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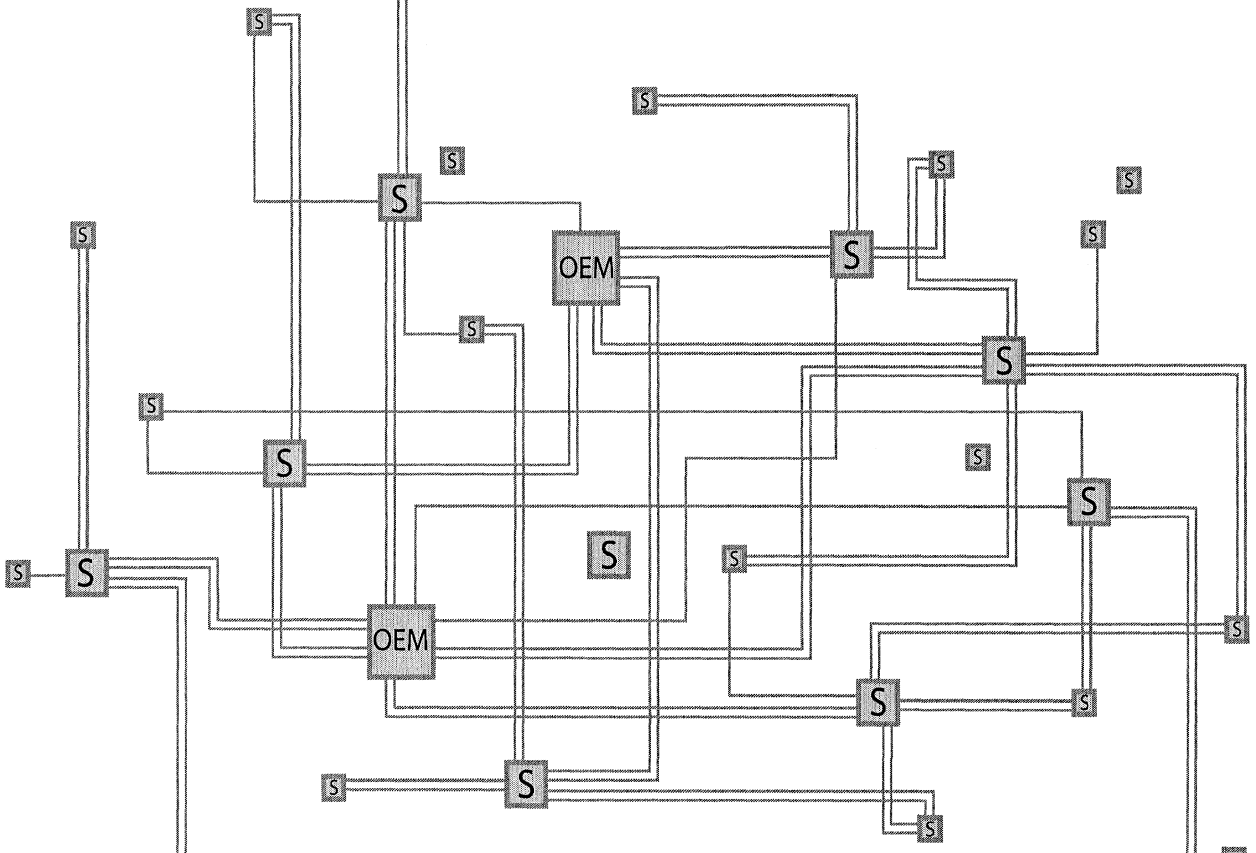
Working with KNOWLEDGE in the Automotive Supply Chain



A study by: Office for the Study of Automotive Transportation
University of Michigan Transportation Research Institute

for: IBM Global Services
Automotive Industry Practice

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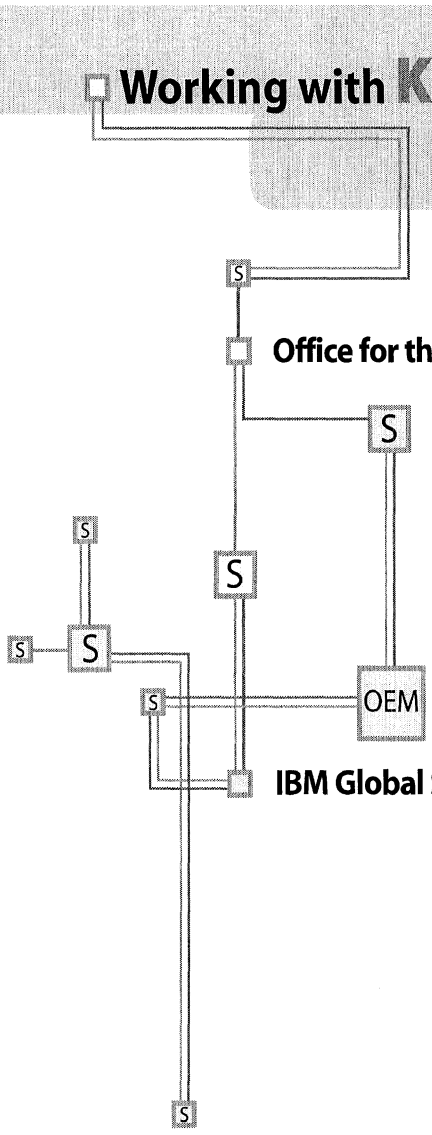

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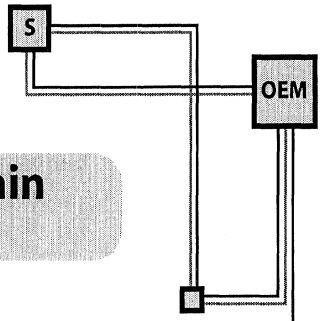


Executive Summary

The automotive industry is currently experiencing turbulent change on two fronts. First, the transfer of increasing design and development responsibility by manufacturers to their major suppliers has created more demand for engineering expertise at the supplier level. Second, many employees throughout the industry are retiring, sometimes leaving large gaps in the accumulated knowledge within companies. IBM Global Systems Automotive Practice and the University of Michigan's Office for the Study of Automotive Transportation (OSAT) collaborated on this study about working with knowledge in the automotive supply chain for two key reasons: first, we hope to improve the performance of the industry overall, and second, we think knowledge offers companies and their supply chains a sustainable competitive advantage, one that transcends changes in personnel, technology, and location.

Our research focused on a division of a major Tier One global automotive supplier of components, modules, and systems, which we call SupplyTime. We conducted interviews with 12 company executives and managers as well as with some primary customers and suppliers. We also surveyed over 150 SupplyTime employees on their views of knowledge activities within the division, and about 60 employees of its customers and suppliers about SupplyTime's knowledge efforts.

A case study such as this offers deep understanding of one company. But SupplyTime is not unique, so these results are also more general, and lessons learned from SupplyTime apply to other suppliers and manufacturers. SupplyTime is an appropriate case for this project because it is a division of a large Tier One supplier that is taking on more design and supply chain responsibilities, and has substantial total sales, numerous OEM customers, and global reach. Hence, it is fairly typical of larger suppliers facing the challenge of becoming system integrators or Tier One suppliers.

This study differentiates among data, information, and knowledge, examining 20 different knowledge activities as the basis for exploring knowledge creation, sharing, use, and storage. It measures the impact of knowledge initiatives on the organization and the perceived value, frequency, and quality of the performance of these activities. It discusses the implications of the findings at both the company and industry level, and provides recommendations for overcoming some of the internal and external barriers to implementing knowledge initiatives.

Our survey of company employees, customers, and suppliers expands on and details the interview findings while identifying important challenges for

knowledge initiatives. **The results of the survey uncovered six major issues that any company embarking on a knowledge initiative needs to address.**

1) **Understand thoroughly the value of knowledge within the organization.**

2) **Acknowledge likely gaps between the perceived knowledge benefits and related activity levels.**

3) **Resolve discontinuities in knowledge-sharing activities within the company.**

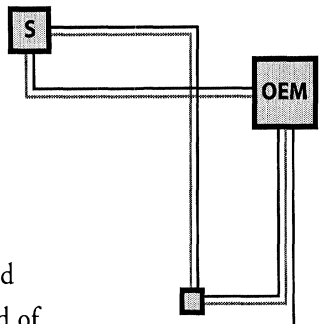
4) **Consider possible differences in the perceptions of knowledge among the company, its customers, and its suppliers.**

5) **Take into account differing emphases by the company, its customers, and its suppliers on people, technology, process, and culture as facilitators of knowledge activities.**

6) **Measure and incent knowledge activities in order to manage them effectively.**

Knowledge initiatives are a basis for future competitive success, yet they are often treated as tactical rather than strategic initiatives. Large, complex organizations can no longer rely heavily on face-to-face knowledge sharing. Systems and processes need to be developed to capture and share knowledge within and between companies. Many companies prefer to be fast followers. However, like the quality initiatives of the 1980s, we think companies and their supply chains that properly implement knowledge initiatives will reap rewards and may establish a lead that forces fast followers into continuous catch-up mode. Knowledge may be the next competitive basis that differentiates which companies and supply chains win and which lose.

Introduction



Knowledge is at the top of nearly every manager's list of their company's competitive advantages. It may be labeled as product or process innovation, manufacturing capability, or marketing expertise, but it is knowledge. It is created, shared, stored, and used, and it is important in every company no matter what its size. In fact, there would be no company without knowledge. It exists in every organization, waiting to be tapped. Knowledge explains the success of any organization and determines how well any organization succeeds.

But knowledge is elusive. It is often hidden within a company, unintentionally or sometimes even intentionally. It shows up in product development through the sheer discipline of the process. It also shows up in design, manufacturing, and marketing, as well as in purchasing, finance, and management. But often knowledge is not shared, neither among these functions nor across company divisions. Few companies have the enabling culture or employ the organizational and technical infrastructure to capture and share knowledge throughout the company, much less with their customers and suppliers.

IBM Global Systems Automotive Practice and the University of Michigan's Office for the Study of Automotive Transportation (OSAT) collaborated on this study about working with knowledge in the automotive supply chain for two key reasons: first, we hope to improve the performance of the auto industry overall, and second, we think this activity offers companies and their supply chains a sustainable competitive advantage, one that transcends changes in personnel, technology, and location.

Historically, successful companies shared knowledge on paper and especially by word of mouth as managers trained their staffs in the lore of their craft; local wisdom and stories were the DNA of knowledge. But over the past 20 years, companies recognized that their frequent downsizing and upsizing due to economic fluctuations and retirements caused major knowledge losses and gaps that needed continual restoring. Over the past ten years or so, companies have experimented with electronic, as well as web-based, systems to gather, store, and distribute knowledge throughout organizations, trying to bridge these knowledge gaps.

The most successful companies recognize the impact knowledge has on their competitiveness and inculcate systems and processes to support knowledge use, sharing, and retention into their culture, across their organization, and with their customers and suppliers. They also nurture knowledge within their culture by measuring its impact and incenting their staffs.

Purpose

Our purpose in this report is to offer the auto industry a view of some of the major issues in working with knowledge by examining specific knowledge activities and processes at a major supplier company. We examine how these issues affect this company, and describe the implications of these results for the auto industry. We also offer specific recommendations for how companies can overcome some of the internal and external barriers to leveraging knowledge and give their companies a sustainable competitive advantage.

Our research focused on a division of a major Tier One global automotive supplier of components, modules, and systems, which we call SupplyTime. We conducted interviews with 12 company executives and managers as well as with several primary customers and suppliers. We also surveyed over 150 SupplyTime employees on their views of knowledge activities within the division, and about 60 of its customer and supplier employees about SupplyTime's knowledge efforts.

A case study such as this offers deep understanding of one company. But SupplyTime is not unique, so these results are also more general, and lessons learned from SupplyTime apply to other suppliers and manufacturers. OSAT's many research projects, focused on the supplier industry, especially system integrators and Tier One suppliers, suggest to us that SupplyTime and the challenges it faces accurately represent this level of the supply base. SupplyTime is an appropriate case for this project because it is a division of a large Tier One supplier that is taking on more design and supply chain responsibilities, and has substantial total sales, numerous OEM customers, and global reach. Hence, it is fairly typical of larger suppliers facing the challenge of becoming system integrators or Tier One suppliers. We capture some of the breadth of the industry's working with knowledge through the people at SupplyTime (who average about nine years working at SupplyTime and about 17 years in the auto industry), as well as through SupplyTime's customers and suppliers, who offer perspectives based on working with numerous companies in the industry.

Why knowledge?

The automotive industry's complex product development and manufacturing processes make it one of the most knowledge-intensive industries. Knowledge has been created, used, and shared over and over again throughout the history of the auto industry. But it has also been re-created over and over again because the original knowledge was not stored and shared with the whole organization. This may have occurred because of organizational complexity, a culture that does not value knowledge activities, or a lack of processes and technologies to gather, store, and share knowledge. But today, business consultants, academics, and executives consider an organization's ability to work with knowledge as an important competitive advantage, raising knowledge from a tactical to a strategic issue for a company.[1] Jack Welch sees "an organization's ability to learn, and translate that learning into action rapidly as the ultimate competitive business advantage."[2] Peter Drucker thinks, "Knowledge has become the key economic resource and the dominant—and perhaps only—comparative advantage."[3]

Another way of thinking about the value of knowledge is in terms of transaction costs. The cost of acquiring and transferring knowledge both within a company and between a company and its customers and suppliers can be measured in time and money. These knowledge-sharing activities already take place in the auto industry, and making them more efficient offers the opportunity to reduce costs and increase the value of knowledge to the organization. Improved knowledge

[1] We chose "working with knowledge" over "knowledge management" as our title because Prusak and Davenport, who were among the first to use the term "knowledge management," report that they wish they could replace it with "working with knowledge." Their reasoning is that knowledge "management" has connotations that one is trying to manage everything that relates to knowledge, which is unrealistic and impractical. It sets up an impossible goal that can never be reached and sets up a process that will surely fail.

[2] Cortada, J. W., Ed. 1999. *The Knowledge Management Yearbook 1999–2000.* Boston, MA, Butterworth-Heinemann., pp. 507.

[3] Ruggles, R. 1999. "The State of the Notion: Knowledge Management in Practice." *The Knowledge Management Yearbook 1999–2000.* Boston, MA, Butterworth-Heinemann, pp. 295.

coordination also offers the possibility for innovation and for synergies within a company and across the supply chain.

What makes knowledge especially important to companies is the sustainability of knowledge as a competitive advantage. Davenport and Prusak point out that, "Eventually, competitors can almost always match the quality and price of a market leader's current product and service. By the time that happens though, the knowledge-rich, knowledge-managing company will have moved on to a new level of quality, creativity, or efficiency. The knowledge advantage is sustainable because it generates increasing returns and continuing advantages. Unlike material assets, which decrease as they are used, knowledge assets increase with use: Ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver."[4]

One can argue that the continuous improvement part of the Toyota Production System embodies this philosophy. Continuous improvement builds knowledge into the processes of the company, and is seen as a strategic part of the company, supported by top management, an organizational infrastructure, and incentives tied to performance. Toyota invites competitors to learn about the Toyota Production System because the knowledge that is part of the system also continually improves the system, making it difficult for another company to gain a competitive advantage from imitating the current form of the system. By the time a competitor initiates a similar process, the Toyota system has already changed to make it more efficient or creative.

Why now?

Two major changes taking place in the automotive industry make knowledge even more important today. First, the consolidation of suppliers into either very large system integrators or Tier One suppliers, and the gradual transfer of design and supply chain responsibility from the manufacturers to these suppliers. OSAT has studied this change as it has occurred, including initial studies of the changing supply base and recent work on OEM purchasing strategies.[5] The reasons for this shift of responsibility include the manufacturers' focus on designing, manufacturing, and marketing the complete vehicle, rather than the individual parts; and the consequent reduction in the manpower and physical assets that manufacturers require. This change has drastic effects on both manufacturers and suppliers. Manufacturers are "leaning out" their engineering staffs, particularly in research and development, as they expect system integrators to take over much of this function.[6]

Second, a rash of early retirements and layoffs over the past five years precipitated by company cost-reduction initiatives, the transition of development responsibility to system integrators, and the current recession—which will exacerbate the first and likely block the second—have left

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[4] Davenport, T. H.; Prusak, L. 1998. *Working knowledge: How organizations manage what they know.* Boston, MA, Harvard Business School Press, p. 17.

[5] Flynn, M.S.; Belzowski, B.M.; Bluestein, B.; Ger, M.; Tuerks, M; Waraniak, J. 1996. *The 21st Century Supply Chain, The Changing Roles, Responsibilities, and Relationships in the Automotive Industry.* Ann Arbor, The University of Michigan Transportation Research Institute and A.T. Kearney, Inc., Vol. 51.

Flynn, M.S.; Belzowski, B.M.; Booms, C. 1998. *Beyond Y2K: Information Technology and the Automotive System Integrator.* Ann Arbor, The University of Michigan Transportation Research Institute, Baan, and Hewlett-Packard Company.

Flynn, M.S.; Alkire, K.F.; Graham, D. 2001. *OEM Parts Purchasing: Shifting Strategies.* Ann Arbor, University of Michigan Transportation Research Institute.

[6] However, some may argue that manufacturers may be giving up a competitive advantage in certain areas such as powertrain.

manufacturers asking the remaining staff to do even more. For many years, manufacturers have met this need by rehiring key laid-off or retired employees as consultants, effectively taking them off their full-time salary roles and placing them in a temporary employment category.

Manufacturers are no doubt already recognizing the loss of institutional knowledge when high level managers and long time product and manufacturing engineers retire or leave. Serious questions are being asked by the remaining staff: How can we capture and retain the knowledge of employees so we do not lose it when they leave? How can we maintain adequate expertise in the systems we are outsourcing? How will we be able to evaluate the systems that suppliers present to us if the people who knew the most about these systems are no longer with the company?

Suppliers face their own set of challenges with their increased responsibility. Not only are they being asked to design/develop, validate, and produce systems that are more complex than the components they built in the past, but they must also do this with accelerated pressure from the manufacturer to reduce costs. To achieve this, they must collaborate with both the manufacturers and their suppliers in new ways, sharing knowledge that will lead to innovative products with high quality and low cost that are developed and produced in a timely manner.

Although most system integrators are still not as vertically integrated as their manufacturer counterparts had been, they have now taken on much more intellectual responsibility for system design, validation, and manufacturing. Consequently, their need for engineering program and system design knowledge has grown. System integrators are meeting this challenge by trying to understand, codify, and use their own knowledge to better meet the needs of their customers. They are doing this by implementing initiatives to gather knowledge over time, which will also support continuous improvement of products and processes, sharing knowledge throughout these increasingly global companies, and retaining knowledge when key personnel leave the company. They are also trying to share knowledge with their customers and suppliers, and experiencing varying degrees of success here as well.

The reorganization of the supply chain that is creating system integrators has also forced some component suppliers into Tier Two status, so these very competent suppliers, who used to work directly with the manufacturer, now work exclusively with the system integrator. This change in the supply chain has created a wider range of abilities among Tier Two suppliers with many remaining build-to-print shops while others design and build specific components.

The degree of success or failure companies experience in implementing knowledge initiatives may in large part be determined by how the initiatives deal with the complexity of the industry. For example, knowledge sharing, both acquisition and transfer of knowledge, may occur between different stages of a program which include research and development, concept award, component design and engineering, component validation, and production and logistics; among different programs within a company; across different company divisions; and among the company and its customers and suppliers. Figure 1 illustrates the potential complexity of knowledge sharing within and between companies. Reflecting this complexity has been a major driver in the design of this study because we need to better understand how it affects knowledge sharing both internally and externally.

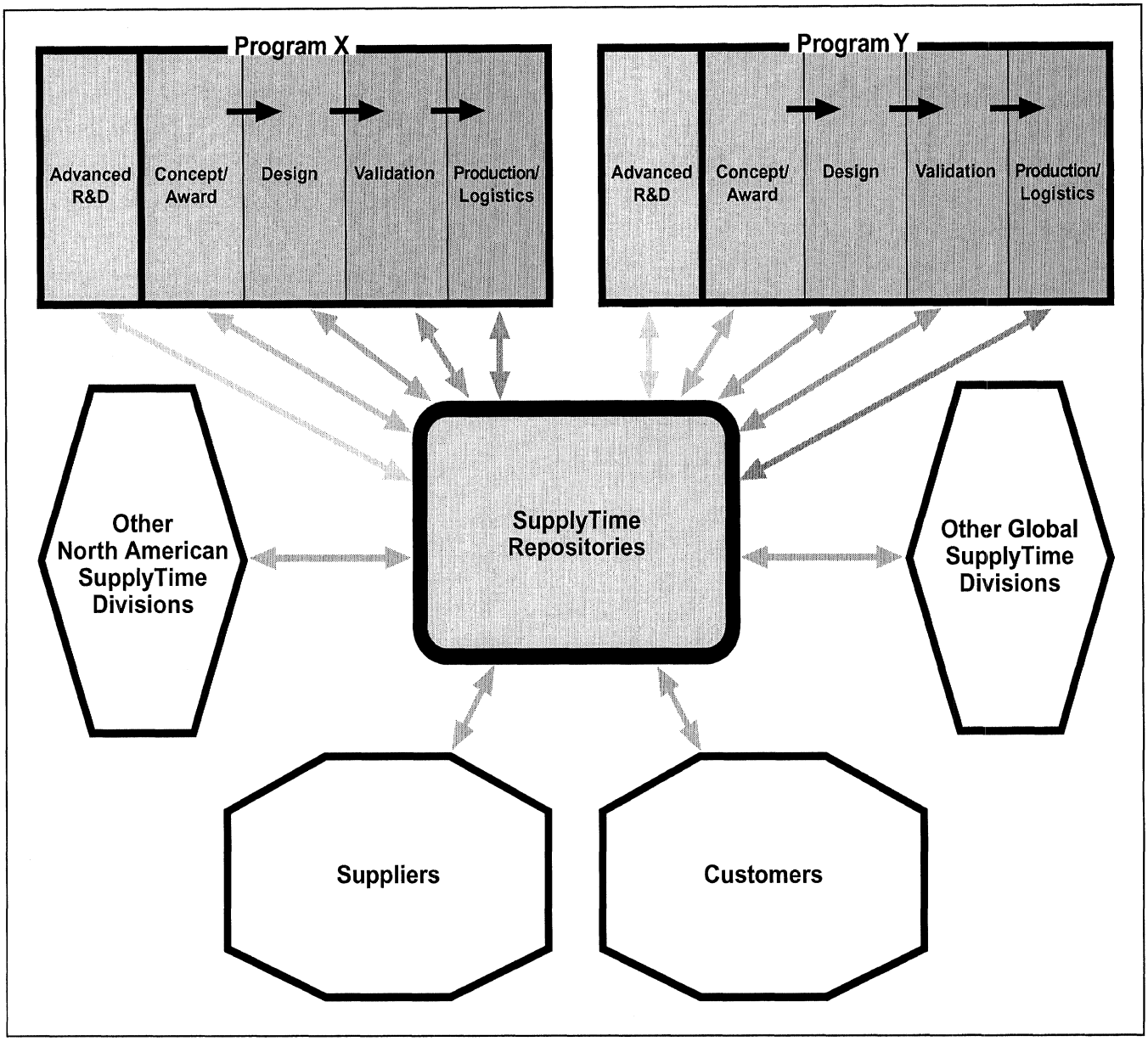


Figure 1. Knowledge Flows Within and Between Companies

Working with knowledge: Definitions

For this study, we draw on a knowledge literature of the past 20 years that views working with knowledge within a company as a subset of the theory of learning organizations, as well as IBM's own knowledge initiatives over the past five years or so (see Bibliography at the end of this document). For our general view of knowledge, we adapted Haeckel's Hierarchy, shown in figure 2, with data at the base of a pyramid, information in the middle, and knowledge at the highest level.[7] We view knowledge generally as "familiarity, awareness, or understanding gained through experience or study."[8] This definition builds on

[7] Haeckel, S. H., Nolan, R. L. 1993. "The Role of Technology in an Information Age: Translating Knowledge into Action," in *The Knowledge Economy: The Nature of Information in the 21st Century, Annual Review of the Institute for Information Studies*. Northern Telcomm and the Aspen Institute, p. 6.

[8] Houghton Mifflin, *The American Heritage College Dictionary*, 3rd ed. Boston, MA: Houghton Mifflin Company.

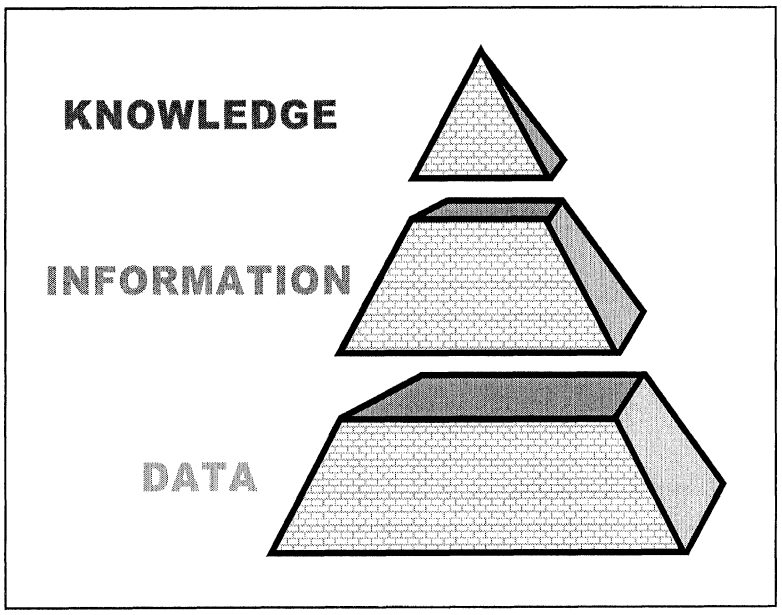


Figure 2. Haeckel's Modified Hierarchy

information and data as a supporting infrastructure for knowledge.

In figure 3 we define data, information, and knowledge in more specific and concrete terms to better differentiate the three concepts. Indeed, our executive interviews at SupplyTime revealed that respondents often equate data and information transfer with knowledge, so clear and distinct definitions are very important.

Our literature review and our interviews with SupplyTime and its customers and suppliers identified a set of 20 knowledge activities. We used these as the basis for our study; they are shown in figure 4. This set of knowledge activities is particularly useful for revealing where disconnects might occur within a company's knowledge processes and where improvements should be considered. We categorize the knowledge activities under the following major headings:

- Creating new knowledge
- Sharing knowledge through its acquisition and transfer, both internally and externally
- Using and incorporating knowledge in processes, products, and services
- Storing knowledge

We use the knowledge activities in figure 4 to represent a "working with knowledge" scale that

DATA

Data includes images, sounds, or facts. So a set of stress-test results for a radius on a plastic IP support is an example of data.

INFORMATION

Information is formatted, filtered, and summarized data. A tabulated summary of the stress-test results for a wide variety of radii, plastics, and conditions is an example of information.

KNOWLEDGE

Knowledge is more comprehensive than data or information. It is a mix of experience, values, contextual information, expert insights, and grounded intuition that actively enables performance, problem-solving decision-making, learning, and teaching. For example, a process or system that enables an individual to choose the ideal radius for an IP design, using lessons learned and tabulated information, constitutes knowledge.

Figure 3. Examples of Elements of Haeckel's Modified Hierarchy

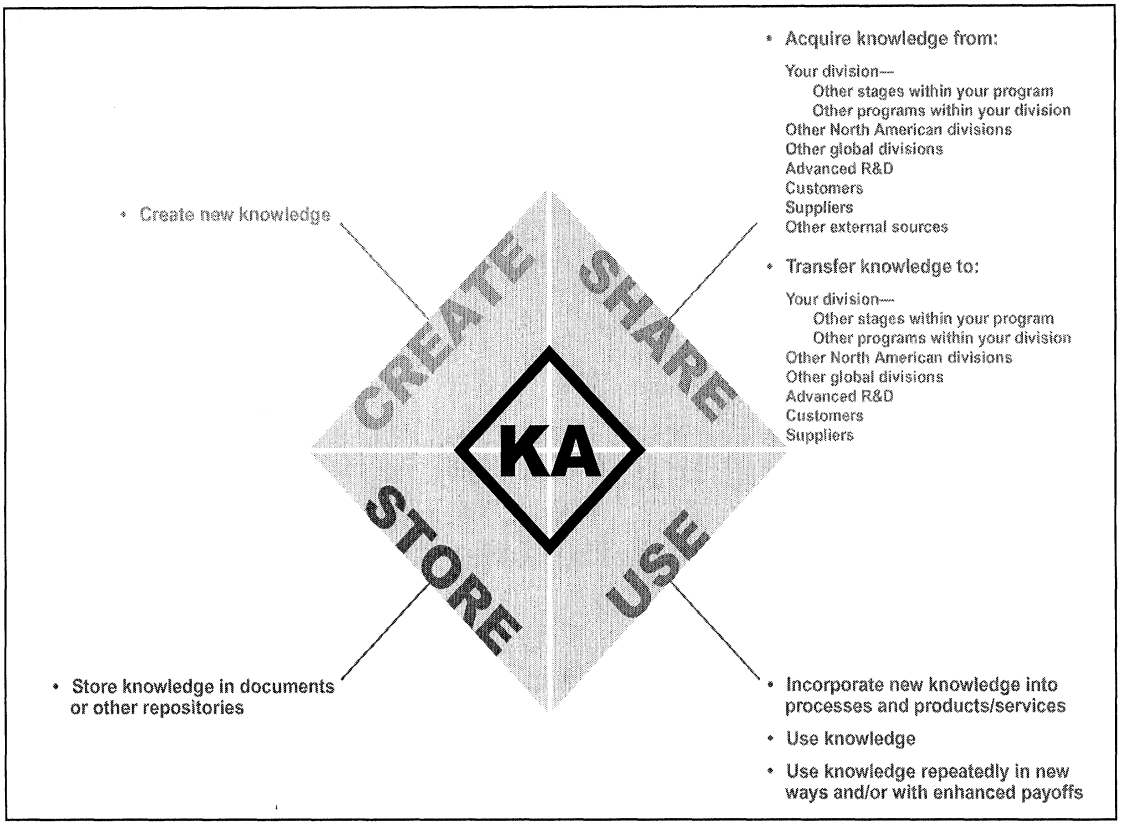


Figure 4. Knowledge Activities

determines where a company's knowledge initiatives stand. We use this scale to explore knowledge activities from a variety of perspectives:

- Perceived benefits of knowledge activities
- The role of knowledge activities in meeting program objectives
- How well and how often knowledge activities are performed
- Perceived barriers to and facilitators of knowledge activities, especially people, culture, process, and technology
- The personal experience of employees concerning knowledge activities
- The role of customers and suppliers in knowledge activities

Working with knowledge: Critical success factors

Like any major initiative, leveraging knowledge demands support throughout the organization for it to succeed, though generating this support becomes a challenge in itself due to competing initiatives and the everyday demands of people's jobs. An auto manufacturer CEO recently noted that because of the recession, his company would implement initiatives to help the company in the short term rather than take on initiatives with a longer term payoff. Though short term initiatives provide for the survival of a company, making fundamental long-term changes may play a more important role in determining a company's success after the crisis has passed.

Some major initiatives, such as cost reduction, quality improvement, and leveraging knowledge are best considered part of the philosophical, long term approach to the business, not just as another program. Balancing these essential initiatives

demands a broad-based integrated approach to management that reflects the core philosophy of the company and maintains that philosophy during lean as well as plentiful times.

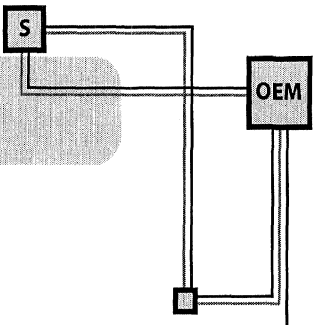
Knowledge initiatives encounter specific challenges that must be addressed for their successful enculturation. We see these challenges as critical success factors for knowledge initiatives. As with all major initiatives, change must be tied to overall business vision and strategies, and its objectives driven home with senior management support. It must also have sufficient funding and human resources, a process for changing or adapting to the current company culture, and a measurement process. **The challenges particularly important to a knowledge initiative include:**

- **Linking the initiative to the economics of the organization or industry**
- **Developing a technical and organizational infrastructure, including training, to support the effort**
- **Adapting the initiative to a culture that often sees knowledge as a base of an individual's competitive advantage rather than as an organizational asset**
- **Providing non-trivial motivational aids**
- **Developing some level of knowledge structure**
- **Understanding that knowledge is transferred through multiple channels that reinforce one other**[9]

These success factors, as well as the areas of concern we discuss in our survey results, apply to any company implementing a knowledge initiative. Throughout the report we will refer to instances where critical success factors are important in leveraging knowledge.

[9] Davenport, T. H.; Prusak, L. 1998. *Working knowledge: How organizations manage what they know.* Boston, MA, Harvard Business School Press, p. 153.

Interview Results



Our initial meetings with SupplyTime executives suggested that the company was well down the road in its development and implementation of its knowledge initiatives. They indicated the company had processes and technologies in place and was already incorporating working with knowledge into its culture. In particular, they thought the company's knowledge processes offered them a competitive advantage in managing its programs. Successfully completing programs for its customers has given the company a good reputation with its customers and suppliers, allowing it to resist price reduction pressures more successfully than its competitors.

Our interviews with company executives, program managers, customers, and suppliers revealed some important issues concerning working with knowledge. The company's knowledge strategy appears to be concentrated primarily at the senior management level. The culture of the company is reportedly very supportive of knowledge efforts, but interviews reveal mixed views about the support for knowledge efforts, especially support provided by the company's organizational structure and technology.

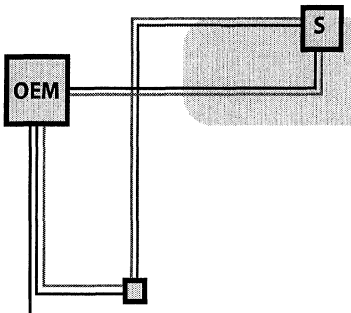
We also found near unanimous agreement that little attempt is made to measure the achievements or returns on the investment of knowledge activities. Interviewees report less effective processes for sharing knowledge among different programs, but many processes for knowledge sharing between the stages within a program.

In terms of SupplyTime's relationships with its customers and suppliers, company interviewees report little problem receiving specific product requirements from customers, but still feel they do not receive the benefits of accumulated knowledge from customers. They also think suppliers play important roles in the company's knowledge processes, but that the company's present efforts to include suppliers in knowledge efforts fall short of the potential.

SupplyTime employees, as well as customer and supplier interviewees, think adequate technology is in place to share knowledge among the company and customers and suppliers, but security concerns between companies restrict better electronic communication. They believe these issues can be resolved through closer long-term relationships including co-location, and by using common systems for sharing knowledge.

In a recent study conducted by OSAT and Roland Berger that focused on the role system integrators play in automotive e-business, researchers discovered similar security concerns. While manufacturers and system integrators recognize the necessity of standardization, each wants proprietary networks to protect its sensitive information. Researchers concluded that "mutually beneficial alliances" were the best model for overcoming security concerns.[10]

[10] Heidingsfelder, M.; Benecchi, A.; Dergis, M.; Rasche, J.; Flynn, M.S.; Senter, R., Jr.; Belzowski, B.M. 2001. *Automotive System Integrators: Spiders or Flies In the e-Business Web?* Troy, MI, Roland Berger-Strategy Consultants, p. 19.



Survey Results

Our interviews with SupplyTime staff and its customers and suppliers gave us insight into their organization's knowledge activities, and helped us design our survey to best measure the company's views on this topic. The results of the survey uncovered six major issues that SupplyTime—and any company embarking on working with knowledge—needs to consider. We believe these issues, combined with the critical success factors already discussed, offer a general framework for understanding how well a company is implementing its knowledge initiative. **Companies must:**

1) **Understand thoroughly the value of knowledge within the organization.**
2) **Acknowledge likely gaps between the perceived knowledge benefits and related activity levels.**
3) **Resolve discontinuities in knowledge-sharing activities within the company.**
4) **Consider possible differences in the perceptions of knowledge among the company, its customers, and its suppliers.**
5) **Take into account differing emphases by the company, its customers, and its suppliers on people, technology, process, and culture as facilitators of knowledge activities.**
6) **Measure and incent knowledge activities in order to manage them effectively.**

Our analyses of each of these issues include our view of the implications these issues have for the company and the automotive industry as a whole. Based on our organizational research in the auto industry, we believe that these findings generalize fairly well to most suppliers and manufacturers. The following sections detail each of the six major issues listed above.

ISSUE #1

Companies need to thoroughly understand the value of knowledge within their organization.

FINDINGS:

SupplyTime is making strides with its knowledge initiative as employees see the value of knowledge at the personal and organizational levels. Figure 5 shows that staff members (which in this report refers to all management and non-management personnel) feel the company's management of knowledge gives it a competitive advantage, as well as helping them perform their jobs better.[11] Though these results are not definitive proof of overcoming the knowledge hoarding challenge, they show a staff with strong positive opinions on the value of knowledge.

[11] Likert scaling is a convenient method for attitude measurement that allows easy respondent participation and administrator scoring. Our survey utilizes five-point scales to allow respondents to choose a neutral position, thereby decreasing measurement error.

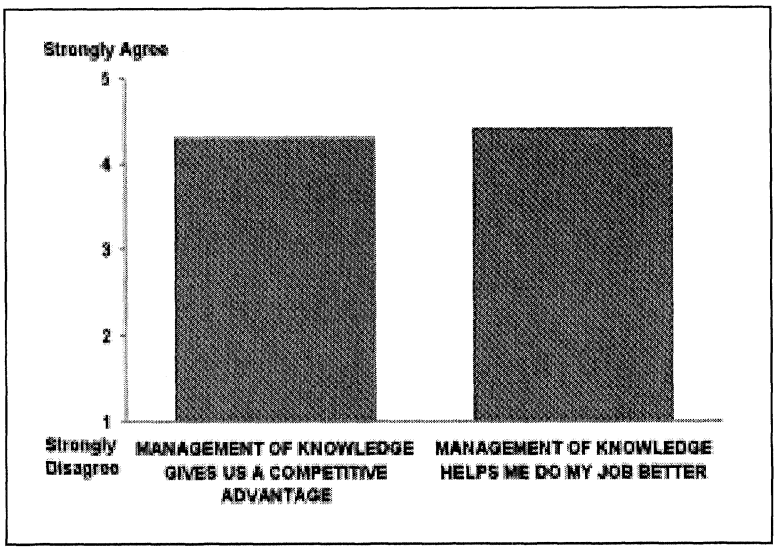


Figure 5. Management of Knowledge Gives a Company a Competitive Advantage and Helps Employees Do Their Jobs Better

Company staff, their suppliers, and, to a lesser extent, their customers view knowledge as highly correlated with overall program success in meeting program cost, timing, and quality objectives. The correlations shown in figure 6 suggest an understanding of the value knowledge plays within the company.[12] Customers see a relationship between knowledge activities and meeting program cost and timing objectives, but less so than do SupplyTime and its suppliers. Customers may be reflecting on the total cost and timing objectives they face for each product development project.

As the integrators of all the systems that make up the vehicle, manufacturers see numerous relationships between cost and timing objectives across different companies. Their report of these relationships probably reflects the variety across these companies. Though none of these correlations are low, they still reveal areas where the company may better exploit its use of its knowledge initiatives.

IMPLICATIONS:

Company Level:

Companies whose employees understand the value of knowledge to their individual work lives and to the programs they work on are well positioned to implement knowledge initiatives that will improve both areas, as well as fill in gaps in their knowledge processes within the company and with their customers and suppliers.

Auto Industry Level:

The importance the auto industry gives to knowledge across the supply chain offers it the opportunity to develop knowledge initiatives that support better knowledge sharing throughout the industry. Although these initiatives tend to be started by individual companies, the development of e-business exchanges may offer the platform and the standards necessary for secure and seamless knowledge exchange across the complete supply chain.

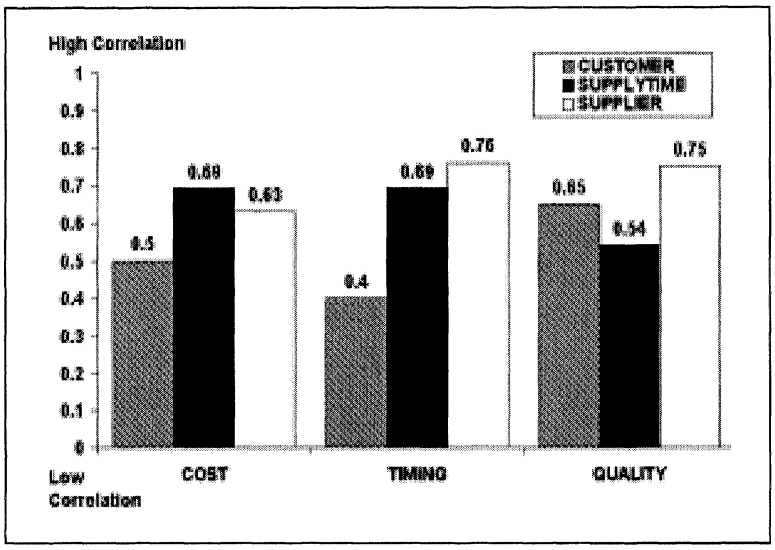


Figure 6. SupplyTime and Its Customers and Suppliers Have Somewhat Similar Views of the Importance of Knowledge Activities to Program Cost, Timing, and Quality

[12] A correlation measures the strength of relationship between variables. The relationship between variables with a correlation coefficient less than .20 is considered negligible; between .20 and .40, low-to-moderate; between .40 and .70, definite-to-substantial; between .70 and .90, high; greater than .90, very high. Adapted from Backstrom, C. H. and Gursh-Cesar, G. 1963. *Survey Research*, 2nd ed. New York, John Wiley & Sons, p. 367.

ISSUE #2

Companies should acknowledge gaps between the perceived benefits and reported knowledge activity levels.

FINDINGS:

Any company working with knowledge and trying to leverage its potential must have employees who understand the value or benefits that working with knowledge provides the company, and the company must also measure the performance of these knowledge activities. As discussed above, SupplyTime staff see the general value of knowledge to the company as a whole, to individual programs, and to each staff member personally. Companies at this point could say, "So, what's the problem? Our company sees knowledge as important in all the ways we would want."

However, companies must take this positive attitude to knowledge and transfer it to action. To measure this transfer, our survey also asked company employees how often and how well their division performed individual knowledge activities, and how much benefit/value these knowledge activities provide to the company. This analysis compares how often (frequency) and how well (quality) the combined knowledge activities are performed with the combined benefits/value shown in figure 7.

Overall, as seen in figure 8, there is a gap between the value staff members see in knowledge activities and their actual performance of those activities. People at SupplyTime report they engage in knowledge activities less often and less well than what we would expect given the benefits/value they attribute to those activities.[13]

The three benefit/value groupings in figure 7 are designed to reflect different effects of leveraging

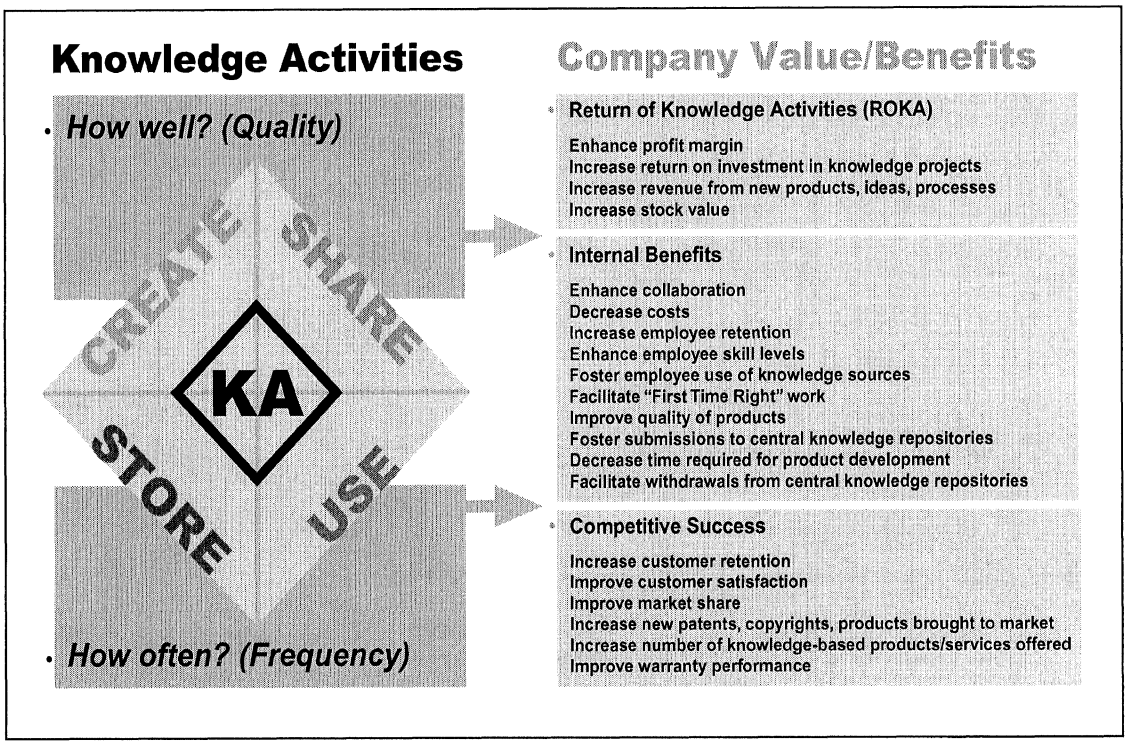


Figure 7. Knowledge Activity Benefits and Value

[13] All differences noted in the text are reliable at the 10% level ($p<.1$); many, of course, are even more reliable ($p<.05$ or less).

knowledge activities within the company and combined represent a Value of Knowledge Activities scale. Return on Knowledge Activities (ROKA) represents direct company financial gains due to leveraging knowledge. Internal Benefits as a group represents the gains of working with knowledge that can contribute to either improved returns or to competitive success, depending on how management decides to deploy them. Competitive Success taps the company's improved competitive performance due to leveraging knowledge activities.

We expected company personnel to differentiate benefits of knowledge activities among these benefit/value categories, but the results suggest they do not. Our analyses showed that company employees viewed these categories as highly correlated and made little differentiation among them.[14]

From a critical success factor perspective, the benefit/value scale includes items that link knowledge activities to the economics of the organization, though staff seem unable to differentiate the economic advantages from other internal benefits or competitive success items. It may be that staff do not truly understand where knowledge activities will have the most impact. It is also possible that knowledge gains are truly diffuse and difficult to allocate distinctly to these categories.

There are also significant differences between some of the individual knowledge activities and the benefit/value scale. The gap between the benefit/value of knowledge activities and the frequency and quality of knowledge activity performance is most pronounced in sharing knowledge, represented here as the acquisition and transfer of knowledge both internally and externally. As shown in figure 9, staff members again report lower knowledge sharing performance than one would expect in light of the high benefit/value they place on knowledge activities.

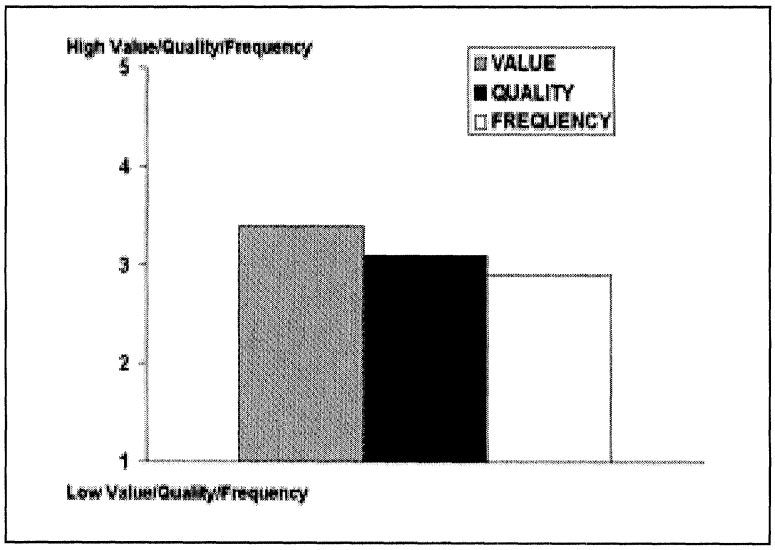


Figure 8. The Value of Knowledge Activities Exceeds the Frequency and Quality of Knowledge Activity Performance

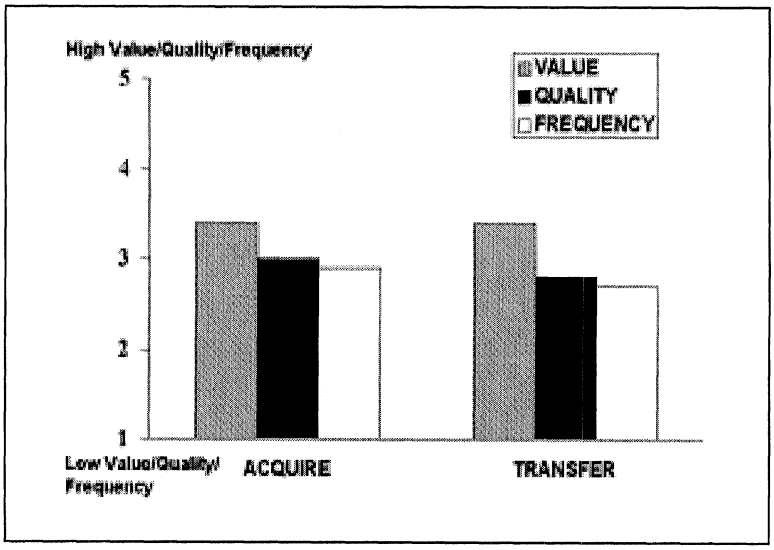


Figure 9. The Value of Knowledge Sharing Activities Exceeds the Frequency and Quality of Knowledge Sharing Performance

In both these analyses, we find a gap between how much benefit/value SupplyTime staff think knowledge activities provide and the frequency and quality of their performance of knowledge activities, especially knowledge sharing. Considering the importance of knowledge activities to individuals and program objectives reported

[14] The benefit/value categories we compared were found to be highly and significantly correlated, falling in the .70 to .90 range.

by employees, this gap emphasizes the need to improve company performance of these activities.

This gap represents a benchmark or a baseline measure for the company as it develops its knowledge initiatives. Continually measuring the performance of knowledge activities and the benefit/value knowledge activities bring to the organization will give SupplyTime, and companies like it, a better understanding of where more emphasis should be placed. In this case, the company seems to have inculcated a sense of the benefit/value knowledge activities bring to the organization, but it has not reached a level of knowledge activity performance consistent with the benefit/value the staff expects.

Knowledge sharing is an area where more emphasis is probably required. It makes up the greater part of the knowledge activities measured (15 of 20 items as shown in figure 4), and represents the movement of knowledge throughout the organization as well as between the company and its customers and suppliers. This gap between the benefit/value of knowledge activities and the actual sharing of knowledge is important. A more developed technical or organizational infrastructure may be needed to support the effort.

A few responses to open-ended questions concerning barriers and facilitators note a "lack of management commitment to following through on knowledge implementation processes" and "a lack of communication structure that shows where in the company 'knowledge' resides." There are aspects of knowledge sharing that offer a challenge to SupplyTime, and probably other companies as well.

One may argue that people will always expect more benefit/value of knowledge activities than their actual knowledge activity performance implies, but some companies have not yet even managed to convince their staffs of the value of knowledge activities. DaimlerChrysler recently polled their employees about their knowledge management challenges. Over half reported that they did not understand the benefit of participating in managing their knowledge, almost half said they lacked the time and skill to do this, and only about a third reported that the company had a sharing culture and incentives for sharing.[15]

Like DaimlerChrysler, SupplyTime is a large organization trying to implement new initiatives that must be nurtured if they are to bear fruit. In this case, it seems both companies share similar challenges in terms of performance, though SupplyTime has done a better job of persuading its staff of the value of knowledge activities. But despite this advantage, the need for staff to perform knowledge activities frequently and well is still an extremely important challenge for the company.

IMPLICATIONS:

Company Level: Based on the critical success factors in knowledge initiatives mentioned earlier, the company needs to increase knowledge activities, especially sharing knowledge. Without this improvement, it will continue to sub-optimize its resources, both people and money, as it unnecessarily recreates knowledge, or experiences quality problems as a direct result of inadequate knowledge sharing.

Auto Industry Level: Besides SupplyTime, other automotive companies, as shown in the DaimlerChrysler example, also struggle to communicate the need for a more structured use of company knowledge. There is a learning curve associated with implementing a knowledge initiative that every company must experience, and companies that begin the process sooner than

[15] Leavitt, P. 2001. *Building and Sustaining Communities of Practice: Continuing Success in Knowledge Management.* Houston, TX, American Productivity & Quality Center (APQC), p. 153.

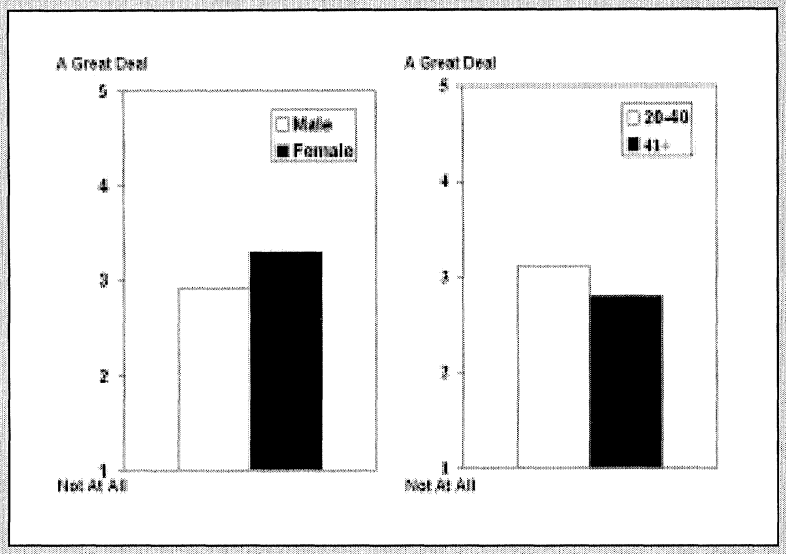


Figure A. Younger Staff Members and Female Staff Members Think Knowledge Activities Are Performed More Often

GENDER/AGE DIFFERENCES

We examined SupplyTime responses to see if there are differences between responses for male and female as well as between younger and older staff members. We found few effects of gender and age for the value of knowledge activities and the quality of knowledge activity performance. However, as figure A shows, we found significant differences within age and gender concerning the frequency of performing knowledge activities with younger staff members and female staff members reporting that knowledge activities are performed more often.

others will be able to reap the benefits of the initiative more rapidly. The need to share knowledge within and between companies also offers opportunities for companies to develop competitive advantage. In particular, larger companies need to optimize knowledge processes in order to move from a knowledge model based only on person-to-person transmission. They cannot rely on the impossible, time-consuming requirements of face-to-face communication as the major mode of knowledge sharing.

ISSUE #3

Companies should resolve possible discontinuities in knowledge sharing within their companies.

FINDINGS:

As the cornerstone of the movement of knowledge throughout the company, knowledge sharing, which includes both acquisition and transfer of knowledge, must be performed often and well. We asked the company respondents how often and well they shared knowledge between stages of programs, across programs themselves, with other North American divisions, and with other global divisions. The results are shown in figure 10.

We explored the increasing gap between both knowledge acquisition and transfer as one moves further away in an organizational and physical sense from other individual staff members, along a "proximity gradient." Company staff report

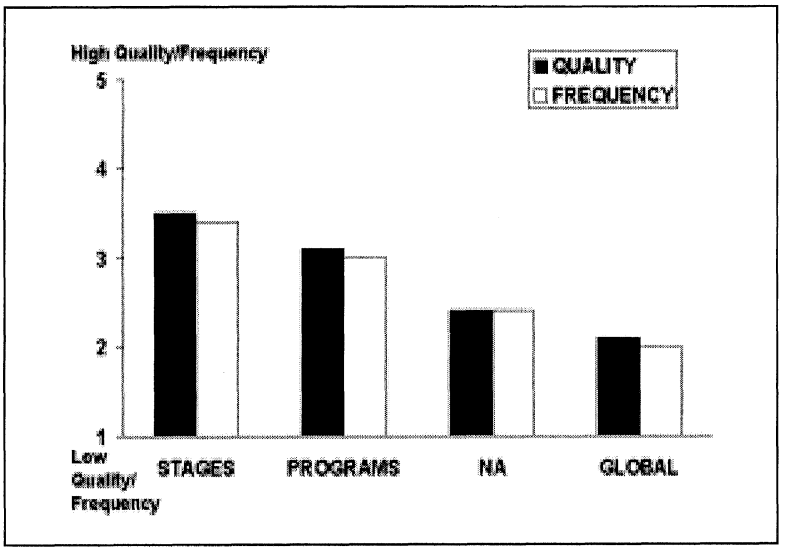


Figure 10. Knowledge Sharing Frequency and Quality Decreases Across the Company[16]

knowledge sharing (acquisition and transfer) between the stages of a program, where there is the most interpersonal contact, is performed better than it is between programs, where the division into business units to serve each manufacturer sometimes isolates groups of employees from one another. Sharing between programs is performed better than across North American divisions, and across the North American divisions better than with overseas divisions.

We suggest this result is not idiosyncratic to SupplyTime. How well these knowledge activities are performed may be a direct function of how often each person interacts with other parts of the company, and may therefore represent a general connectivity bias within any company. Knowledge exists in people throughout the organization, but it is not acquired or transferred as beneficially as it could be. Implementing a technical and organizational infrastructure may be an important step in shaping this proximity gradient.

But there may also be another reason for the low level of knowledge sharing across program, division, and geographic boundaries. Sharing is probably the most challenging knowledge activity because it demands a high level of commonality in systems, functions, and processes across the company for meaningful, non-face-to-face knowledge sharing to occur. This commonality also includes a culture that supports knowledge sharing across internal company boundaries. These results suggest a weakness in the systems, processes, and culture employed across the company.

Unless commonality issues are addressed, even high amounts of technology and executive support will increase knowledge sharing across these company boundaries only to a limited degree.[17] These large supplier companies may not only have different business processes for their divisions, but the divisions may be completely different businesses. Companies need to decide on their corporate business model before implementing knowledge initiatives that may create conflicts between their different divisions.

Given the complexity of the divisional structure of some of the supplier companies in the auto industry, the need for a technical and organizational infrastructure for knowledge initiatives becomes even more important. But there is also a need for a knowledge structure that makes accessing knowledge from anywhere in the world a rewarding experience. Requiring that employees go through multiple contact points—for example, different knowledge initiatives for different divisions or even within the same division—may decrease knowledge sharing. Faced with this

[16] The differences in this graph are not between Quality and Frequency, but across the four areas: stages, programs, North American divisions, and global divisions.

[17] In the OSAT/Roland Berger report, researchers reported that one key to system standardization is that the standards that evolve should be based on how to do transactions, not on specific applications or software providers. This allows system integrators to adopt software and applications that may give them a competitive advantage, while still meeting the interoperability requirements of the manufacturers.

complexity, employees will likely revert to face-to-face sharing primarily within their program.

Company staff did not report directly on the company's knowledge structure, but they did offer some mixed views on items related to knowledge structure. They report that knowledge is accessible (3.5 on a 5 point scale) and that processes help them perform knowledge activities better (3.7), but they also report that stored knowledge is often incomplete and out of date (3.5).

Both Ford Motor Company and Daimler-Chrysler recognize the low levels of knowledge sharing with their overseas entities, and list this as one of their major knowledge management challenges.[18] This need to share knowledge across boundaries may merge with a larger system and encourage commonization within the company. Sharing knowledge in this scenario would be one of the core elements in the initiative, leading to a more knowledge-based focus throughout the company.

Implications

Company Level: The company needs to overcome its internal proximity gradient in knowledge sharing in order to leverage knowledge across the company. By not addressing this issue, the company risks isolating lessons learned and best practices within the organization, and not benefiting as widely as it might. This may mean improving the organizational infrastructure, resources, and timeliness of knowledge for the initiative to succeed. There also seems to be a lack of emphasis on common approaches for sharing knowledge. The company may need to align its corporate knowledge initiatives with the different divisions within the company, leading to system and process commonization.

Auto Industry Level: Because of the complexity of many of the large supplier companies within the auto industry, overcoming the knowledge-sharing proximity gradient within organizations may require system and process commonization across companies. Knowledge sharing commonization efforts by each manufacturer with its supply base may also hinder similar internal supplier efforts if each requires different systems or processes.

Issue #4

Companies should consider possible differences in the perceptions of knowledge among their company and their customers, and suppliers.

Findings:

Sharing knowledge with customers and suppliers is a key ingredient of leveraging knowledge within an organization. In contrast to the internal proximity gradient we discussed within the company, knowledge sharing is seen here extending outside the organization. Customers and suppliers offer very different, but complementary, inputs into the company's knowledge base. The customer has knowledge accumulated over years of working on certain systems. This system knowledge is invaluable to companies like SupplyTime that are now either developing these systems or producing a large part of a system. SupplyTime suppliers, some having once worked directly with the OEM manufacturers, offer knowledge on specific system components concerning materials, processing, and even design.

[18] Leavitt, P. 2001. *Building and Sustaining Communities of Practice: Continuing Success in Knowledge Management.* Houston, TX, American Productivity & Quality Center (APQC), pp. 141–165.

Figure 11 shows that SupplyTime thinks the acquisition and transfer of knowledge is fairly balanced between itself and its customers and suppliers, though staff report acquiring and transferring only some knowledge (about 3.0 on a 5 point scale). Customers and suppliers think the company transfers about the same amount of knowledge, but both, especially suppliers, also report that SupplyTime acquires more knowledge from them than it thinks it does.

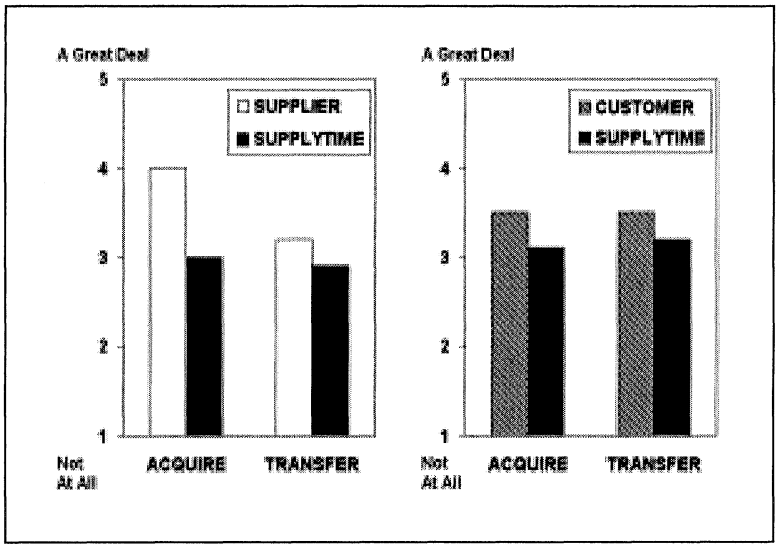


Figure 11. Suppliers Think SupplyTime Acquires More Knowledge Than It Transfers to Them

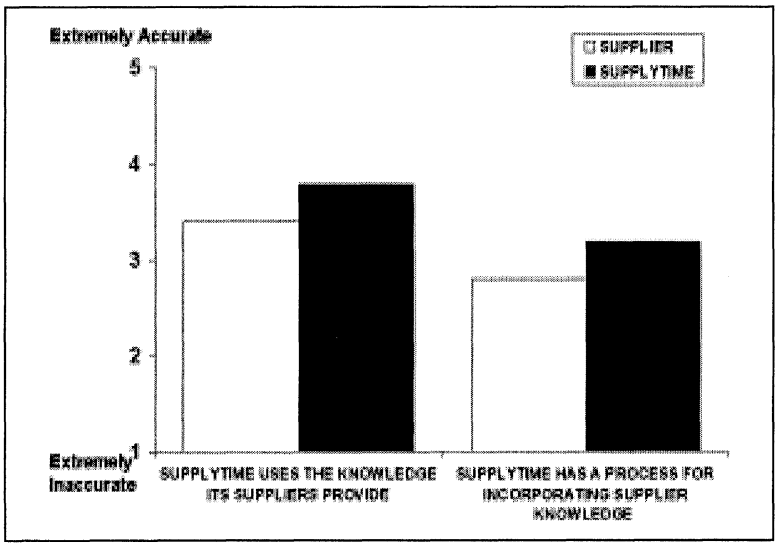


Figure 12. SupplyTime and Its Suppliers Have Different Views of the Knowledge Role Suppliers Play

Suppliers also think SupplyTime acquires significantly more knowledge than it transfers, while customers report more balanced knowledge sharing. SupplyTime does not report any gap between its knowledge acquisition and transfer with its suppliers, creating a possible disconnect in their perception of knowledge-sharing.

This imbalance of knowledge sharing with suppliers raises an interesting irony. SupplyTime may be treating its suppliers in exactly the way it does not want to be treated by its customers. With other large suppliers, it wants its customers to share knowledge and establish better relationships with itself. Yet it may not do the same with its own suppliers. If supplier views are accurate, SupplyTime has not adopted its proper role as a customer, in its own implicit definition.

SupplyTime's own view that it acquires less knowledge than reported by its customers and suppliers suggests it may be sub-optimizing its knowledge resources. This kind of disconnect appeared in one of our earlier studies of manufacturer-supplier relationships. There, suppliers thought the manufacturers were much further along in transferring responsibility to suppliers than did the manufacturers.[19] In this case, customers and suppliers report SupplyTime acquires more knowledge than it thinks it does.

Figure 12 shows there are also some important disconnects between SupplyTime and its suppliers concerning processes the company has in place for incorporating supplier knowledge into its knowledge base, and its use of supplier knowledge. In both of these analyses, SupplyTime is at odds with its suppliers. The company, more than its suppliers, thinks it has processes in place for incorporating supplier knowledge into its knowledge base and that it uses the knowledge suppliers provide.

[19] Flynn, M.S.; Belzowski, B.M; Bluestein, B.; Ger, M.; Tuerks, M.; Waraniak, J. 1996. *The 21st Century Supply Chain, The Changing Roles, Responsibilities, and Relationships in the Automotive Industry.* Ann Arbor, The University of Michigan Transportation Research Institute and A.T. Kearney, Inc., Vol. 51, p. 24.

Toyota offers a good example of a customer establishing good relationships with its suppliers, including sharing knowledge. Suppliers often report that Toyota recognizes the expertise that exists in its supply chain and nurtures the relationship and the knowledge that comes with that relationship. Toyota has established institutionalized routines for knowledge sharing across its Tier One suppliers, even those who also work with the U.S. manufacturers. This network of suppliers itself becomes a competitive advantage as manufacturers outsource larger portions of the vehicle.[20]

To be sure, all knowledge a company creates need not—perhaps ought not—be shared with its customers and suppliers, but there needs to be access to certain parts of each company's knowledge base to help all participants in the supply chain succeed.[21] Understanding what part of the knowledge base should be shared will evolve over time, but companies with a knowledge structure that allows for tailoring knowledge sharing to customers' or suppliers' needs will have a competitive advantage. Suppliers such as SupplyTime may find this type of relationship more rewarding if they develop processes for knowledge sharing jointly with their suppliers. Institutionalizing a process for both acquiring and transferring knowledge with suppliers will not only make it easier to generate more knowledge from suppliers, but it will also offer suppliers the opportunity to learn from SupplyTime.

IMPLICATIONS:

Company Level: Developing a knowledge-sharing culture will create a competitive advantage for companies such as SupplyTime and their value chains for the following reasons: First, supplier companies that do not adopt a knowledge-sharing culture and processes will have difficulty participating in a knowledge-based supply/value chain demanded by some customers. Second, how restrictive or open companies are in their relationship with their suppliers will determine how successfully they share knowledge. Third, if knowledge transfer to suppliers is poor, major suppliers will stifle innovation and problem solving within the lower tiers. They will also likely lose suppliers to companies that do share knowledge. Fourth, being the best at knowledge sharing can create a barrier that will make it difficult for other companies to enter the product market.

Auto Industry Level: The transfer of responsibility for design as well as manufacturing of larger "chunks" of the vehicle to suppliers is expected to create a more innovative and capable automotive supply chain. But this is threatened by the uneven and sporadic sharing of knowledge between OEMs and Tier One suppliers and between Tier One and Tier Two to Three suppliers. Industry-wide efforts to establish standards in other areas that have been only partially successful may slow the development of knowledge-sharing standards. Technology that offers open standards for knowledge sharing between companies may play an important role in facilitating the development of knowledge-sharing supply chains.

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[20] Dyer, J. H.; Nobeoka, K. 2000. "Creating and managing a high-performance knowledge-sharing network: The Toyota case." *Strategic Management Journal*, Vol. 21, No. 3, pp. 345–367.

[21] Heidingsfelder, M.; Benecchi, A.; Dergis, M.; Rasche, J.; Flynn, M.S.; Senter, R. Jr.; Belzowski, B.M. 2001. *Automotive System Integrators: Spiders or Flies In the e-Business Web?* Troy, MI, Roland Berger-Strategy Consultants, p. 30.

ISSUE #5

Companies need to take into account differing emphases by their company, their customers, and their suppliers on people, technology, process, and culture as facilitators of knowledge activities.

FINDINGS:

When companies decide to actively leverage knowledge within their organization, they need to consider how their people, processes, culture, and technology support or hinder the initiatives. SupplyTime staff report mixed opinions on their company's knowledge initiatives. They think the company's organizational infrastructure (3.1 on a 5 point scale) and resources (2.9) neither facilitate nor hinder knowledge activities, while the technology infrastructure (3.8) and training available to employees (3.7) tend to support them.

Figure 13 shows that SupplyTime and its suppliers see people and technology as facilitating knowledge activities more than do process and culture. SupplyTime's customers think the people at the company facilitate knowledge activities more than do technology, process, and culture.

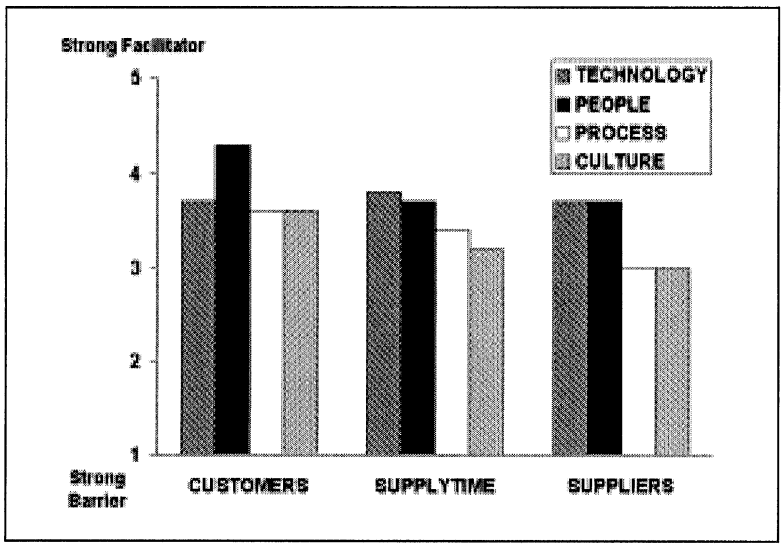


Figure 13. SupplyTime and Its Customers and Suppliers Have Somewhat Similar Views of How People, Technology, Process, and Culture Facilitate Knowledge Activities

However, one of the reasons for implementing knowledge initiatives is to rely less heavily on individual people who inevitably exit the organization. So if people are the strongest facilitators, the company may be risking its knowledge initiatives if a steep downturn in the economy leads to a large number of layoffs and retirements. Granted, it is important to have people in the organization identifying with and supporting the initiative, but what truly sustains a knowledge initiative is changing the company processes and culture so that knowledge activities become a corporate way of life, and the knowledge itself stays when individuals leave.

Changing a company's culture is not an easy task; it demands implementing processes, including measurement and incentives as well as technology to support the change. SupplyTime does not have these processes fully in place, and consequently, faces the possibility of its knowledge initiatives dissolving as leaders of the initiatives leave the company or the staff responds to shifting incentives and initiatives. From a critical success factor perspective, management may need to focus more on supporting knowledge processes to change the current company culture at this point in the initiative's implementation. As noted earlier, we see many of the issues this company faces as emblematic of many large automotive companies that may also face the challenge of changing a company's culture.

The 3M company has long exemplified using culture and processes as a key element in knowledge initiatives that support innovation. 3M's initiatives are built on the premise that people in one area of the company can learn from what others are doing in another area to create innovative products. To that end, 3M designed its work areas and common meeting areas, such as lunch rooms, to allow easy co-mingling of people from different

work groups. Incentives also support the company's initiatives by compensating and evaluating staff based on ideas generated in other areas of the company. These initiatives could not run without its people, but no one person or group of people determines whether it will succeed. The organizational infrastructure is in place to support the knowledge-sharing system, linking the company's success directly to the performance of the knowledge initiatives.

The higher scores SupplyTime staff, as well as its suppliers, give to technology over process and culture as a facilitator of knowledge activities should also be cause for concern. One of our key assumptions throughout this study is that technology should be considered an enabler of the processes and culture that drive the knowledge initiatives. It seems the company may be using technology as a substitute for developing appropriate culture and processes instead of using it as an enabler.

Technology, used properly, can overcome the hurdle of accessing the knowledge base anywhere in the world, or it may make it easier for staff to enter, retrieve, and use lessons learned or best practices as part of their daily routine. But technology cannot substitute for the changes in processes and culture required for successful implementation. If the processes are in place, technology becomes the final piece of the puzzle that enables people to use the processes and helps them participate in the initiatives by providing technical commonization and access.

Implications:

Company Level: The company should establish a better balance among people, technology, process, and culture for supporting its knowledge initiatives. Technology by itself is not a sustainable competitive advantage; it can be purchased and implemented by any company, any time. If a company relies on technology as the cornerstone of its knowledge initiatives instead of initiating the required, and more sustainable, process and cultural changes, it could well lose its competitive advantage in program management.

Auto Industry Level: If the industry tries to use technology as a silver bullet, as they have in the past, it will fail. Technology is a wonderful tool, but applying it inappropriately accomplishes little. Companies must address cultural and process issues if they are to succeed in leveraging knowledge. Granted, addressing these issues may not be easy because of the cost and time pressures companies face. The industry may need a lead company that sets the example of the benefits of clearly leveraging knowledge activities, as General Motors with its divisional strategy or Toyota with its lean production led in those areas. A knowledge leader, as was W. Edwards Deming for quality initiatives, might also be an important catalyst.

Issue #6

Companies need to measure and incent knowledge activities in order to manage them.

Findings:

Developing and leveraging a knowledge culture entails creating incentives that nurture it, especially at the inception of the initiative. As previously noted, developing a knowledge culture is not a simple task, and if incentives are not in place to support its development, staff members will perform other work activities that are more familiar, easy, and better incented. SupplyTime's knowledge initiatives are currently not closely linked to incentives; the staff rates them the least effective

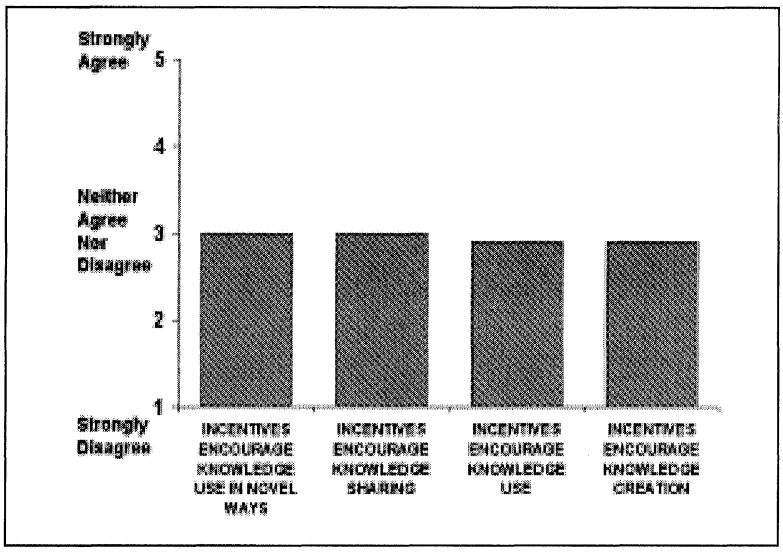


Figure 14. SupplyTime Staff Report that Incentives Neither Encourage nor Discourage Knowledge Activities

facilitator of knowledge activities. Figure 14 shows that in their personal experiences, they question whether incentives exist to encourage them to create, share, or use knowledge.

Incentives are a serious issue for any company initiative because they motivate staff to respond in particular fashions. There are numerous examples of companies saying that they want to be a knowledge- or quality-driven company, only to reward their staffs exclusively on the basis of metrics such as sales or meeting deadlines. To be sure, meeting sales goals and deadlines is extremely important to any business, but if management is serious in its belief that knowledge is integral to the company's future success, it must provide incentives across all these major areas.

But in order to incent knowledge activities, companies must develop objective measurements to decide what and when to incent. Company staff and their executives, as shown in figure 15, do not think the company measures knowledge assets particularly well or very often.

Measurement is a key issue that is addressed somewhat poorly at SupplyTime. According to company staff, not only is measurement infrequent and poorly performed, but it is not facilitated by culture, process, or technology. A lack of measurement can lead to fragmented knowledge initiatives by managers who want to implement the initiative but are not sure which of the knowledge activities need the most focus. As a critical success factor for any knowledge initiative, measurement as well as incentives need to be in place to facilitate cultural change. Incentives show the company "walks the talk," while measurement shows the staff the effects of the implementation and permits appropriate use of incentives.

Measurement of a knowledge initiative is similar to measuring initiatives like quality because the financial gains that one ultimately expects come later in the initiative's implementation. Some early measures should focus on linking knowledge processes to strategic business objectives. Once appropriate processes and technologies are identified and developed, measuring business value,

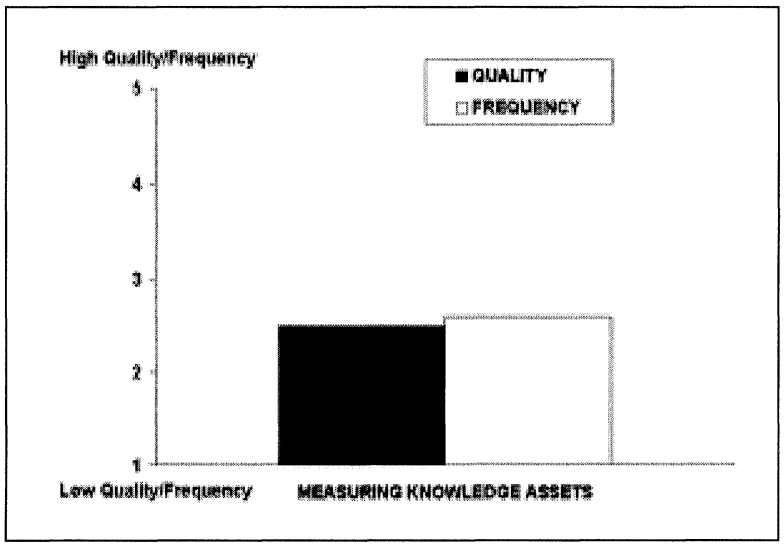


Figure 15. The Frequency and Quality of Measuring Knowledge Assets Is Not Very High

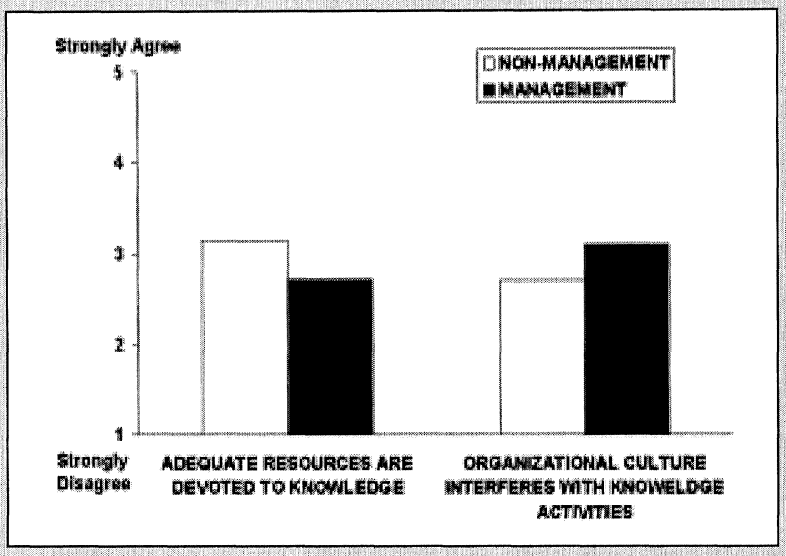


Figure B. Managers More Than Non-Managers Think Adequate Resources Are Not Devoted To Knowledge and That Culture Interferes With Knowledge Activities

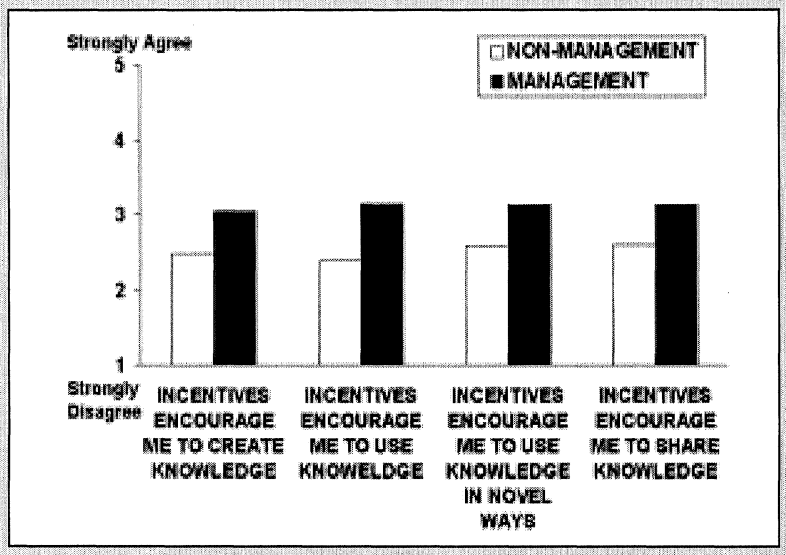


Figure C. Non-Managers Less Than Managers Think Incentives Encourage Knowledge Activities

Management and Non-Management Comparisons

Though managers and non-managers at SupplyTime agree on the value, performance, and quality of the company's knowledge activities, they agree less on the effects of resources, company culture, and incentives on knowledge activities. As seen in figure B, managers are less sure that adequate resources are devoted to knowledge activities than are non-managers. Managers also think organizational culture interferes more with knowledge activities than do non-managers. These differences are contrary to the usual finding that management paints a rosier picture of its company's processes, while those on the line are more aware of its flaws.

One of the main pieces missing from SupplyTime's knowledge culture is an incentive/reward system that directly facilitates knowledge activities. Like most initiatives, if the incentive system does not support or demand the desired behavior, the initiative will likely not be successful. As figure C shows, SupplyTime's managers and non-managers see the current incentive /reward program quite differently, with the managers seeing it as more of a facilitator than do non-managers across a broad range of knowledge activities.

retention of knowledge, cultural impact, effectiveness of sharing communities, ownership of capture and compilation, and management effectiveness becomes appropriate. Measuring knowledge process performance and identifying knowledge bottlenecks within the process should follow.[22]

One of the major challenges knowledge initiatives face is that companies make funding decisions based primarily on the cost reduction potential of the initiative. A knowledge initiative

[22] Hartz, C.; Sammis, S.; Hofer-Alfeis, J.; Lopez, K.; Raybourn, C.; Neumann Wilson, J. 2001. *Measurement of Knowledge Management.* Houston, TX, American Productivity & Quality Center (APQC).

offers cost reduction as part of its value equation, but this savings can come well after the implementation is complete. Managers face the challenge, especially during an industry downturn, of balancing the short-term need to reduce cost while implementing initiatives that offer long-term value, including enhanced success when the industry rebounds. Short term thinking sometimes leads to unwanted consequences. We believe that most companies are making tactical knowledge investments based solely on the cost-reduction potential, similar to many e-business investments.[23] However, a few visionary players will make knowledge initiative decisions with a more strategic perspective, based on the opportunity to increase value.

For many years, quality initiatives faced a similar predicament in the industry. Even though everyone reported that quality was of strategic importance, companies did not truly develop the processes to support the initiatives. Some companies took the lead and developed the processes and culture to support quality initiatives. The rest of the industry finally realized that quality was no longer an initiative that could be discarded and then brought back based on the company's economic circumstances. The companies that took the early lead have kept the lead and the quality reputation that came with it.

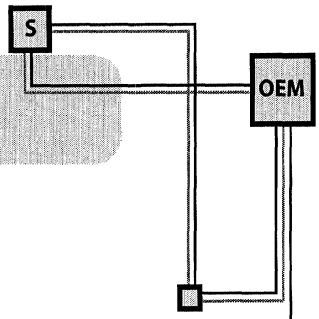
Will knowledge initiatives follow the same pattern as quality? Will some companies drag their feet while others take the lead in working with knowledge and outdistance their competitors? Will a major industry shift force all companies to recognize the strategic value of working with knowledge? Will knowledge become like quality, a differentiator between successful companies with long-term perspectives for success and companies with short-term perspectives focused only on survival?

IMPLICATIONS:

Company Level: The lack of measurement and incentives offer significant challenges to a company's knowledge initiatives because staff may not see measured value over time or they may be incented to place more emphasis on other initiatives.

Auto Industry Level: The auto industry already has numerous measurement demands from the demands of engineering to test and validate components to the needs for developing a business case for major organizational initiatives. In spite of this "measurement culture," companies are not yet measuring the value of their knowledge assets and activities. Without the confidence such measurement provides, efforts to sustain a knowledge culture will fail as initiatives with measurable returns capture company focus and direct company resources.

[23] Heidingsfelder, M.; Benecchi, A.; Dergis, M.; Rasche, J.; Flynn, M.S.; Senter, R. Jr.; Belzowski, B.M. 2001. *Automotive System Integrators: Spiders or Flies In the e-Business Web?* Troy, MI, Roland Berger-Strategy Consultants, p. 13.



Summary and Conclusions

The automotive industry has highly repetitive processes that can—indeed must—take advantage of knowledge gained through best practices and lessons learned throughout the organization and supply chain. Because of the nature of its product, the automotive industry has always been knowledge intense, creating, sharing, using, and storing knowledge throughout its history. However, knowledge has also been recreated time and again because the original learning was not shared or stored within the company.

As many employees retire over the next ten years and as the manufacturers move more design and development responsibility of systems and modules to large system suppliers, the need to capture and share knowledge will only escalate, not only within individual companies but also across entire supply chains. If it has not done so already, supply chain competitiveness will likely supercede individual company competitiveness in the near future in determining who wins and who loses. Developing and deploying knowledge processes, based on supportive cultures and enabling technologies, will certainly be a key factor in achieving that supply chain competitiveness and success.

The manufacturers and major system suppliers are large, complex organizations that experience many of the same challenges, including sharing knowledge within the company and with their suppliers throughout the world. They cannot rely exclusively on informal, primarily face-to-face knowledge sharing. Most of these companies are developing systems and processes for sharing knowledge, but they often differ within the same company, as well as from their customers and suppliers.

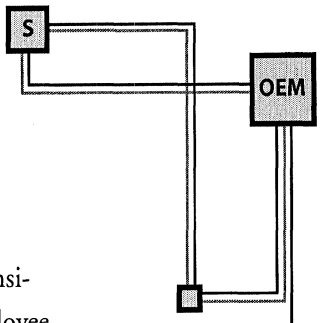
This report notes a number of major issues companies confront as they implement these initiatives. Though employees may understand the general value of knowledge to their company, they must be able to transfer that knowledge into action by performing knowledge activities often and well. Companies, especially multidivision, multinational companies, must also be very aware of how knowledge sharing decreases as one moves further away in an organizational and physical sense from other units or staff members in the organization. When sharing knowledge outside the organization, companies need to establish a balance of knowledge acquisition and transfer with their customers and suppliers.

We also found that one of the major issues in implementing a knowledge initiative is the need to develop processes to change company culture rather than relying primarily on people and technology to bring about change. If the processes are in place, technology becomes the final piece of the puzzle that enables people to use the processes and helps them participate in the initiatives by providing technical commonization and access. Proper incentives and a system of measurement also are needed for a successful implementation. Incentives show the company "walks the talk," while measurement shows the staff the effects of the implementation and permits appropriate use of incentives.

Knowledge initiatives are a basis for future competitive success, yet they are often treated as tactical rather than strategic initiatives. In product development, for example, where staff may enjoy the clearest and largest gains from knowledge

initiatives, time and resource pressures still can undercut their support. As was the case with early quality initiatives, people will say knowledge initiatives are important, but staff behavior and incentives are not designed to support their full implementation. Many companies prefer to be fast followers, but, like quality initiatives, we think companies, and their supply chains, that properly implement knowledge initiatives, will reap rewards and may establish a lead that forces fast followers into continuous catch-up mode. Knowledge may be the next competitive basis that differentiates which companies and supply chains win and which lose.

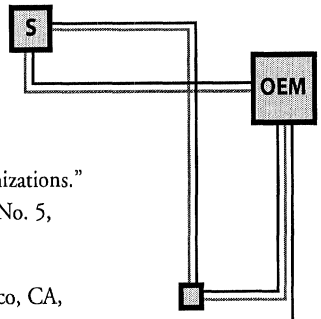
Recommendations



Combining our experience in working with knowledge with the results of our case study of a major automotive supplier division, we found some important issues that need to be considered before companies embark on a knowledge initiative:

- Companies need a clear view of the value of knowledge to their companies and the implied behavior expected from their employees based on that value. Employees should not only know very clearly what value knowledge activities will bring to them and the company, but they should also know exactly what these activities are so that they can perform them often and well as part of their normal routine.
- Companies should avoid organizationally isolating knowledge efforts within the company. Thus, we do not recommend establishing a specific knowledge office or function, except perhaps as a very initial and temporary mechanism for starting the process of emphasizing knowledge in company activities. For example, though we think someone with experience in knowledge initiatives should lead, we think a representative from each product development team should be trained in support of the knowledge initiative, rather than assigning someone from a "knowledge" office or function to support the team. We also suggest this position rotates within the team, giving all members the opportunity to understand the importance of knowledge activities within the organization. This will ultimately smooth the transition to a company where every employee understands and behaves consistently with the company emphasis on knowledge.
- Knowledge initiatives need to be integrated into the company's culture, processes, and technology. We recommend that management set priorities for creating and sharing knowledge through employee deposits and withdrawals from knowledge repositories. This may also mean providing time for employees to begin the transition to establishing new patterns of knowledge activities. Incentives for employee participation are extremely important to support this initiative, although these incentives may not be exclusively financial. We also recommend integrating measurement of knowledge initiatives into company measurement processes to better assess the direct value of the initiative.
- Companies must make efforts to change the company culture to demand and reward knowledge sharing as normal organizational behavior rather than as tactical for the individual. Technology enables people and companies to connect in ways not possible in the past, and it also offers the opportunity to redesign processes to take advantage of this connectivity. While linking knowledge initiatives to processes through technology will aid in breaking down barriers to knowledge sharing throughout the organization, technology alone will not suffice.

- We recommend that companies perform a self-assessment of their knowledge initiatives and processes, similar to our case study analysis, which can include an audit of current initiatives and processes, the role of culture (positive, negative, or neutral), and an inventory of knowledge systems to rate their effectiveness. Gaps in the initiatives can be addressed through pilot programs focused on specific areas in need of improvement.
- Companies need to integrate their knowledge activities across their entire supply chain, drawing on the expertise of both their customers and suppliers. These activities not only support areas such as product development, but also facilitate relationship management among all companies. We recommend introducing pilot programs coordinated with customers and suppliers to begin developing processes for sharing knowledge.
- Finally, we cannot stress enough how important it is to tie knowledge initiatives to serious business concerns. This is key to their success. Knowledge initiatives in many companies today are similar to early quality initiatives in that everyone gives verbal support, but the initiative languishes within its own organization until people recognize its role in affecting the company's success. Also, similar to early quality initiatives, early adoption of knowledge initiatives offers companies opportunities to develop and/or maintain a competitive advantage through continuous development, improvement, and targeted use of knowledge.



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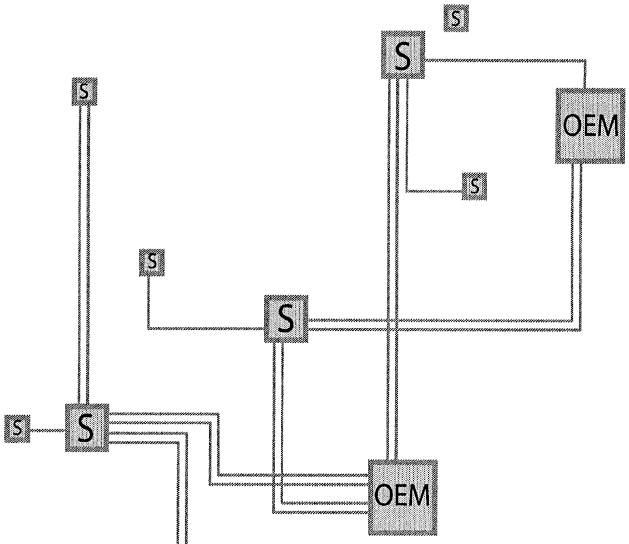

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