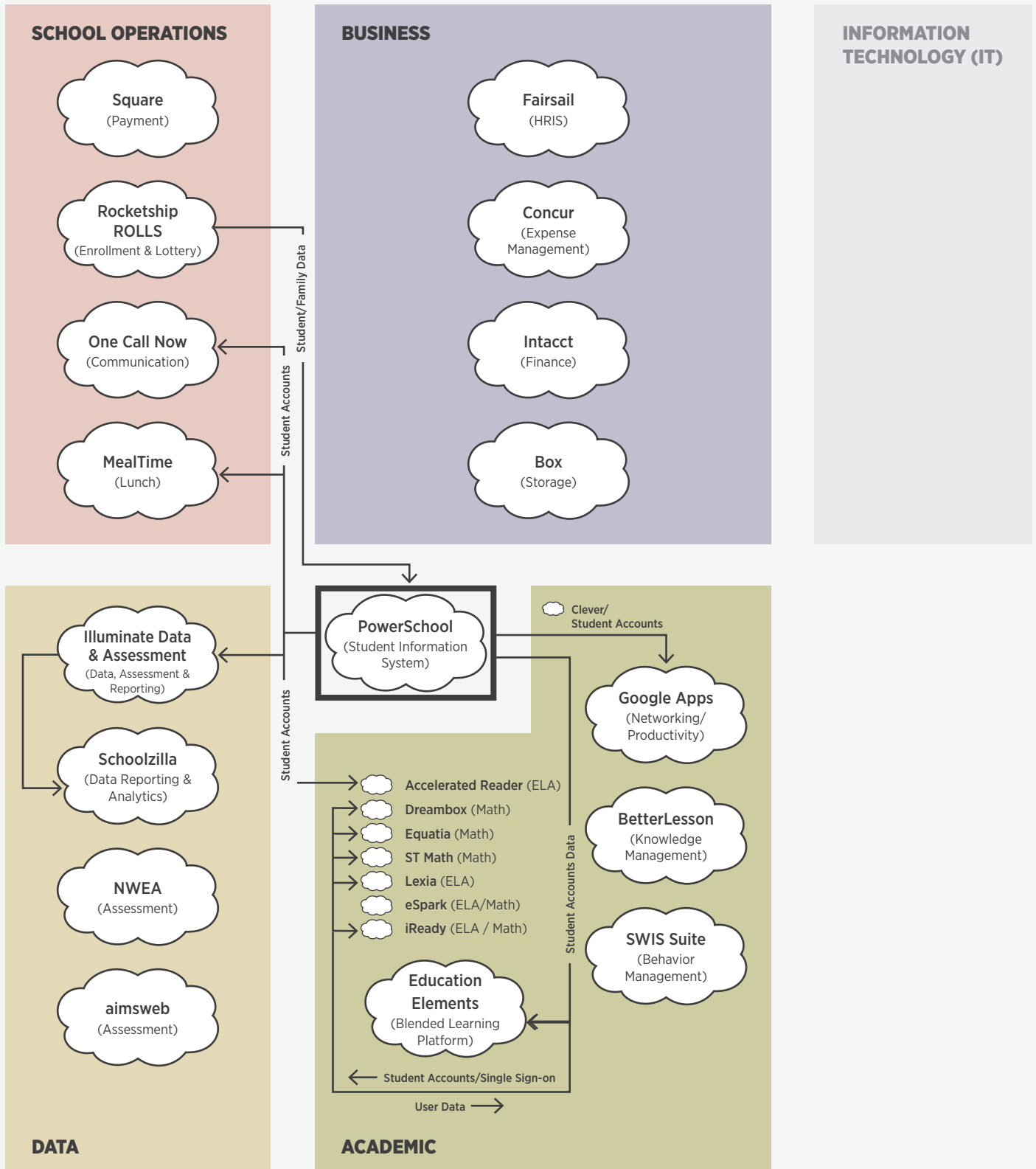
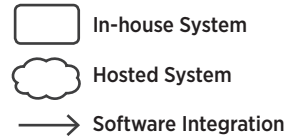


Rocketship Education

Redwood Shores, CA

K-5; 9 schools; 5k students

Created 10/11/13

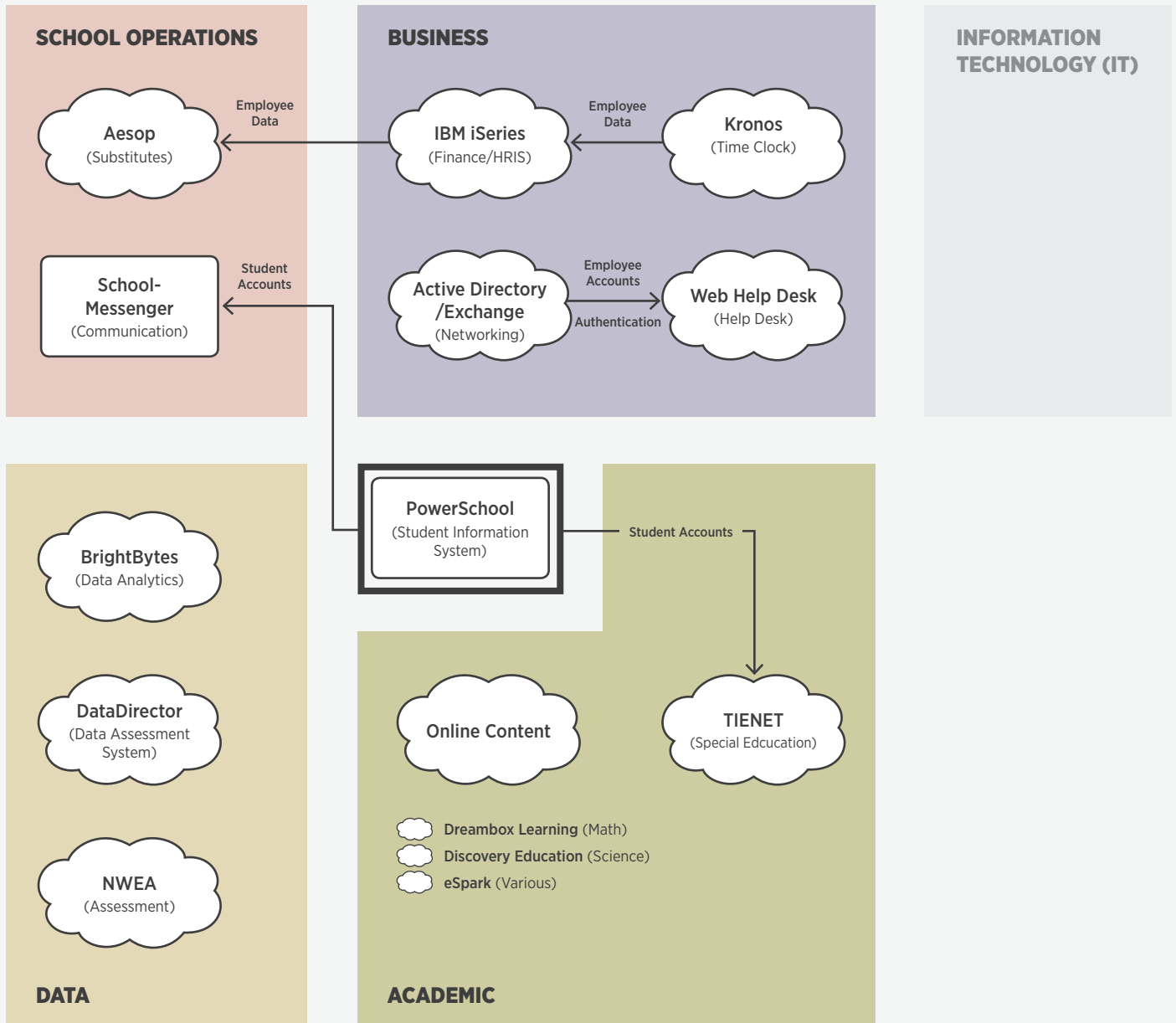
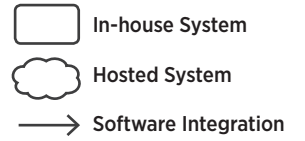


Utica Community Schools

Utica, MI

K-12; 37 schools; 29k students

Created 10/11/13



About the Clayton Christensen Institute

The Clayton Christensen Institute for Disruptive Innovation is a nonprofit, nonpartisan think tank dedicated to improving the world through disruptive innovation. Founded on the theories of Harvard professor Clayton M. Christensen, the Institute offers a unique framework for understanding many of society's most pressing problems. Its mission is ambitious but clear: work to shape and elevate the conversation surrounding these issues through rigorous research and public outreach. With an initial focus on education and health care, the Institute is redefining the way policymakers, community leaders, and innovators address the problems of our day by distilling and promoting the transformational power of disruptive innovation.

About the Charter School Growth Fund

The Charter School Growth Fund (CSGF) is a nonprofit fund that invests in the nation's highest-performing charter school operators to dramatically expand their impact on underserved students. Founded by national philanthropists to help transform K–12 education, CSGF has funded over 40 charter school management organizations (CMOs) that represent some of the most innovative and successful public school networks in the United States. Similar to a venture capital firm, CSGF provides financing, business planning, strategic support, and other resources to help portfolio members build sustainable networks of high-performing charter schools.

Disclosure

Alex Hernandez works for CSGF, which has a mission-related investment in Dreambox Learning and is a philanthropic supporter of many of the CMOs surveyed for this paper. Aylon Samouha currently works as an independent design consultant for Achievement First.

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