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The concept for Corporate computer-aided design (CAD)/computer-aided engineering (CAE)/geographical information systems (GIS) and engineering information (EI)/ information technology (IT), and the sharing of this information is becoming popular as organizations flatten (or perhaps become more hollow) and as their functions merge into processes. However, not much is known about information sharing: why sharing happens, whit it does not, how much sharing is desirable, and how to manage it. This paper takes a look at these important issues.

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Fred J. Norton

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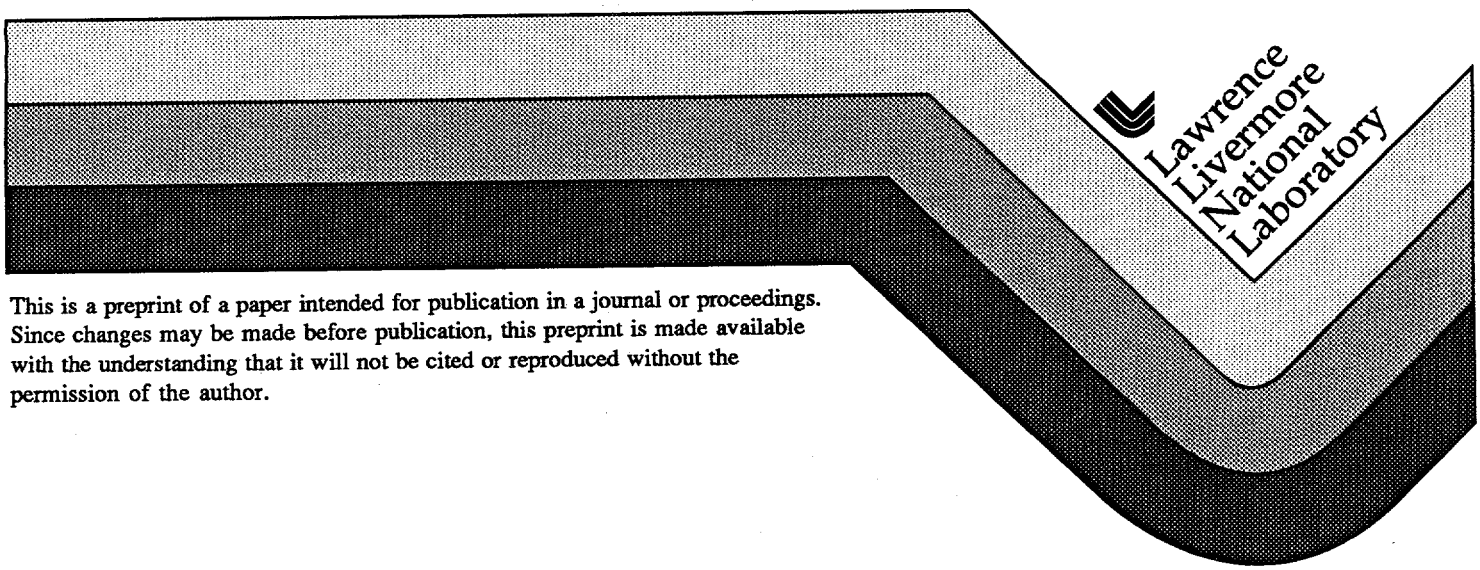

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Providing Access:
The Difference Between Sharing
and
Just Reporting Geographical Information Systems
and
Engineering Information/Information Technology Organizational Data

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June 10, 1996

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Abstract

The concept of Corporate computer-aided design (CAD)/computer-aided engineering (CAD)/geographical information systems (GIS) and engineering information (EI)/information technology (IT), and the sharing of this information is becoming popular as organizations flatten (or perhaps become more hollow) and as their functions merge into processes. However, not much is known about information sharing: why sharing happens, why it does not, how much sharing is desirable, and how to manage it. This paper and presentation takes a look at these important issues.

Introduction

New technology is making ever-mounting volumes of information more readily available, through more types of media, to more recipients, than ever before. However, the extensive array of communication channels that has eased CAD/CAE/GIS and EI/IT information transmission has coincidentally reduced the certainty that the message a sender tries to transmit will be received by the intended party. From this point on in this paper, the acronyms CAD/CAE/GIS and EI/IT will be referred to as "information."

These changes have complicated the jobs of those who manage their organizations' information behavior, that is, the way their organizations' personnel acquire and use information. This article explores the factors that affect information behavior and contribute to information sharing.

A Definition of Information Sharing

Information behavior is the way people act regarding the type of information they need, hold, or manage. It includes creating, retrieving, or modifying information, storing information, and providing access to information.

Information sharing is the voluntary act of making information available to others. It is not the routine reporting of information (e.g., checking in a drawing electronically, checking and updating scanned documents, etc.), nor is it the routine exchange of

information between intelligent devices. Figure 1 (see p. 5) highlights some of the differences between information sharing and reporting.

Information sharing represents one end of a continuum of information access. It describes voluntary information access that takes place on an *ad hoc* basis. Together, information sharing and information reporting represent the two ends of the information access continuum.

The information access continuum is dynamic because information behavior changes over time. Consequently, when organizations have positive experiences with information sharing, they try to systematize this sharing into a more formal exchange process (i.e., information reporting). Information sharing must be acknowledged as a beneficial practice, and then other parts of the organization should be encouraged to use it.

The Importance of Information Sharing

Information sharing has been seen to increase employee commitment, improve decision making, quicken an organization's response to potential shortages or delays in production, and predict shifts in organizational structure. However, some employees use it to advance their personal goals. They leak sensitive information to outsiders and withhold critical information from their managers.

A study of how information sharing affected the results of collective bargaining processes found that, in Japan, sharing led to shorter and easier negotiation processes, accompanied by the acceptance of lower wage increases by unions.(1) In contrast, a similar study in the U.S. concluded that information sharing increased labor's bargaining power! Thus, sharing can result in undesirable consequences, depending on which side of the relationship the observer sits.

Experience shows that information sharing does not occur easily. Because individuals try to maximize their gain, they restrict their information sharing when they believe that their unique value to the organization is reflected in the information they control and selectively share.

The Importance of Context

The context and content of information determines a lot about how and when it will be shared. Over time, relationships between humans and technology inevitably change. Consequently, human access to, use of, and sharing of information over the life cycle of business process can also change.

Organizations must try to ensure that truly useful information is made available to those who will use it to serve the interests of the firm. Organizations can achieve this by using appropriate incentives for encouraging the sharing of this information. However, incentives, in and of themselves, are not enough. Other contextual matters play a role, namely, the implicit and explicit organizational structures (i.e., norms and rules) that

help determine information behavior. These three factors: incentives, rules, and norms are discussed in the following paragraphs.

Information Behavior: What Determines It?

The following discussion of the factors that determine information behavior demonstrates that it is impossible to treat any of these factors in isolation. In fact, two of the factors, behavioral norms and incentives, are always in evidence, regardless of whether formal or written rules are in place. *Oddly, people often act as if they must attend to only the written rules of an organization when they attempt to change information behavior within it.*

All large and complex organizations use explicit rules to define their intended information flows. For information reporting, they use standard formats that specify information types and the frequently of reporting types and the frequency of reporting required to systematically support decisions, trigger events, and in other ways drive organizational outcomes. For example, people in most large organizations must report time, evaluate themselves and others, and report on a project's status. Organizational units prepare budgets, develop tactical and strategic plans, and report on projects and initiatives. Increasingly, organizations report on quality achievements; the measurement of performance, in general, is becoming increasingly popular. Most of this reporting is in response to explicit rules that identify the information required to run the business.

People, however, tend to adhere only selectively to such explicit reporting requirements. People comply more often when adherence is linked to incentives. Directly linking payment to the timely submission of time, for example, is tremendously successful in increasing the percentage of reports delivered on time, to knowing that the data in the Project Manager's report is current. An inverse relationship exists between the number of reporting rules and the level of compliance. People conform to rules selectively; those linked to outcomes of interest are observed first.

Explicit rules need not always be written. Official policy manuals often lag behind operational reality. For example, someone with senior-level authority can quickly change the rules that govern information access in an organization, simply by leading through example. In one organization, a senior manager of a corporate information technology group wanted to impose a new software product as a communication standard. To enforce this rule, he refused to communicate through any other mechanism. He tried following the communications rule to the incentive of communicating directly with him. Thus are new rules written.

As the information technology manager introduced his official communication mechanism, he also encouraged staff members to use a formal, rumor-mill database for posting rumors or responding to posted rumors. Rumors included facts, beliefs, or mere suspicions. Intended to promote an environment of trust and openness, this mechanism provided a very informal opportunity for information sharing.

Following this experimental phase in the database's introduction, this organization merged with another organization that did not encourage as much communication among its personnel. The potential value of the rumor mill conflicted with the

underlying norms of the new organization. In short order, the database was discontinued, though it continued to be used for other reporting purposes.

The executives of the newly created organization were concerned about how the automation of informal information flows would affect the regulation of the organization. Information sharing can encourage organizational changes that may have little to do with an organization's formal structure. Informal systems of information access (i.e., rumor mills) must support an organization's formal goals, or chaos will take commend of the situation.

Because information sharing tends to flatten hierarchies and further democratization, it is strenuously resisted by those who expect to lose through such a transformation. Those who see an advantage in it support it. Organizations considering information sharing must decide whether organizational flattening, improved morale, and democratization are the goal of transformation they are considering or an unintended result.

Behavioral Norms: The Unwritten Rules of the Game

Although the terms *organizational culture* and *behavioral norms* are often used interchangeably, they do not mean the same thing. *Culture* refers to the decision styles and customary forms of interaction that characterize an organization's work environment and significantly determine behavioral norms. Culture is ever present, and it can encourage or discourage desired changes in information behaviors.

Many people describe culture as "the way things work around here." This can include being polite to one's supervisor, not revealing personal information to staff members one does not know well, and leading a discussion if one has the highest status in the room.

Figure 1 suggests that explicit rules of access are typically associated with information reporting, but the implicit norms of organizations relate more closely to information sharing. Reporting, which is more formal and systematic, is defined by rules. *Information sharing, which is more informal and* ad hoc, *occurs through the tacit agreement of people acting according to behavioral norms.*

One commonly observed behavioral norm is the fact that people prefer to share information associated with positive outcomes. In a recently reengineered research and development (R&D) function within a major chemical corporation, for example, cross-functional teams were observed to be much more comfortable sharing information about the progress they were making, rather than negative results teams or team members had received.

Another behavioral norm is the preference for sharing when it is possible. Seeding, a mechanism for encouraging the use of shared discussion databases, works because people like to share. When an organization seeds a database, it makes the database freely available in the expectation that users will, in turn, contribute to it. The more useful, interesting, or rewarding the information in a seeded database, the more people want to contribute information to it, to reseed it. Without such reseeding, a database declines in value, and sharing diminishes in a downward spiral of use and usefulness.

Information Sharing		Information Reporting
Informal		Formal
Ad Hoc		Periodic
Unstructured		Structured
Voluntary		Mandatory
Non-Systematic		Systematic
Implicit exchange value		Explicit change value

Figure 1. Forms of information access.

Therefore, systems in which users receive information but do not contribute to it tend to be unstable and decline in usage.

The more useful, interesting, or intrinsically rewarding information is, the easier it is to share. The easier it is to share, the more an organization can rely on behavioral norms to ensure its communication. However, when information supports formally structured processes or when it can have a negative impact (e.g., the reporting of negative project results), organizations must systematize its communication by establishing formal reporting relationships and mechanisms. Information reporting is thus associated with increased formalization of the information access process.

Incentives

When information sharing is not seen as risky, and when people depend on each other to accomplish work, the intrinsic value of information is often a sufficiently attractive incentive to support an adequate level of information sharing. However, when traditionally conservative information behavior is entrenched or when the information required is negative and is mandated, organizations desiring to encourage information sharing should examine the value of the incentives they offer for it.

The evolution of customer support at Lotus Development Corporation provides a useful example of the important role that incentives can play in transforming an organizational culture and enforcing formal rules of behavior. Early customer service at Lotus was a cumbersome process in which a support representative would take a call, document the caller's problem, attempt to reproduce it, and develop a solution. The solution would then be documented and catalogued so that the next support representatives who faced that problem would not have to recreate the solution.

One challenge in managing this support function was cataloguing its solutions in such a way that representatives could retrieve them; another challenge was changing

the way representatives shared their knowledge. At the time, Lotus was actually discouraging representatives from sharing information.

Representatives could get promoted by carving out a problem area and becoming such an expert in it that other representatives with questions in it would come to that representative for help. Representatives learned that by hoarding information, by making other representatives come to them, they could seem valuable to the company. Doing so, however, did not help the organization do its job of providing answers to customer problems as quickly as possible. To best support the customer, the organization had to document all known solutions and make this material as readily available as possible.

Lotus now takes a two-pronged approach to customer service. Representatives are now supported by a combined groupware and database system that provides full text search and retrieval. This system helps them to determine rapidly whether a solution has been developed for any specific problem. However, Lotus recognizes that a technical solution by itself can not ensure optimal customer support. Therefore, it has instituted a formal performance review evaluation standard whereby 10% of each support representative's annual appraisal involves a peer evaluation of how well he or she shares information. This is an appropriate incentive when information sharing is an important goal.

Information Sharing: Does It Pay Off?

Information sharing is most appropriate when information behavior is unformalized or when individuals need to adjust their behavior to coordinate their activities work with others. As Figure 2 illustrates, information sharing is most useful to people who are reciprocally interdependent (i.e., who work together) performing nonroutine tasks. They need to communicate frequently, making mutual adjustments to complete tasks.

The situation often occurs after an organizational transformation or when the external environment is changing rapidly. In many organizations, business process reengineering is disrupting information flow; information sharing can improve cohesion within and across processes.

Degree of Independence	Nature of Tasks	
	Routine	Non-Routine
Pooled Efforts	Reporting	Semi-Structured Sharing

Figure 2. Optimal information access according to the nature and interdependence of employees.

The important of information access can also depend on the type of work being done. For example, concurrent product development can benefit from information

sharing practices because it involves people working together. Other activities that can be improved through information sharing include, but are not limited to:

- Conceptual design.
- Management of projects.
- Technology demonstrations.
- Feasibility demonstration.
- Process capability demonstrations.
- Design review.
- Production readiness.

Development of an architecture/engineering project is one of the most promising places to implement workgroup computing meant to support cooperative work. Here, idea sharing and parallel development promise dramatic reduction in the development cycle. Within the architecture/engineering project development, the less-structured components will usually provide the best opportunities for sharing. Information reporting is likely to be more useful within routine components of the process.

Closing Comments

The role EI/IT plays in the twenty-first century will be different than it is today. Enterprise trends emphasizing EI/IT process, teamwork, reduced time to completion of projects, and customer service are transforming EI/IT systems. We must do more than automate processes; we must give the users of this information relevant data, in a timely fashion, that can be turned into useful information. The failure to make this transformation will jeopardize enterprise access and the sharing of data.

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(1) Morishima, David, "Information Sharing and Collective Bargaining in Japan: Effects on Wage Negotiation." *Industrial and Labor Relations Review* **44** (3), April 1991.