

EDUCAUSE Center for Applied Research

Research Bulletin

Volume 2004, Issue 20

September 28, 2004

Knowledge Management, Information Systems, and Organizations

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Higher education institutions have poured millions of dollars into information technologies to increase the effectiveness of operations and information systems, but many institutions still face the difficult task of successfully integrating these technologies for improved knowledge sharing and effective decision making. Implementation plans sometimes overemphasize the role of technology, with less importance given to the organizational structures and institutional processes that rely on both technology and information. In fact, many information system implementations in higher education fail not because of the technology, but because insufficient attention is paid to issues related to organizational culture—organizational processes and practices, information politics, and patterns of information sharing and hoarding.^{1–3} Studies have shown that technology tools alone cannot be used to address discordant organizational information structures.^{4–6}

A technology-focused problem-solving strategy is likely to overlook organization-wide symptoms that prevent institutions from successfully capitalizing on their use of technology. Ultimately, this approach hampers an institution's ability to perform in-depth, timely, and accurate analysis related to student success and organizational effectiveness. Institutional obstacles might include factors such as data access, data integrity, and technological incompatibility.^{7,8} For example, department administrators might be unable to access timely data about how many students have accepted for the fall semester. This in turn impacts administrators' ability to offer financial aid packages to students who are on the wait list. Because of this delay, some students might decide to attend other colleges where their financial packages are more certain. In this case, the impact of a system that does not provide accurate enrollment data translates into a decreased ability for departments and programs to make effective day-to-day decisions about enrollment management.

Additionally, educational institutions are just beginning to recognize that, too often, information is held tacitly by individuals, making it difficult for much-needed information to be shared institution-wide. For example, in many organizations, each employee holds a certain amount of institutional memory that provides the history, context, and basis for many day-to-day decisions. Yet rarely is this type of information documented, perhaps because there are no organization-wide mechanisms to do so. Therefore, the challenge is how to make accessible to the organization the information that currently resides with individuals. Capturing and making this information available not only ensures continuity but can also accelerate organizational learning, and it is particularly important to capture this information before individuals leave an institution or retire.

While it is generally understood that a robust technological infrastructure plays a crucial role in helping educational institutions gather and analyze data to improve outcomes, the barriers to successful technology and information systems implementation in educational institutions can be attributed to a narrow understanding of just how these systems and technologies manifest themselves within organizations.⁹ For example, the implementation of a recent multicampus enterprise resource planning system was

brought to a halt by a strong faculty labor union that felt that the cost for this system could not be justified, particularly in light of recent cuts in academic instruction. If the planners and architects of this system had incorporated academic needs into its design and interface, the system might have been perceived as one that could have served both the academic and administrative interests of the institution. Therefore, in order to further develop the technological infrastructures that can support and make the best use of information systems, institutions of higher education that incorporate an organization-wide perspective to address the obstacles before them will likely obtain greater benefits from these types of systems.

The purpose of this research bulletin is to demonstrate how knowledge management (KM), a human-centered approach to understanding how information systems function within a larger organizational context, can be used to examine the overlapping and ongoing relationships among people, processes, and technology systems. It will also show how the application of a KM approach enables institutions to gain a more comprehensive, integrative, and reflexive view of the impact of information technologies by obtaining a better understanding of the cross-functional organizational obstacles around issues of information use and access—ultimately leading to improved knowledge sharing and more effective decision making.

Highlights of a Knowledge Management Approach

A KM approach is the conscious integration of the people, processes, and technology involved in designing, capturing, and implementing the intellectual infrastructure of an organization. It encompasses not only design and implementation of information systems but also the necessary changes in management attitudes, organizational behavior, and policy. It is what enables people within an organization to develop the ability to collect information and share what they know, leading to action that improves services and outcomes.

A KM approach can be used to provide educational institutions with a method to focus their strategies and practices, making best use of their energies and resources. KM provides a framework that can be used to focus attention on three specific areas—people, processes, and technology—as a way to illuminate and address organizational obstacles regarding issues of information use and access. Each of these three areas functions as an integral part of the ongoing organizational dynamics, and institutions need to devise strategies to determine how the organization's structures and institutional processes can give shape to how people use both technology and information in meeting their information needs. The basis of KM is a process of shaping, supporting, and managing this endeavor through a delicate balance among attention to organizational processes, the people who partake in them, and technology investments.

Recognizing the Knowledge Management Approach

How do we recognize a KM approach? KM may not be visible to the naked eye, primarily because it is about changes in strategies and practices that are integrated

throughout the organization. We can, however, look for indications of KM at play. Some indications include cross-functional decision making, a robust information systems infrastructure, rewards and incentives based on using data to monitor programs and provide feedback on change, and increased responsiveness to constituents' needs.

A KM-smart institution is actively engaging in data activities, information activities, as well as knowledge-based activities. This does not mean that a KM organization has simply moved beyond the use of data and information; instead, it demonstrates increased activities at all three stages of the KM cycle concurrently. This is what enables a KM-smart organization to make best use of its people, processes, and technology at all three stages of the data-information-knowledge cycle.

KM includes providing individuals with the data they need and want in a timely manner in an easy-to-use format, allowing them to manipulate, format, and tailor data to their needs. Within a KM organization, individuals use data to search for trends and patterns within their organization and share data with others across the organization, across hierarchies, and across functions. In using information to make decisions for short-term, long-term, and research strategy, the organization collectively transforms information into knowledge. It is important to note that these activities and practices do not simply occur in disparate pockets of the organization. An organization needs to demonstrate these practices and activities throughout the organization, across all levels and groups, in order to be a KM-smart organization.

Similar to KM, process management is useful in identifying practices and processes. Process management is often thought of as the management and improvement of a system of inputs and outputs; however, understanding information and knowledge practice organization-wide also requires a thorough understanding of how people, processes, and technology support each other in these efforts, including an explicit assessment of the role of the organization's information culture and politics. A KM approach takes these into account, while process management typically does not. Perhaps just as importantly, process management does not consider the nuances among data, information, and knowledge. Instead, it often refers to knowledge simply as data aggregation. KM, on the other hand, uses knowledge to inform action based on data and information.

With a KM approach, the most effective technologies are broadly accessible to identified user groups and promote a tracking and exchange of accurate and pertinent information across all levels of the organization. Additionally, a KM approach facilitates feedback loops as data and information are translated into decisions and action. As such, KM asserts that technology cannot, and should not, stand alone. Contextual factors of organizational processes and structures, as well as the people who use these technologies, all come together to help improve the use of information technologies. In doing so, educational institutions can better understand their strengths and challenges along these three key areas—people, processes, and technology—as they strive to meet their data and information needs. KM is the nexus of these three resources, integrating them in such a fashion that those organizations gain a more comprehensive

self-understanding. KM serves to make these processes and activities transparent, leading to a more sophisticated organizational reflexivity.

Information Feedback Loops

A KM approach underlines the importance of both formal and informal procedures, patterns, and processes of action that are part of an organization's knowledge and information-sharing activities. These activities may be part of administrative and curriculum-development processes, information-sharing patterns, and others. Indeed, KM can be used to illuminate certain patterns that may not have been otherwise apparent, particularly in how technology interacts with people and processes and vice versa.

KM-centered practices can be used to actively engage people in knowledge and information sharing activities across all levels of an organization. One feature of a KM approach is the development of mechanisms that provide ongoing feedback loops throughout the cycle of data, information, and knowledge. This cycle depends upon input across multiple groups and all levels of an organization—horizontally and vertically within the organizational structure—and is accomplished by bringing together disparate groups into an integrative, continuous learning cycle. For example, an Early Alert system developed at one college was designed by both academic and student service personnel. The system allowed faculty to identify those students who, early in the semester, might benefit from particular academic intervention and student support services on campus. Divisions that normally compete for dwindling resources instead worked together to design a system that helped each group enhance its offerings to students. But perhaps most importantly, a strong link with the research office ensured that they would be able to track and monitor the impact of this system over time by measuring the various interventions on student success and giving important feedback to faculty and student services.

Let's say that a college implements a new Web-based interface that gives administrators access to statistics on faculty recruitment to better understand and therefore optimize the hiring of new faculty members. The college finds, however, that information in the system is not kept up to date and that key variables are inconsistently entered, which protects particular departments from revealing their recruitment difficulties. It fails to undertake the challenging work required to understand and resolve the organizational issues at play and instead introduces technology to "solve" the problem—a strategy that exacerbates the situation. It is no wonder that we hear about efforts to undermine information technology implementations within organizations that have little or nothing to do with the technology per se.

Building Blocks of the Data-Information-Knowledge Cycle

A primary component of a KM approach is the distinction between gradations of data, information, and knowledge. The iterative cycle of data, information, and knowledge within educational institutions is at the core of understanding how knowledge management can be used to support continuous learning within the organization. KM draws specific attention to how data moves and evolves throughout an organization—

from data, to information, to knowledge. As data flows within an organization, its evolution takes on various forms, shapes, and functions.

An organization that learns how to make sense of and apply data to problems that are context specific, rather than using data to fulfill reporting or compliance-based functions, becomes more effective in using and sharing information for decision making. Subsequently, an organization that has put in place mechanisms to support and sustain a culture of inquiry has successfully passed through the data-information-knowledge cycle. However, today's knowledge is tomorrow's data. Therefore, an organization that is complacent in turning its new knowledge into action and does not have a feedback loop that enables it to define new questions within the organization breaks the cycle of inquiry.

Access to Reliable Data

Data is the cornerstone of KM practice. Even the most advanced knowledge-driven organizations still use data on a regular basis. In fact, knowledge users are significant consumers of organizational data. Therefore, having key policies and procedures in place that guarantee data access and reliability will ensure data use within an organization. It has been shown that clear data-collection priorities make it easier for an organization to justify the human and technological infrastructures to maintain these data.

A lack of coordination between functional areas such as inconsistent data definitions, however, can invalidate the organization's ability to conduct meaningful campus-wide data analyses. Many educational institutions have multiple information systems and sources of data. This creates a situation in which conflicting systems populate the information landscape of an organization. These different sources serve to complicate the data-gathering process, which can make it even more difficult to compare and analyze disparate sets of data. For example, this makes it difficult to compare fiscal data with student data, resulting in the inability to calculate financial projections for enrollment management or to conduct retention analysis. Such lack of integration across systems can operate as an enormous disincentive to data use.

Research suggests that in an environment in which reliable data are not readily available, enterprising individuals—when unable to obtain the data they need from existing information systems—compensate by creating, or participating in, idiosyncratic or ad hoc methods of data collection and management. These informal practices, known as workarounds, can be seen both as inventive solutions to pressing organizational needs and—over time—as a redundant and costly alternative to a robust and flexible information system.

Effective Information Use and Sharing

The second component of the data-information-knowledge cycle involves an organization's ability to effectively use and share information. An institution needs to have consistent and well-defined expectations and opportunities for sharing information organization-wide. Divergent practices throughout an organization can result in information practices that may be insufficiently integrated throughout the institution. In

turn, ambiguous priorities can render information useless and thus removed from the wider mission of the educational institution, undermining the effective use of information. Consistent leadership has been shown to be a primary fact in an institution's ability to reliably use and share information over time.

Research also has shown that the existence of information silos prevents the sharing of information horizontally across the organization. In their attempts to overcome the challenges of inconsistent and unreliable data, individuals within an educational institution often resort to manually gathering and storing their own data for their own purposes. These silos operate as pockets of information sources, dispersed throughout an organization, thus making it even more cumbersome for information to be shared organization-wide. The presence of these silos, along with dispersed systems, undermines institutional technological legitimacy, creating further problems for the information landscape of an organization.

The Importance of Supporting a Culture of Inquiry

A culture of inquiry suggests that there are organization-wide norms and policies where all members are encouraged to ask questions on an ongoing basis about how their programs and services could be used more effectively, and where individual members systematically use data and information to answer these questions and to meet their own needs. Therefore, a culture of inquiry relies on the use of data. This requires that institutions recognize the importance of data and information in decision making and necessitates a cultural shift in which data are trusted, valued, and rewarded. For example, educational institutions are often called on to examine how they have historically responded to underperforming programs. Rather than penalize those programs for underperforming, educational institutions can foster a positive culture of data use by providing assistance to improve functioning, and thus reduce the fear and mistrust that may have historically been associated with data use. Educational institutions can also foster a culture of inquiry by supporting the involvement of administrators, faculty, and staff. The problems of information sharing operate as a challenge to many organizations. Facilitating cross-functional planning and decision making has been shown to be a primary factor in overcoming these challenges, as cross-functional teams can promote ongoing feedback across various levels of the organizational hierarchy.

Recognizing that information analysis is a human-centered rather than technology-centered process is a fundamental component of a KM approach, and bringing together individuals across organizational hierarchies is one aspect of this orientation. Cultivating an environment where information is regularly shared throughout an organization also entails bringing together individuals along lines of expertise and knowledge. These group efforts, sometimes referred to as "communities of practice," help promote continual information sharing and problem-solving, while placing educational institutions on the path to continuous learning. Bringing together individuals with shared expertise can help educational institutions be more explicit about not only "knowing what they know" but also "knowing who knows what." Educational institutions with a strong culture of inquiry are in a much more advantageous position to make informed decisions.

Finally, an organization should have incentives and rewards in place that support the use of data in order to maximize the potential impact that its employees can have on institutional success. This might include implementing new processes to strengthen campus-wide access and use of institutional data for decision making, using data more effectively for long-term planning, as well as considering incentives for using data in program evaluation and student success that address state accountability requirements.

What It Means to Higher Education

One important long-term impact that KM can have on higher education practices is the ability to monitor and sustain ongoing change. A KM approach also supports a culture of inquiry and continuous improvement, which can provide the appropriate mechanisms for organizations to deal with a climate of increasing accountability. In addition, rather than simply having data and information to comply with state and federal requirements, KM allows organizations to leverage information to better target services and programs to their students and to their organization as a whole.

Demands for accountability require institutions to report aggregated and disaggregated data in new ways, placing additional strain on already antiquated or inadequate data management systems. These new pressures for accountability come from the public, policy makers, and the educational community, placing an increased awareness on the issues of accountability in the public educational institutions,¹⁰⁻¹² which has resulted in an increased call for reliable and accurate information, particularly regarding critical outcomes in higher education.¹³ In the past, expectations for data collection required educational institutions to track enrollment figures and the number of credits and types of classes students were taking. More recent accountability pressures explicitly demand that educational institutions be able to directly link academic performance data and outcome data, as well as compare academic performance data to financial data. These explicit demands have brought to light the types of weaknesses of their current information systems as well as the kinds of data that are available. Subsequently, these developments demonstrate a marked divergence from previous expectations, forcing educational institutions to rethink the use of data and information internally.

KM brings some specific advantages to an institution. Institutional knowledge is captured and stored systematically throughout the organization, making it more secure and more easily shared. Knowledge management allows the organization to actually know and build on the knowledge within the organization. This is important because there is increasing demand for strategies that help institutions meet external and internal demands.

Therefore, the following KM strategies are recommended for higher education institutions:

- Ensure that there are clear data-collection priorities.
- Increase access to data and information while breaking down data silos throughout the organization.

- Have clear practices that directly relate data and information analysis to the overall mission of the organization, and provide adequate allocation of resources so that qualified faculty and staff can effectively analyze data.
- Include faculty and staff in technology issues in order to combine the expertise of technology experts along with the information needs of the people in the organization.
- Have committed leadership that consistently supports data and information use and knowledge sharing.
- Have consistent coordination between functional areas (such as consistent data definitions or use of various software) in order to reach consensus on campus-wide analyses.
- Create a culture that rewards successes rather than punishes mistakes.

Assessing the Success of KM

An organization must develop criteria or metrics to benchmark the success of its KM efforts. Conducting an information audit early is very useful to analyze how people share information and knowledge, the incentives provided for doing so, levels of satisfaction and retention among employees, measures of student success, greater operational efficiencies, and the organization's ability to proactively address trends and problems.

Organizational reflexivity and continuous learning can help higher education institutions effectively and successfully manage their key information and knowledge assets. For example, a KM approach can be used to integrate disjointed information systems, particularly silo-based ones. Information maps and audits can provide a bird's-eye view of current processes and practices and their corresponding strengths and weaknesses. This can be important for implementing KM to identify the most appropriate entry point. The cyclical quality of KM encourages organizations to take an honest and reflexive stance on what is already going on in their organizations. Only from this position can educational institutions begin to capitalize on the opportunities that KM offers. This process of organizational reevaluation and reflexivity proves to be the most difficult challenge for educational institutions, while at the same time this process can be an ideal opportunity for institutions to integrate KM strategies to promote sustainable learning—not only to meet external demands but also to improve organization-wide effectiveness.

Higher education institutions can begin to implement KM strategies by identifying information shortages and needs—finding out where people are already asking for more data and information. They can also start by identifying groups of people who already maintain synergistic relationships of collaboration and sharing. As such, educational settings already demonstrate many information-sharing activities. To sustain ongoing inquiry and continuous learning, however, educational institutions must determine how to systemically embed these values within the fabric of the organization. Individually, information-sharing activities can be used to foster incremental improvement; however, when KM is adopted and executed as an organization-wide strategy, improved methods

of data and information sharing can promote knowledge development. In turn, this can help educational institutions be more informed in their decision making as a whole. All of these factors contribute to a robust culture of research and reflexivity and thus establish the mechanisms for sustainable, long-term organizational learning.

Because information and knowledge are integral to planning and operations, institutions that have yet to realize the power of KM may expend enormous amounts of time and energy shifting through redundant and inaccurate data and information. While some departments will create their own workarounds to compensate for lack of data access, others will unwittingly support a haphazard approach of documenting information about programs and services. Therefore, those institutions that desire to overcome many of the current risks and challenges may find that KM can help them do so, or they may otherwise risk the waste of limited resources and the loss of legacy information—not to mention the loss of competitive edge.

Ultimately, using a KM approach to develop strategic internal alliances and incentives will enable educational institutions to more effectively use their limited resources to reap the most benefit from their investments in both people and technology. This can be done by enabling the institution to quickly respond to its goals and objectives, identify target markets, close performance gaps between students, and respond to—and some cases preempt—staff and faculty needs and demands. To develop a robust and thriving knowledge environment, however, educational institutions need to look beyond the technology systems and into the overall culture of how information is accessed, shared, and managed.

Key Questions to Ask

- How do information systems support continuous learning throughout all levels of your organization?
- What programs and services are integral to your mission? What indicators do you use to measure whether your programs and services are aligned with your mission?
- How does the institution develop cross-functional planning and implementation of information systems that link academic instruction and operations?
- What rewards and incentives are in place regarding the use and sharing of information?

Where to Learn More

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