Creating a system for data-driven decision-making: applying the principal-agent framework

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The purpose of this article is to improve our understanding of data-driven decision-making strategies that are initiated at the district or system level. We apply principal-agent theory to the analysis of qualitative data gathered in a case study of 4 urban school systems. Our findings suggest educators at the school level need not only systemic support but also enough decision-making autonomy to make site-level decisions on the basis of data. Secondly, we found that building expertise and capacity at the school site for data-driven decision-making is necessary but not a sufficient condition for success. Finally, in designing an accountability system, the imbalance in the distribution of information between the central office and the schools must be accommodated. Implications for further research and policy, based on these findings, are also discussed.

Keywords: data-driven decision-making; principal-agent theory; education reform; school improvement; accountability; urban education

Introduction

With the advent of the No Child Left Behind Act (NCLB), the push for increased accountability and improved student achievement in American public schools has never been greater. Prominent educational researchers have long decried education as a field in which practitioners make decisions based on intuition, gut instinct, or fads (Slavin, 2002, 2003). Supporters of data-driven decision-making practices argue that effective data use enables school systems to learn more about their schools, pinpoint successes and challenges, identify areas of improvement, and help evaluate the effectiveness of programs and practices (Mason, 2002). In fact, the theory of action underlying NCLB requires that educators have the will and know-how to analyze, interpret, and use data so that they can make informed decisions in all areas of education, ranging from professional development to student learning.

Previous research, though largely without comparison groups, suggests that data-driven decision-making has the potential to increase student performance (Alwin, 2002; Doyle, 2003; Johnson, 1999, 2000; Lafee, 2002; McIntire, 2002; Peterson, 2007). When school-level educators become knowledgeable about data use, they can more effectively review their existing capacities, identify weaknesses, and better chart plans for improvement (Earl & Katz, 2006). A recent national study of the impact of NCLB found that districts are indeed allocating resources to increase the use of student achievement...
data as a way to inform instruction in schools identified as needing improvement (Center on Education Policy, 2004; also see The Information Edge, 2006). Student achievement data can be used for various purposes, including evaluating progress toward state and district standards, monitoring student performance and improvement, determining where assessments converge and diverge, and judging the efficacy of local curriculum and instructional practices (Crommey, 2000).

However, data need to be actively used to improve instruction in schools, and individual schools often lack the capacity to implement what research suggests (Diamond & Spillane, 2004; Ingram, Louis, & Schroeder, 2004; Marsh et al., 2005; Mason, 2002; Petrides & Nodine, 2005; Wohlstetter, Van Kirk, Robertson, & Mohrman, 1997). To address this problem, districts have invested in management information systems and professional development to develop expertise and capacity at the school level (see, e.g., Borja, 2006). Some districts have also contracted with external agencies and consultants to assist in their capacity-building efforts district-wide (Jacobson, 2007; Marsh et al., 2005).

Similarly, in the charter school arena, education service providers including education management organizations (EMOs) and charter management organizations (CMOs) have also sought to build capacity in schools and throughout the system (Colby, Smith, & Shelton, 2005). Several expressly utilize data-driven decision-making as one of their key pillars. For example, a case study of an Edison school found that the EMO helped to cultivate a culture of data use and data-driven practice through its curriculum, assessment, and organizational structure (Sutherland, 2004).

In spite of system-level investments to build capacity and expertise for data-driven decision-making, many studies conclude that teachers are not actively using data to guide planning and instructional decisions (Earl & Katz, 2006). Teachers need not only the capacity to use data but also the empowerment and the will to do so. How can data-driven decision-making plans be more effectively executed? At the most fundamental level, data-driven decision-making plans involve an implicit contract between the central office and the schools whereby the district assists in the collection and analysis of data, but the responsibility for interpreting results and developing solutions is decentralized to schools and individual teachers. Viewing data-driven decision-making through this lens – as a contractual relationship – leads to questions such as if the information management system is there, why don’t teachers use it? If professional development is offered, why is it ineffective with so many teachers?

The purpose of this article is to improve our understanding of data-driven decision-making strategies that are initiated at the system level. We apply principal-agent theory to identify strengths and diagnose problems in current data-driven decision-making plans and to help devise policy options for future plans. In particular, we emphasize the role of the system in shaping and supporting instructional improvement through the use of student achievement data. The article also explores the degree to which principal-agent theory helps to inform policy options for implementing data-driven decision-making. Although principal is the term commonly used in the USA and other countries to refer to the school-level leader or administrator, for purposes of clarity, we use principal in the principal-agent dyad to refer to system-level leaders and use the term school leader or site administrator in place of the usual term principal.

**Basics of principal-agent theory**

The principal-agent framework captures an essential feature of work organizations in which interpersonal relations are viewed as “webs of contracts”: One party (the principal)
needs a task carried out, lacks the time or expertise to do it personally, and so delegates the task to another (the agent). This theory of organization, originally associated with unbundling the black box inside firms, has since been applied to a variety of contractual relationships across many disciplines – employer-employee (management), legislator-bureaucrat (political science), and buyer-supplier (economics), to name a few. While much of the early work with principal-agent theory focused on formal contracts, more recent work extends the framework to exchange relationships where the contract is implied and where relationships involve different levels of government (Brown, 1988; Ferris & Winkler, 1991).

At the heart of principal-agent theory is a contract specifying decision rights – what the agent should do and what the principal must do in return – and with this relationship come built-in control problems. First, how can the principal design the contract with various incentive structures to facilitate control of the agent? Second, when the principal monitors and discovers the agent has strayed from the principal’s preferences, what kind of sanctions or rewards can be applied to bring the agents back in line? In effect, the theory makes two assumptions: that goal conflict exists between principal and agent and that the agent has more information than the principal, which results in information asymmetry between them. As Waterman and Meier (1998) further explain: “Because there is goal conflict between principals and agents, agents have the incentives to shirk (or engage in other non-sanctioned actions). The information asymmetry allows [agents] to be unresponsive to [principals]” (p. 177). In sum, from the principal-agent perspective, behavior of individuals entails an interactive function of decision rights, information, and values.

Applying the principal-agent framework, public education can be viewed as a series of contractual relationships (see, e.g., Davies, Coates, Hammersley-Fletcher, & Mangan, 2005; Ferris, 1992; Hentschke & Wohlstetter, 2004; Moe, 2005). In the U.S. federal system, the central government – the principal – delegates primary responsibility for education to the states – the agent. However, the states traditionally decentralize much control over education to local school districts. Thus, the contractual relationship between the state and school districts can be viewed as a second principal-agent relationship. Within school districts, the local school board delegates authority to the central district staff to implement its decisions, providing another principal-agent relationship. The district office, in turn, decentralizes authority to the school level. It is this last relationship that is at the heart of data-driven decision-making and, thus, the focus of this article.

As noted earlier, principal-agent problems plague contractual relationships largely because of the interactive effects of decision rights, information, and values on the behavior of individuals – the principal and the agent. The principal seeks to get the agent to act or behave as if the agent were the principal. More specifically, the principal-agent theory leads us to five specific and interrelated problems within the district-school relationship. Below, we detail the five problems associated with principal-agent relationships: (1) limited decision rights, (2) information asymmetry, (3) divergent objectives, (4) weak incentives, and (5) adverse selection.

First is the problem of limited decision rights, which results in an imbalance of decision-making power between the principal and agent. Those closest to the students are in the best position to judge their needs and abilities and hence to choose the most suitable methods and technologies for successful learning. A school charged with implementing a data-driven decision-making plan needs to have the decision rights at the school site such that teachers have the authority to identify, develop, and implement an intervention strategy based on their analysis of data. For instance, to what extent do individual schools
have the authority to establish intervention programs for English-language learners during after-school hours or on Saturdays? Equally problematic is the fact that in many school districts, hiring decisions are largely controlled by the central office. This has the effect of limiting the school’s decision rights – the head of a school has only limited control over who is on her education team, and further its composition can be changed at the whim of the central office.

Related to decision rights is the information asymmetry problem, which arises when information within the principal-agent relationship is not evenly distributed; the agent, who is closest to the action, has an information advantage (e.g., knowledge about students and their families) over the principal. For example, a district imposing a data-driven decision-making plan on its schools may require all teachers in the district to attend a basic literacy workshop even though the reality is that many of its schools are struggling with the specific issue of teaching English-language learners. Also, it is usually the case that the principal – the central office – lacks information necessary to accurately assess the causes of poor (and good) performance of each and every agent. In the case of data-driven decision-making, the district has access to very little information about, for instance, the process teachers use to apply data to school planning and improvement decisions. Consequently, some schools will look better than they actually are and some will look worse than they are. A key component for addressing these problems entails a strong bottom-up information flow. In order to devise an effective data-driven decision-making system, districts need to rely on schools to provide accurate and comprehensive knowledge of their abilities so that, for example, professional development strategies can be tailored to educators’ needs. However, at this point, past studies suggest that many district data use plans tend to be devised by central office administrators, based on incomplete information of schools and then imposed on site-level teachers and administrators.

Another aspect of information and its asymmetry focuses on knowledge about the consequences of alternative decisions and behaviors. The principal is interested in getting the agent to behave as if the agent were the principal, so the principal empowers the agent with authority, but the agent might not have the information necessary to make smart decisions about alternative actions. The theory takes into consideration the widespread circumstance that individuals will act even without authority because the information to which they have access suggests no consequences for doing so. An example of this is a classroom teacher who schedules a test for the Monday after a school-designated “homework free” weekend. Of course, the reverse is also common: Agents shirk and act as if they did not have authority, because they perceive more favorable consequences for doing so, based on the limited information they have. An example of this would be a second-grade teacher who passes onto the third grade students who cannot yet read, because the teacher believes that the consequences are more favorable than if she retains the students.

In principal-agent relationships, the behavior of individuals is also affected by the divergent objectives problem, which occurs when agents pursue their own objectives at the expense of pursuing the principal’s objectives. For example, the central office administrators – the principals – may value using data only from standardized tests in math and reading in making decisions about curriculum and instruction, while agents – the schools – value a broader range of subjects assessed using multiple measures (e.g., attendance rates, portfolios, parent satisfaction ratings). This problem is compounded when the principal achieves compliance at the extreme cost of monitoring and controlling the agent. In the context of a data-driven decision-making plan, an example would be a central office that invests time and money in designing an instrument to guide school-level
discussions about data and then deploys staff to schools to attend all teacher meetings to “police” implementation.

Closely related to the divergent objectives problem is the weak incentives problem. The agent is not motivated to share the same values as the principal. In effect, the agent does not have the will to carry out the activities requested by the principal. In school districts, this problem can easily arise around data-driven decision-making. While the central office supports making decisions based on data through its investments in information management systems and professional development, teachers in classrooms where students are performing extremely poorly (or extremely well) may not have an incentive to spend time in teacher meetings, some outside the school day, to design data-based strategies for improving student performance. In the first instance, “there’s nothing I can do to improve the very low performers”; in the second instance, “there’s no need to intervene.”

Finally, the principal-agent framework addresses the adverse selection problem. The adverse selection problem can occur when agents, regardless of capacity, ability, or desire to perform, are selected to enter into the contract with the principal. In education terms, this often occurs when systems move to mandate that all schools adopt and implement a reform strategy. Alternately, systems could select particular schools – likely those most willing – to participate in a reform initiative, and thus more likely to lead to a successful result.

In summary, the principal-agent framework is useful in helping to explain the interactive effects of decision rights, information, and values on behavior. These conditions characterize a variety of relationships in public education. Of particular interest in the context of this article are the relationships within school districts, particularly between the central office and schools. From the perspective of principal-agent theory, effective data-driven decision-making systems will need to transmit the values of system-level educators (the principal) to the agents at the school level. The principal will also need to empower school-level educators with the authority to act and with information about the consequences of alternative actions such that the agents will choose to behave as if they were the principal.

Research methods
During the 2006–2007 school year, we conducted a qualitative case study of four school systems to capture the details of data-driven instructional decision-making. The study was supported by a grant from NewSchools Venture Fund, with funding from the Gates and Hewlett Foundations. Our study included two mid-size urban school districts and two nonprofit charter management organizations. Our rationale for including both regular public school districts and charter management organizations in this study was based upon research suggesting that both types of school systems are engaging in innovative practices in data-driven decision-making. These particular school systems were chosen on the basis of being leaders in using performance results in general – and data in particular – for instructional decision-making, which seems to have led to improved student achievement over time (see Datnow, Park, & Wohlstetter, 2007).

In collaboration with NewSchools, we chose four school systems from a list of over 25 school systems that had been recommended as fitting our criteria. We narrowed down the list of possible sites after reviewing system web sites, speaking with experts in the field, and conducting phone interviews with system leaders. While acknowledging the successes they had experienced in becoming more data driven, all system leaders also were careful to note
that their work was “in progress.” Our study included the four school systems described in Table 1.

These school systems have obvious differences in size, history, and mission. Garden Grove and Aldine are mid-size urban public school districts that have been in operation for many years. Both have histories of steadily improving student achievement over the past decade. Aspire and Achievement First are relatively new organizations, the former having been founded in 1998 and the latter in 2003. They are both networks of charter schools that operate “home offices” that function similarly to school districts’ central offices, providing oversight in accounting, curriculum, governance, and organization. All four school systems are composed primarily of schools in urban locations or those serving large numbers of low-income students and students of color.

We studied two schools in each of the four school systems, with a focus on practices in the elementary grades (K-8). These schools were recommended to us by system personnel because of their high level of engagement in data-driven decision-making. Our study included six elementary schools, one middle school, and one high school serving ninth graders only. Table 2 gives a detailed demographic picture of the individual schools and the systems themselves.

Our site visits to the school systems and schools took place between March and May 2006. We interviewed two to three administrators from the home or central office, including the superintendent, assistant superintendent (in three of the four systems) or chief academic officer, and the director of research and/or assessment. At each school, we interviewed the school leader, often the assistant head, and a minimum of five teachers across grade levels. We also interviewed lead teachers, where possible. We conducted approximately 70 interviews across the four school systems and schools. At each school, we also conducted informal observations of the school and classrooms and relevant meetings. Finally, we gathered a plethora of documents at the school and system levels that were pertinent to our study.

All interviews were taped and transcribed verbatim at the conclusion of the site visits. Interview transcripts were then coded with the aid of HyperResearch, a qualitative data analysis software package. We initially coded the data according to an early conceptual framework we had developed about the role of the system in supporting school-level data-driven decision-making. The coded data were then used to develop detailed case reports on each system in the study. These case reports were organized according to a common outline, thus facilitating cross-site analysis. For the purposes of this article, we then coded the data in the case reports once again using the principal-agent framework discussed above.

Table 1. Overview of system sample.

<table>
<thead>
<tr>
<th>System</th>
<th>No. of Schools</th>
<th>Location</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden Grove Unified School District</td>
<td>70</td>
<td>CA</td>
<td>Regular public school district</td>
</tr>
<tr>
<td>Aldine Independent School District</td>
<td>63</td>
<td>TX</td>
<td>Regular public school district</td>
</tr>
<tr>
<td>Achievement First Public Schools</td>
<td>6</td>
<td>NY; CT</td>
<td>Nonprofit charter management organization</td>
</tr>
<tr>
<td>Aspire Public Schools</td>
<td>14</td>
<td>CA</td>
<td>Nonprofit charter management organization</td>
</tr>
</tbody>
</table>
Findings

With knowledge from principal-agent theory about contractual relationships and the accompanying problems/challenges, how can data-driven decision-making plans be structured more effectively? Our findings are organized to explore the following five research questions: (1) How did the systems (meaning educators above the school level acting as “principals”) align the objectives and values of schools (meaning educators at the school level who are acting as “agents”) with their own? (2) How did systems deal with the problem of information asymmetry? (3) Did the systems provide incentives to their schools to encourage data use in ways valued by the principal? (4) Have the systems empowered their schools with enough decision-making authority to improve quality and performance? Do the schools have sufficient information about the consequences of alternative actions so that decisions are made in line with the system’s objectives? (5) How did systems deal with the problem of adverse selection? What did systems do to build the capacity (knowledge and skills) of school-level educators to implement data-driven decision-making as the principal preferred?

(1) Addressing the problem of divergent objectives between the central office and schools

Traditionally, given the loosely coupled arrangements in American school systems (Meyer & Rowan, 1977), it is not surprising that districts often imposed goals on schools, relying on incomplete or even inaccurate information about them. However, when we examined how the systems set the groundwork for data-driven decision-making, we found that they
accomplished this through aligning goals, curriculum, and assessment with the schools and by creating a culture of data use. As we will explain, all of the systems revealed that data-driven decision-making was not a reform that was implemented in isolation. Before implementing strategies for effective data-driven decision-making, the systems invested time and resources in building a solid foundation for system-wide change. In doing so, the systems and the schools co-created similar objectives and values.

Aligning goals
Establishing meaningful and challenging goals for student performance was a precondition for effective data-driven decision-making in all of the systems we studied. Without tangible student achievement goals, school systems were unable to orient their use of data toward a particular end or desired outcome. The four systems approached goal-setting in a number of different ways; however, all melded the need to meet larger accountability demands with goals tailored to the needs of their own students and schools.

For most school systems, taking the time and resources to develop specific goals geared toward their needs ended up being a pivotal aspect of using data purposefully. Setting up system goals enabled school leaders to grapple with and reflect on their history, their current progress, and future plans. Thus, goal-setting was a critical step in beginning the process of continuous improvement.

Garden Grove’s efforts provide a key example of the importance of aligning objectives across the system. With the state’s accountability system as a lever for change, Garden Grove began to assess its strengths and weaknesses with regards to student achievement. The first strategy was to work on ensuring that the curriculum and instruction were aligned to the state standards. The district’s administrative team then began a several-year process of establishing goals. Criteria for the goals were set, including the requirements that they were meaningful and measurable at all levels: student, classroom, school, and district. Site administrators and teachers from schools representing all levels served by the district were part of the goal development and refinement process. The district also received assistance from an outside consultant, WestEd. All in all, it took 3 years before the goals were finalized and documented before they could be shared throughout the system. As evidence of the district’s ability to achieve common goals, all school staff members interviewed for the study were able to clearly articulate the district’s goals. In concert with system-wide goals, schools also formulated goals specific to the needs of their students and communities. Often, schools established school-wide goals, then grade-level goals, classroom goals, and, in some cases, individual student goals. With the involvement of site administrators and teachers in the creation of system goals, schools had buy-in and commitment, and the emphasis among schools seemed to be on making local goals meaningful in the system context.

Aligning curriculum and assessment
Another way in which systems cultivated similar objectives for data-driven decision-making was through the alignment of curriculum. The CMOs worked on creating common objectives and values through shared curriculum and benchmark assessments. For example, Aspire produced a set of instructional guidelines for science, language arts, humanities, and mathematics based on the state standards. Both districts, Garden Grove and Aldine, also put into place a system-wide curriculum, accompanied by a pacing plan, instructional materials, and benchmark assessments. Implementation of the curriculum
was closely monitored for several years before data-driven decision-making came to the forefront of their policy agendas. For example, Aldine developed a pacing plan in 1997 and framed it as “you’re going to follow it, and it’s non-negotiable.” The plan follows the state standards and is divided into six-week periods. At the same time, the district curriculum had flexibility built into it. As a district administrator shared, “The text does not drive the curriculum, and you’re not going to walk into classrooms and find everybody using the same things in the book at the same time.” A teacher reinforced, “The district gives us lesson plans, but they don’t tell us how to teach them.” Once the curriculum was set, the central office did not devote substantial resources to monitoring classroom instruction in schools; however, they did require all schools to submit action plans, as discussed later in this article.

The existence and implementation of a system-wide curriculum and assessment system facilitated data-driven decision-making in the school systems, as it allowed all teachers to be “on the same page” in their discussions regarding data about student learning. However, the tradeoff was that teachers at the school level had less autonomy. As one teacher said, curricular and instructional alignment can be especially positive for new and “lower performing teachers, but sometimes the higher performing teachers almost feel hamstrung by it.”

Establishing a common language and culture for data use

In addition to aligning goals, curriculum, and assessments, establishing a culture of data use was a critical component of each system’s efforts in obtaining shared objectives with the schools. School systems created explicit norms and expectations regarding data use at the system and school levels. However, Garden Grove district leaders noted that behavior with regards to data use and collaboration could not be simply mandated. Teachers, especially, needed to see the value of data, and, thus, part of the system leaders’ responsibility was to “build the thirst for it.” Creating a culture that valued the regular, consistent use of data was essential; otherwise it was too easy for educators to slip back into old routines of making decisions based on instinct alone. This situation, described earlier, is one where agents shirk (they have authority but don’t act), because the agents perceive no negative consequences for doing so, based on the limited information they have. The common culture was also useful in minimizing the time and resources systems needed to invest in monitoring the behavior of school-level educators. Even so, the finding suggests a net increase in monitoring by the principal, which had the effect of changing the information the agent has about the probable consequences of alternative (agent) behaviors.

Also noteworthy was the fact that system leaders created explicit expectations for data use among all school administrators and teachers. In effect, the systems did not choose a single agent at the school site to entrust with data-driven decision-making authority; rather all school-level administrators and teachers were involved in the “data-use contract” between the system and the school and, therefore, were considered agents. This situation illustrates the complexity of principal-agent relationships, starting with changes in principal behavior and resulting in changes in the behavior of the agent.

Across all these school systems, analyzing school data to improve instructional practices was non-negotiable, and the expectation was widespread that decisions would be made on the basis of data. As a system administrator at Aspire explained, “We are in the business of making improvements and making sure that all kids succeed and reach their potential. So, as a result, we need to know what things work and what things don’t work.” At the same time, teacher and administrator buy-in to the concept of data-driven
decision-making was critically important, and their support needed to be carefully
nurtured. One school leader remarked, “You have to take it step-by-step because if you
don’t, you can send people over the edge . . . and burn them out.”

(2) Addressing the problem of information asymmetry between the schools
and central office

In order to mitigate information asymmetry problems, systems worked to encourage a
two-way communication flow between schools and central offices. The systems recognized
that schools had the information advantage, as they were closest to the students and had
the most accurate and complete information about what was needed to implement an
effective data-driven decision-making plan. The “bottom-up” information flow from
schools to districts ensured that the systems’ knowledge about its schools was both
comprehensive and accurate, rather than based on narrow performance measures.

Throughout all levels of the system, the central office created structures to encourage a
strong bottom-up information flow from school-level participants, so that the central
office had access to the information necessary for accurately assessing the causes of
performance of each school (the agent). With the information advantage of the agents
(schools), this design component of data-driven decision-making plans was especially
critical. The schools in the CMO systems also frequently fed data back to the central office,
although the process was sometimes less systematic, relying more on informal, face-to-face
contact. School leaders at Aspire worked collaboratively with central office administrators
to monitor their goal targets. Every month, these school leaders met with their regional
vice-presidents and instructional coaches to review school finance, student achievement,
staff competence, and parent satisfaction. Achievement First school and central office
administrators also worked closely together. The superintendent and president maintained
a visible presence in the schools by visiting schools and meeting with various staff. All the
staff members mentioned that they personally had frequent contact with system
administrators. At one newly-started school, the staff noted that the president visited on
a weekly basis. At the same time, student achievement data produced at the school level
were sent to the central office at least every 6 weeks. The central office also asked teachers
specifically for feedback on curriculum pacing and instructional assessments. For instance,
noticing teacher frustration with the lack of alignment between the assessments and
curriculum pacing, the system conducted teacher focus groups with test developers to
modify the assessments.

Training and personnel to assist in data management and use

A common approach to improving the flow of communication and information was to
invest in data management systems and train personnel. Typically, school systems are
beset by another information asymmetry problem, where district-level administrators
manage student achievement and organizational data but school-level educators lack
access to it. On the contrary, in the sites we studied, the four systems not only offered
access but also training and assistance for data management and use. In all cases, there
was an individual at the district or home office who directed data management efforts and
worked to enhance the flow of information upward from the schools as well as downward
to the schools. This person performed the critical role of supporting both the system and
the schools in obtaining the data and reports necessary to make decisions. For example,
the director of assessment for Aspire explained that a large part of his role was to translate
and disseminate data in an accessible way. He conducted follow-up conversations with each school leader and assisted them by developing goals and creating Annual Yearly Progress (AYP) achievement projections. Most schools had at least one designated person who assisted with data management and use. In Achievement First schools, school administrators were instructed and expected to support teachers in data use. In Aldine, each school had a designated assessment coordinator and a technology specialist. Informally, leadership team members and other teachers at schools became “data experts.” Across all of the school systems, teachers named one or two teachers to whom they specifically turned to assist them with using the data management system for inputting results, analyzing results, and creating reports. Many of these teachers took the initiative to learn how to gather and analyze data – ultimately for the purpose of sharing their knowledge with the rest of the staff. Garden Grove also trained teams of teachers from each school who served as leaders regarding data-driven decision-making. They also had teachers on special assignment working at the district level on issues related to data use, and two full-time district staff dedicated to assisting schools in this effort. Consequently, the four systems worked to ensure their data management systems enhanced bottom-up information flow, recognizing that data quality was only as good as the input from school-level administrators and teachers.

(3) Addressing the weak incentives problem among schools

In addition to establishing the culture and structures to enable data use, the systems – and their broader policy contexts – provided incentives for school educators to do so. State and federal accountability policies shaped districts’ work with data, creating strong incentives for schools to examine student achievement data and assess student and school progress at meeting standards. Also, school systems required school improvement plans that measured progress towards goals. Finally, the systems examined their compensation systems, and some tied them to student performance. Taken together, these initiatives motivated schools to carry out the data-driven decision-making activities the systems requested.

All of the systems’ incentives for data-driven decision-making were both strongly influenced by and tightly interwoven with state and federal accountability systems. As one school leader in Aldine stated, “Accountability is a strong force for change. It truly is the change agent.” Federal and state accountability policies provided an important frame for what happened at the school and system levels, largely because of the consequences tied to school-level results. Some system leaders pointed to NCLB as having provided the political leverage they needed in order to stimulate improvement at the school level. That said, when asked about the sustainability of data-driven decision-making in relation to state and federal policies, leaders across the school systems believed that data use was a fundamental tool for accountability. As one superintendent stated: “Even if the state system goes away, and NCLB goes away . . . this is going to stay. We will create our own system because this is good and it’s the way our kids get equal access to [learning opportunities] like the kids in more affluent areas . . . ” In effect, the systems imbued classroom teachers with the capacity to use data, and, equally important, the systems increased the incentives to encourage teachers to spend time using data to improve instruction.

Compensation systems

Compensation systems for teachers were used indirectly as a motivator or incentive for data use. Three of the school systems in this study had reward systems in place, factoring
educators’ ability to improve student performance into their compensation plans. However, it is important to note that rewards were not meted out for using data in instructional decision-making but for achieving a particular outcome – improving student performance. As an Aspire leader stated, “We’re really clear that we don’t want to be a place where you just get raises because you showed up for another year.” However, in all cases, the emphasis was on teacher growth rather than on punitive measures. For example, in Achievement First, teacher pay was tied to professional development plans in three key areas: student learning, professional development, and community service. In Aldine, there was a monetary incentive plan for all employees. The plan for instructional personnel – teachers and school administrators – was based on student performance.

Across the four systems we studied, the compensation systems were outcome/performance oriented, and data-driven decision-making was viewed as instrumental for obtaining the preferred outcomes. Fundamental to the reward systems was the idea that through data use, teachers would produce more effective classroom instruction, which, in turn, would improve student performance. Most of the systems in this study rewarded teachers for improving student performance – not for the process of using data. The school systems seemed to have recognized (at least implicitly) how enormously time-consuming data-use processes are to police across large numbers of schools and teachers and how highly subjective they are to judge.

(4) Addressing the problem of decision rights of schools

Although the systems were relatively centralized in their efforts toward data-driven decision-making, they also empowered the schools (both site administrators and individual teachers) with some decision-making authority. First, the systems allowed the teachers decision-making authority – and indeed expected them to make the decisions – about how to differentiate instruction for students based on the data. Second, the systems allowed considerable site autonomy in the hiring of teachers and in professional development.

The nature of teacher autonomy

Although all of the systems’ data-driven decision-making reforms relied on a system-wide adoption of curriculum and instructional materials, teachers had individual authority in their classrooms regarding differentiated instruction and student groupings. For example, Garden Grove schools had the flexibility to make instructional changes for their English-language learners based on their needs. Schools could target students for an extended-day program using English Now, could place students in the reading comprehension program, re-group, or team teach during the language arts block. In Aldine, there were many examples of data bringing about changes at the classroom level. For example, based on low math scores, the third- and fourth-grade teachers at one school decided to divide into subject areas (reading, math, and writing/science/social studies) and work in teams of three. One school leader shared, “I have empowered [teachers] to be the professionals and to make those decisions that are best for the children and do it in a collaborative, consensual manner.” Overall, it seems that a balance can be struck, with a district pacing plan that allows for some flexibility to account for the needs of individual students, classrooms, or teachers. Thus, teachers were expected and empowered to make instructional changes based on data.

The CMOs also focused on local decision-making regarding both instructional and curricular choices. They had core instructional and supplementary materials, but
individual schools and teachers still had considerable latitude in making curricular and instructional decisions in terms of sequencing and pacing as appropriate to meet the needs of their students. For example, Achievement First had a structured curriculum for reading and math, but teachers also had individual authority to differentiate instruction and organize student groups based on the needs of their children. At one Aspire school, grade-level teams developed their own scope and sequence plans. Grade-level teams also worked jointly to develop curriculum binders so that standards and objectives were mapped out in 4-week increments with a checklist to monitor mastery of concepts. One teacher at an Aspire school summarized the school leaders’ philosophy as, “If you can show me data on something, you can do whatever is best for your student.” Thus, teachers had a great deal of discretion to modify instruction, as long as it fit within the systems’ curricular guidelines.

School leaders’ authority over site decisions

Not only did the teachers’ have some autonomy in their classrooms, the school leaders also had quite a bit of authority regarding school-level policy-making and teacher hiring. Aldine’s superintendent shared that school-level leaders (the agents) have total decision-making authority at their site levels. She added that, “We [at the district office as principal] are not going to call the shots for them until they have demonstrated that what they’re putting their money into is not making a bit of difference.” For instance, schools made decisions about extended-school days and Saturday schools based on data. Some of the elementary schools decided to eliminate the extended-day program because their data indicated that it did not improve student learning. The schools gathered data that compared the performance of students who qualified for extended-day and those that did not and attended the regular school day. Based on the data, the schools concluded there was no marked difference between the two groups. With other data supporting this conclusion, the schools decided to redirect the money to hire people to teach small pull-out groups during the regular school day, rather than invest in after-school remediation. Administrators were also expected to monitor the performance quality of their staffs and had the authority to make hiring and firing decisions.

Site administrators and their school leadership teams in the CMOs had authority to determine their own academic calendars and to hire and fire staff, although often we found that the schools worked closely with the central office to support their conclusions. As noted above, the Aspire system set up a plan to determine salary increases and merit pay with all jobs tied to performance goals. For teachers, one third of merit pay depended on student performance, another third depended on parent satisfaction, and the other third was based on administrator/supervisor evaluation. Achievement First school leaders were also described by the central office as “site-based leaders” who were given flexibility to make decisions based on the needs of their local school communities. They, as agents, worked with the central office to develop school budgets based on the Achievement First budget model. Typically, site administrators had 10% latitude to move funds around. Also, they had a discretionary fund which could be used to hire additional personnel, buy supplies, and so forth. In terms of compensation, teacher bonuses were determined by professional development goals established jointly with a school administrator. One school had a bonus system with $500 earmarked for individual teacher goals.

From the principal-agent perspective, systems took into account the variation in capacities across schools and, rather than mandate a single system-wide approach, vested individual schools with decision-making authority to capitalize on data available at their
school site to improve instruction for their particular students. Several educators pointed out that allowing flexibility to use different instructional strategies was a necessary component in fostering data use. Decisions needed to be seen as arising from data rather than simply from system mandates. Thus, there were a variety of ways in which classrooms were organized, how students were grouped, and types of programs within the district and CMO, suggesting that the reconfiguration of decision rights was more complex than (unidirectional) empowerment.

(5) **Addressing the problem of adverse selection**

Along with decision rights, the above section also raised the issue of adverse selection – that is, when data-driven decision-making plans are system-wide, it is likely that the capacity (and thereby, results) of schools in the system will differ. Moreover, the capacities – and interests in the reform – of the individuals within and across schools differ as well. The schools we focused on in this study were selected because they were front runners in data-driven decision-making, and thus we did not have ample opportunity to capture a full picture of adverse selection. However, district leaders were very forthcoming with the challenges they faced in bringing people on board; many of these have already been noted previously.

Data-driven decision-making was heavily pushed by both the districts and the CMOs, but the CMOs and districts used different strategies to deal with teachers’ resistance/discomfort in using data. Charter schools enjoyed much more flexibility in hiring and firing teachers, while districts had to be politically savvy in cultivating an interest in reform among teachers, many of whom were more committed to protecting the status quo. However, both types of systems had to manage their schools such that they did not overload the agents or create compliance without buy-in. Thus, the systems dealt with the challenges of adverse selection in different ways.

Not too surprisingly, system leaders were keenly aware of the importance of hiring staff that supported their beliefs in data-driven decision-making in order to lessen problems associated with adverse selection. In some ways, the CMOs had a distinct advantage here. Because they were starting schools “from scratch,” they could hire teachers and site administrators who bought into their expectation of data-driven decision-making. The school districts, Aldine and Garden Grove, obviously had to cultivate an interest in data-driven decision-making with a wider variety of teachers, many of whom had been in the system for some time. They worked to create an atmosphere around data that would gain buy-in from different staff members, as the superintendent in Garden Grove explained, “by making data non-threatening.” She added, “Just like for doctors, lab reports are not a bad thing.” The same was true in Aldine, where the superintendent emphasized that she framed data not as a game of “gotcha, you’re doing a poor job” but as an acknowledgement that instructional strategies were not effective for particular students.

Targeted professional development also helped to address the adverse selection problem or the possibility that unwilling participants were more likely to disengage in the reform effort. Although all systems offered generalized professional development on data use (the more typical approach), in most cases they also offered individualized professional development based on school needs. In fact, it appeared to be available to anyone who asked for it. For example, in Garden Grove, achievement gaps evidenced by assessments were addressed in a manner that invited help from the district in particular areas, such as differentiated instruction. In Aspire Schools, teachers were required to develop their own
professional growth plans every year, which detailed goals, measures of goal progress, educator activities, school leader support, and coach support. The school leader conducted a check-in meeting with each teacher to review the assessment data, demographic data, parent survey data, and strategic plan for the schools. Then he or she conducted a mid-year follow-up to review progress on the plans.

Nevertheless, helping staff members to use data appropriately and thoughtfully remained an ongoing effort. Expressing a sentiment echoed by several teachers across these school systems, one teacher in Aldine remarked that gathering and disaggregating data was not the problem but having more training on what to do with the data and how to read it more carefully would be welcomed. When asked about what schools should avoid, a teacher stated, “Don’t just throw the data out there and expect the teachers to be able to pick it up and run with it.” Building teacher capacity for effective data use seemed to go hand-in-hand with building instructional knowledge and skills. Without professional development to build instructional knowledge, teachers did not have the tools to utilize data to make improvements. These findings suggest there may still be some information asymmetry with the school having more information it can use and the central office (principal) expecting more than schools can deliver on data use (a divergence in principal-agent objectives).

**Structuring collaboration**

Common among three of the four systems, however, was the strategy of networking. The systems attempt to stem adverse selection was to build capacity by establishing time for teachers to learn from one another. One administrator observed that the key to making data relevant was developing working relationships between staff, because “without collaboration and collegiality, data is impossible.” Teachers relied heavily on one another for support, new instructional strategies, and discussions about data. In fact, participants across all systems and levels we spoke with stressed the importance of having built-in collaboration time; this was seen as a crucial factor in developing mutual trust between educators and for sharing knowledge to improve practice. A common sentiment was that “you can’t do it alone;” in fact, “we do it together” was a common refrain across many of our conversations with teachers.

Most of the school systems devoted frequent and substantial time to reviewing data and planning accordingly. Aldine and Aspire not only had weekly structured data discussion times, but teachers also had daily instructional planning time within grade levels or partner teams. The ways in which schools structured time around data discussions was probably the most important scaffolding for continuous improvement. Most schools had early dismissal for students in order to provide 2 to 3 hr of uninterrupted time for data discussions. At Aspire, teachers also had daily preparation time (50 min every day for fourth-/fifth-grade teachers). As noted by the school leader, “It’s better to have well-planned instruction than just have [kids] in the room.” Additionally, there was built-in time for discussions around data and instruction. At least once a month, two meetings were devoted to team data discussions. Another meeting was set up for similar discussion between instructional coaches and teams. The last meeting of the month was used by the school leader, leadership team, and coaches to look at data together to decide which teachers needed instructional support or which students needed intervention.

The school systems found that they had to develop tools in order to ensure that discussions about classroom-level data occurred and that actions were taken on the basis
of these conversations. All of the school systems developed some type of discussion template that typically begins with a discussion of basic trends and then gets into more detail regarding strengths, weaknesses, grade-level trends, and ethnic, gender, and language subgroup trends. These discussions are then generally followed by brainstorming on strategies and action plans. The discussions typically took place after the results from benchmark assessments had been analyzed and often occurred even more frequently.

In three of the four school systems (all but Achievement First), such discussions occurred primarily among teams of teachers, often facilitated by a lead teacher. For example, Aspire instituted a “cycle of inquiry” process. Although details of the process differed slightly from school to school, all Aspire schools engaged in structured data discussions around student achievement and instructional data. Most schools conducted the cycle in a meeting held every three weeks. Groups met in either multi-age level or subject area teams to examine data from benchmark assessments and develop action plans focusing on instructional strategies. At one school, every two weeks on Wednesday afternoons, grade-level teams gathered to discuss data in a meeting facilitated by the grade-level lead teacher. Teachers were asked to prepare ahead of time by filling out data summary sheets. They were also required to bring in an assessment (e.g., pre- and posttest, benchmark, or unit test). They typically shared what worked well, areas of struggles, and their action plans.

All of the school systems recognized that data-driven decision-making was enhanced when educators shared data not only within schools but across them. These interschool networks helped to strengthen connections and spread innovation across sites. While most data discussions still occurred at the school level or between an individual school and the central office, the districts and CMOs we studied were attempting to structure data discussion across schools.

In sum, in order to address the problem of adverse selection (under circumstances when the system needs all schools to participate, not only schools that volunteer or have the capacity), the systems set up mechanisms that fostered collaboration between weaker and stronger teachers within schools, as well as between weaker and stronger schools across the system. Table 3 provides a summary of these findings.

**Conclusion and policy implications**

Data-driven decision-making is an effort to capitalize on information available at the school level to improve classroom instruction and, ultimately, the educational performance of students. As argued here, just as organizations can be characterized as webs of contract-like relationships among individuals, data-driven decision-making involves contractual relationships between system-level educators and school-level educators, and frames a classic principal-agent problem: How can the system improve the likelihood that school-based educators, vested with greater decision-making authority over instruction, will pursue the goals of system-level educators? Emerging from the analysis is a set of criteria that apply to the design of any data-driven decision-making plan, regardless of the nature of the principal (school district, CMO) or the number of agents involved. The criteria propose that any effective data-driven decision-making plan should be characterized by several common traits. The results suggest several important conclusions.

First, systems need to cultivate shared objectives with schools by aligning goals, curriculum, and assessment across schools. By involving school-level educators in the process of establishing these system-wide policies, there are less likely to be divergent
objectives. Creating a culture of data use was a critical component of each system’s efforts in obtaining shared objectives with the schools. School systems created explicit norms and expectations regarding data use at the system and school levels. In doing so, they also fostered mutual accountability between school and system levels.

Second, to diminish information asymmetry, systems need to solicit information from school-level educators on their needs, strengths, and weaknesses and develop capacity-building plans around this information. System leaders recognized that schools had the information advantage, as they were closest to the students and had the most accurate and complete information about what was needed to implement effective data-driven decision-making. However, they scaffolded data use by investing in information management systems, offering training and personnel dedicated to data use and networking educators within and across schools.

Third, systems need to carefully create incentives for data use so that school-level educators behave in ways the system values. The systems we studied used state and federal accountability policies as political leverage in order to stimulate the need for change at the school level. However, all of the systems also had their own internal accountability systems which relied upon a much broader array of indicators. These internal mechanisms were used to drive an ongoing process of continuous improvement rather than simply being done for compliance purposes. The bottom-up information flow from schools to districts also ensured that the systems had much more accurate information about schools and, thus, could set better system-level policies accordingly.

Fourth, the systems need to provide teachers and school leaders with sufficient autonomy in order to make site-based decisions on the basis of data. Most system leaders were open to changes that were based on a careful assessment of student achievement data, and they empowered teachers and school leaders to do so. That said, superintendents and other system leaders realized how important it was for curricula, data management systems, and other key support functions to be centralized at the system level.

Finally, to address adverse selection, systems need to recognize that schools are likely to have varying competencies or interests with regard to data-driven decision-making. Systems, therefore, may need to choose (at least initially) to tailor data-driven decision-making plans selectively rather than on a system-wide basis. If the system has reason to believe that some schools have a willingness to participate but not the ability, the system may target those schools for intense professional development, including training in the process of data use as well as creating structures, both within and across schools, to facilitate conversations among educators about data use. However, if there is a lack of interest as well, the system will need to motivate interest at the school site through the use of incentive-based schemes to align objectives. Without addressing both dimensions of school capacity, data-driven decision-making is unlikely to yield the intended performance gains.

Taken together, these design elements form the beginnings of a new approach to data-driven decision-making that can guide policy-makers’ choices about the division of responsibility between the system and its schools – who should be responsible for which decisions and how the plan should be organized. Perhaps most noteworthy in the new version of data-driven decision-making is the importance of individual behavior and the explicit inclusion of incentives.

Current events suggest that the intense focus on accountability will likely continue at all levels of the educational system. The principal-agent theory provides a framework for exploring how data-driven decision-making can be integral to improving school performance. Based on the findings from this study, data-driven decision-making is
<table>
<thead>
<tr>
<th>Principal-Agent Problems</th>
<th>System Strategies</th>
<th>Goals for the System</th>
<th>Goals for the School, Classroom, and Individual Student</th>
<th>Goals for the Teacher Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Achievement First</strong></td>
<td><strong>Public Schools</strong></td>
<td>Developed meaningful and measurable goals aligned to overall district goals and individual student goals tied to the state standards.</td>
<td>Developed alignment of goals across the school, class, and individual student levels.</td>
<td>Developed accountability systems tied to professional development.</td>
</tr>
<tr>
<td><strong>Divergent Objectives</strong></td>
<td><strong>Aldine Independent School District</strong></td>
<td>Developed curriculum pacing plans divided into 6-week periods.</td>
<td>Developed instruction guidelines for subjects based on the state standards.</td>
<td>Developed a compensation system tied to improved student outcome.</td>
</tr>
<tr>
<td><strong>Aspire Public Schools</strong></td>
<td><strong>Garden Grove Unified School District</strong></td>
<td>Developed curriculum pacing plans split into 6-week periods.</td>
<td>Developed alignment of goals across the school, class, and individual student levels.</td>
<td>Developed accountability systems tied to professional development.</td>
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</tbody>
</table>

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<tr>
<th>Principal-Agent Problems Related with DDDM</th>
<th>System Strategies</th>
<th>Achievement First Public Schools</th>
<th>Aldine Independent School District</th>
<th>Aspire Public Schools</th>
<th>Garden Grove Unified School District</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limited Decision Rights of Schools</strong></td>
<td>Balanced school-site decision-making power with cross-system consistency</td>
<td>Site administrator had flexibility in budgeting, scheduling, and professional development</td>
<td>Teachers had instructional and curricular decision-making rights within the parameters of system-wide assessment schedules and pacing plans</td>
<td>Site administrator had flexibility in budgeting, scheduling, and professional development while teachers had autonomy to develop scope and sequence plans</td>
<td>Teachers had instructional and curricular decision-making rights within the parameters of system-wide assessment schedules and pacing plans</td>
</tr>
<tr>
<td><strong>Adverse Selection</strong></td>
<td>Hired agents with capacity and interest</td>
<td>Hired new teachers comfortable with data use and invested in early data analysis training</td>
<td>Teachers participated in weekly structured collaboration time examining student performance data</td>
<td>Teachers participated in cycles of inquiry when they examined student achievement data on a bi-weekly basis</td>
<td>Ongoing structured and unstructured training were offered to all staff members in using data</td>
</tr>
</tbody>
</table>
indeed a reform that should be cultivated at the system level, as there are very important supports that systems need to provide. However, flexibility, incentives, and empowerment also need to be essential ingredients of this reform so that schools do not feel as if they are hamstrung by district policies and cannot act on the basis of their data. A process of mutual accountability between schools and systems also created a climate in which schools engaged in a process of continuous improvement and in which systems actually had accurate information about what was occurring at the school level.

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References

Alwin, L. (2002). The will and the way of data use. School Administrator, 59(11), 11.


