

# Mid-american Journal of Business

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## Change?

*W. Rocky Newman*  
*Editor-in-Chief*

For those of us in academia, the speed at which innovation makes its way into curriculum and organizational structure can be frustrating. I ask myself: "How many college professors would it take to change a light bulb?" Making the "change" is the problem. Collegiality is a great thing. Pushing decision making to the lowest feasible point is what we know should happen in successful organizations. But, when we isolate ourselves by department, discipline, or specialty, we tend to make issues of "turf" or "protectionism" the focus of our curriculum interactions with each other. This invariably slows any attempts to work together toward change. Does the analogy "herding cats" come to mind?

My guess is that most schools are looking for ways to deal with these problems. Getting people to think across discipline or functional boundaries is difficult. Teaching and conducting research across boundaries can be even more difficult. Most business schools tend to be organized around functionally aligned departments. This tends to mirror businesses in their functionally aligned "silos" (Stallkamp, T. "Transforming the Organization Through Teamwork," MAJB, Vol.13, No.1, 1998, pg. 7-10). The difference is that businesses are moving in another more cross-functional direction and in most cases academia is lagging behind. In some cases, colleges aren't even aware of the changes occurring in business.

Progressive businesses have understood for some time now that cross-functional thinking (or breaking down the "silos" that have been ingrained into corporate structures since the beginning of the century) is necessary to success in a very competitive world. Speed to market, agility in positioning products, creating value for customers, understanding the cost of product, flexibility to change with technology, and the ability to maximize aggregate workforce productivity all depend on breaking down the functional silos. That needs to happen in academia as well.

Judging by the requests for reprints, the MAJB published its most successful issue in Spring, 1998. It featured cross-functional concerns of leading businesses and academia. Now, we want to go one step further. Supply

chain management expands the idea of crossing functions internally to include spanning across the external enterprise or supply chain.

The marketing of relationships, working with suppliers and the supplier's suppliers, streamlining inter-firm communication through electronic data interfaces, and redefining the role of firms within the chain are all extrapolations of cross-functional thinking. In the fall of 2000, we will publish a special issue on Supply Chain Management. We hope you have heard about it by now and submitted your work in the area. If not, maybe you can do so soon.

Meanwhile, we think you'll find a very interesting set of papers in this issue. Kintzele et al. discusses some timely issues concerning the Y2K issue. Cummings et al. talk about standardizing documentation for modern accounting information systems while Humphrey and Krehbiel describe their experience with a simple, yet useful, graphical approach to managing process capability with respect to the classroom, McFadden et al. summarize industry perceptions of what should be included in contemporary operations management curriculum while Filbeck et al. share experiences with faculty internships in family business. Overall, these articles represent the quality of the submissions we are getting from our colleagues and we hope you find them valuable.

## ***The Cycle of Renewal in the Academic Year***



*James Pope  
Dean, College of Business  
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One of the pleasures of working in academe, and one which is largely lost when one becomes a dean, is the annual cycle of renewal. This is a phenomenon that one seldom finds outside academe. With our two fifteen-week semesters, we can start anew, progress through our courses, and reach a definitive finish twice a year. We then have the summer to reflect upon the previous year and make plans for the coming year.

This cycle provides both opportunities and imposes constraints. The opportunities are many. First of all, we have a new group of students in each course in each semester. That way, if we somehow get a class that does not seem to respond to us or the material, we always know that at the end of the semester they will be gone, to be replaced by a new group. The downside is, however, that a particularly good class will also be gone and we will have only a short time to experience the pleasure of leading them through their learning experiences.

Another opportunity is to try new material, approaches, formats, and settings. In choosing anything new, we do not commit ourselves for years at a time, but only for fifteen weeks. If we try to teach a course on the Web, and it is a dismal failure, we have two choices. One is to simply discard it as a bad idea and try something else. The other is to analyze the problems and try again doing something different. If we try again, we will know again in fifteen weeks whether or not it worked. If it is a success the first time, we again will know in fifteen short weeks.

Many things are changing constantly in academe, just as they are in the so-called “real world.” The difference is that for us, we have time to pause and think about what has changed and how we must change to adapt. Students, for example, have changed over the past thirty years. The percentage of high school graduates going on to college has increased from around fifteen percent to almost eighty percent. Our advantage is that we do not have to adapt to that huge change all at once. We have had thirty opportunities to adapt to small changes, and we have had the time to think about the changes and what we must do to adapt.

We are often criticized for “working” only thirty weeks out of fifty-two each year. What many people forget is that we are in the business of thinking and learning, and our thinking and learning is just as important, if not more so, than that of our students. We are all in this profession because we enjoy thinking and learning. And, the cycle of the academic year gives us so much pleasure because it allows and encourages those very activities.

The academic cycle is somewhat of a metaphor for life. In a larger sense, there is only one large cycle in life leading from birth to death. There are many shorter cycles in our early lives and there probably should be in adulthood. In many people’s lives, however, the cycles are repressed and eventually exert themselves as one form of crisis or another. The result is that many jobs are long stretches of boredom punctuated by these crises. In the academic profession, with its natural cycles, we can be continually renewed and refreshed and face new semesters and years with the enthusiasm we had when we first entered the profession. As I said at the beginning, it is one of the great pleasures of working in academe.



# Managing Process Capability

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Timothy C. Krehbiel, *Miami University*

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## Abstract

Process capability is the ability of a process to consistently meet specified customer-driven requirements, and is often reported in terms of capability indices and ratios. In this paper we briefly discuss these indices and ratios, as well as their managerial implications. We then introduce a graphical approach that can be used in monthly reports and team meetings to help visualize the capability of a process that has several quality characteristics. These graphs, which we refer to as capability graphs, have been well accepted by a number of managers in the consumer products industry. The methodology is illustrated via an in-depth example.

## Introduction

A process transforms inputs to outputs. Numerous processes exist in any business, whether the business is focused on service operations or manufacturing. To analyze a process, one first determines the process' stability and then its capability. Bothe (1997, 6) states "A process output is considered stable when it consists of only common-cause variation." Control charts are used to determine the stability of a process. Once the process is deemed to be stable, one must determine whether or not the process is capable of satisfying the customer. An unstable process is always considered incapable since future output from an unstable process is unpredictable.

## Process capability

Process capability is the ability of a process to consistently satisfy the customer. To measure process capability, process output is compared to specifications. The values of the specifications are determined by managers and engineers by translating customer expectations into quantifiable levels of measurable product (or service) attributes. These selected attributes are then referred to as quality characteristics. In sum, specifications are customer-driven requirements and when the quality characteristics are within specifications, the process is said to be capable of satisfying the customer.

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***...when the quality characteristics are within specifications, the process is said to be capable of satisfying the customer.***

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Among the numerous approaches to reporting process capability, both graphical and non-graphical methods exist. A simple and effective graphical method is to produce a histogram for each of the quality characteristics. A histogram is a vertical bar chart that depicts the distribution of sample data. Histograms are popular in business, particularly in manufacturing settings, because they are easy to understand and can therefore be taught to everyone in the organization. The example featured in a later section of this article demonstrates their use.

Of the non-graphical approaches to reporting process capability, the simplest is to note the fraction of the sampled output that is found to be within specifications. A slightly more complicated method uses sample data to estimate the fraction of the entire population being produced by a process (i.e., all process output produced by a stable process in the past, present, and future) that is within specifications.

A better, slightly more sophisticated, approach is to report the capability of a process using capability indices. Capability indices are statistics which compare process averages to process targets and operating ranges to specifications.

Businesses that decide to use capability indices can choose one from among several that have been developed in various articles and texts. There are detailed technical discussions of the various indices in Kane (1986), Gilchrist (1993), Kotz and Johnson (1993), and Spiring (1997). The most thorough treatment of process capability, and the most extensive bibliography, is in the text by Bothe (1997). One of the best-known indices,  $C_p$ , is defined by

$$C_p = (USL - LSL) / 6\sigma, \quad (1)$$

where USL is the upper specification limit, LSL is the lower specification limit, and  $\sigma$  is the process standard deviation (Mitra, 1998, 379-382). Another popular capability index,  $C_{pk}$ , is computed by

$$C_{pk} = \min[(USL - \mu)/3\sigma, (\mu - LSL)/3\sigma], \quad (2)$$

where  $m$  is the process mean (Mitra 1998, 379-382). Note that the larger the value of  $C_p$  and  $C_{pk}$ , the more capable the process. Historically, many industries set process capability goals at 1.0 (3 $\sigma$  quality), but today many are striving for indices as high as 2.0. (Although some companies refer to this as 6 $\sigma$  quality, this should not be confused with Motorola's touted six-sigma program.)

An alternative to  $C_p$  is the capability ratio, CR, where  $CR = 1/C_p$  (the smaller the value of CR, the better). In either case, the ratio form of the indices facilitates a comparison of customer specifications and process variability (numerator vs. denominator, or vice-versa).

Capability indices are usually reported in conjunction with histograms and/or statistics reporting the fraction of product within specifications. Experience with these indices has shown that, in practice, they are too simplistic to stand alone (Nelson 1992). For example, they do not provide any insight into whether a process is centered on its operating target or not. They only give an indication of how much process variation exists compared to how much is "allowed" by specifications.

Managing process capability entails assessing the current results, improving them if needed, then maintaining the improved results for sustained benefits (Bothe 1997, 68-69). Some of the benefits of a capable process are increased customer satisfaction, increased operating efficiencies, and reduced costs. Customers are the ultimate winners because they get consistently well-made products. Inside the operation, the reduced process variability, which is the basis for improved process capability, leads to less rework and less wear and tear on manufacturing equipment. These production efficiencies yield lower costs and result in less environmental impact. The administrative expenses associated with rework and handling customer complaints also fall.

### Capability Graphs

In practice, a process typically has several quality characteristics. To assess and communicate the capability of a process, an analyst must produce multiple histograms and/or report multiple observed values of a selected capability index, i.e., one histogram and one observed value for each quality characteristic. We propose the use of a graphical method called the capability graph to supplement these histograms.

The history of capability graphs is difficult to trace. Previous experience of the authors suggests that capability graphs were developed inside the consumer products industry. The graphs have evolved over the years as their use has spread within the

industry. Several chemical suppliers and packaging companies were introduced to the method in the early 1990s. And by the mid-1990s, managers and analysts were bringing the approach to new employers and to their own start-up companies. Our search indicates that nothing has ever been published about the use of this method.

Organizations use capability graphs to help report and analyze process capability. In the consumer products industry, these graphs are used in the management of both continuous and batch manufacturing operations. At a typical plant, process teams generate one graph per product for use in team meetings and various written reports. Line operators and lab technicians keep the graphs up-to-date, so that process changes show up immediately on the graphs. Importantly, however, a control chart is still the tool of choice for real-time control. The power of capability graphs lies in their ability to help managers understand the extent to which their processes are satisfying their customers needs. This helps companies prioritize their ongoing quality improvement activities.

Two slightly different capability graphs are introduced in this article: one using an iso-defect approach (developed in the consumer products industry) and one using an iso-loss approach (developed by the authors). In both cases we assume that the processes are stable and that the data are normally distributed.

#### Iso-Defect Approach

Capability graphs illustrate the relationships among the process mean, process variation, and product specification limits for all the quality variables being measured from a single process. The horizontal axis represents process targeting (i.e., how close the mean is to the target), and the vertical axis represents process variation (i.e., how dispersed the data are compared to specifications). Specifically, the horizontal axis represents  $Z_T$ , a targeting index, computed by

$$Z_T = \frac{\mu - T}{\sigma} \quad (3)$$

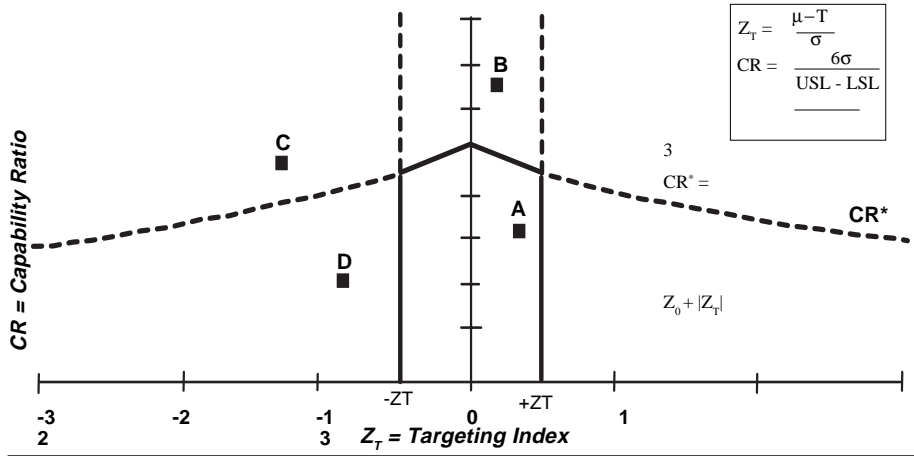
where  $\mu$  is the process mean,  $\sigma$  is the process standard deviation, and  $T$  is the process target. The vertical axis represents CR, a capability index, computed by

$$CR = \frac{6\sigma}{USL - LSL} \quad (4)$$

where USL and LSL are the upper and lower specification limits, respectively. Note that  $CR = 1/C_p$ . Thus, the smaller the value of CR, the more capable the process is of satisfying the customer.

The capability graph in Figure 1 plots the quality variables in two dimensions. Variables within the vertical boundaries produced by  $\pm Z_T^*$  are said to be on-target (variables A and B) and those outside the boundaries are said to be off-target (variables C and D). Similarly,

**Figure 1**  
**Capability Graph**



variables below the reference line  $CR^*$  are said to be satisfactorily dispersed (variables A and D) and those above the line are said to be overly dispersed (variables B and C). Ultimately, the goal is to have all variables plotted within the house-shaped region enclosed by the solid black lines, i.e., to be on-target and properly dispersed as is variable A.

Next, consider the selection of  $Z_T^*$  and  $CR^*$ .  $Z_T^*$  represents the maximum desired difference between the process mean and the process target. The appropriate value of  $Z_T^*$  for a given process depends on the product's performance when its quality variables are off-target. For many quality variables, we have found  $Z_T^* = 0.5$  to be a reasonable value. The best value to use, however, depends upon the unique characteristics of the product and quality attribute under study.

$CR^*$  is defined as

$$CR^* = \frac{3}{Z_0 + |Z_T|} \quad (5)$$

where  $Z_0$  is the minimum desired distance from  $T$  to the closest specification. For example, if when the process is perfectly centered ( $Z_T = 0$ ), we wish to have a maximum capability ratio of 1.0 then we set  $Z_0 = 3$ . Now, both the LSL and USL are  $3\sigma$  from  $T$ . We denote this value of the capability index when  $Z_T = 0$  as  $CR_0^*$ . In this example,  $CR_0^* = 1.0$ . If the process moves off target ( $|Z_T| > 0$ ), then the value of  $CR^*$  decreases to a value such that the closest specification remains  $3\sigma$  from  $T$ . Selecting appropriate values for  $Z_0$  and  $CR_0^*$  is an important task. It should be the joint responsibility of an analyst (or at minimum, someone well trained in statistics) and a business leader. Together, they can decide what defect levels are "acceptable" to the organization. The numbers we used here ( $Z_0 = 3$  and  $CR_0^* = 1.0$ ) translate to an expected defect level of 2700 parts per million.

In practice, equation (5) is often called an iso-defect line since any point along the line represents roughly the same proportion of nonconforming product. Strictly speaking, "iso-defect" is somewhat of a misnomer since the proportion of nonconforming product actually decreases slightly as  $|Z_T|$  increases due to the fact that the distance between the process

mean and the farthest specification limit increases. For convenience, we will adopt this name and refer to the capability graph using this method as the iso-defect approach.

Before we proceed, equation (5) merits further explanation. Why does  $CR^*$  peak at  $Z_T = 0$ ? When the process mean shifts away from  $T$ , the process variation must be reduced in order to produce the same proportion of nonconforming product. To do so, the process standard deviation must decrease to a new value denoted  $\sigma^*$ . It can be easily shown that

$$\sigma^* = \sigma_0^* \quad (6) \quad \frac{CR^*}{CR_0^*}$$

where  $\sigma_0^*$  is the standard deviation required to obtain  $CR_0^*$ . This relationship between  $\sigma^*$  and  $\sigma_0^*$ , which depends on the process mean, process target, and product specification limits, highlights the complexity of process capability and illustrates one reason why a single number can not completely characterize process capability.

#### **Iso-Loss Approach**

An alternative to the iso-defect approach employed by the consumer products industry is based on the concept of average loss. This approach is consistent with Taguchi's philosophy that a product loses worth whenever its characteristics deviate from the ideal target value (Krehiel 1994). Loss of worth is approximated by the function

$$L(Y) = k(Y - T)^2 \quad (7)$$

where  $Y$  is a quality characteristic with mean  $\mu$  and variance  $\sigma^2$ , and  $k$  is a positive constant. The expected value of  $L(Y)$  is given by

$$E[L(Y)] = k[\sigma^2 + (\mu - T)^2]. \quad (8)$$

The average loss approach, as defined above, is the basis for the capability index  $C_{pm}^*$ , sometimes referred to as the Taguchi Capability Index. Mitra (1998, 384) defines the Taguchi capability index as

$$C_{pm}^* = (USL - LSL) / 6\tau, \quad (9)$$

where  $\tau^2 = \sigma^2 + (\mu - T)^2$ . As  $C_{pm}^*$  increases, the capability of the process improves. Note that if a process is perfectly centered, i.e.,  $\mu = T$ , then  $C_p = C_{pk} = C_{pm}^*$ . Technical discussions of  $C_{pm}^*$  are given in Chan, Cheng, and Spiring (1988), and Boyles (1991). The mathematical relationship between equation (8) and  $C_{pm}^*$  is explored in detail by Johnson (1992).

Instead of defining  $CR^*$  as in equation (5), we can use an iso-average loss line as an upper limit on the amount of variation in a process. Consider

$$CR_{LOSS}^* = \frac{3}{\tau} \quad (10)$$

$$Z_0(1 + Z_T)^{1/2}$$

Equation (10) defines a line such that for any value of  $Z_T$ , the average loss defined by equation (8) is constant. In an argument similar to the one used in the iso-defect case, the reduction in the standard deviation required for off-target processes can be expressed as

$$\sigma^* = \frac{CR_{LOSS}^*}{CR_0^*} \sigma_0^* \quad (11)$$

As with the iso-defect approach, an analyst and a business leader should determine the appropriate values for  $Z_0$  and  $CR_0^*$ .

The choice between  $CR^*$  and  $CR_{LOSS}^*$  depends upon the individual company. Companies that already track defects and are accustomed to thinking in those terms should adopt the iso-defect approach. The consumer products industry falls in this category. Alternatively, a company that has found that deviations from its customers' targets are costly is probably already familiar with the Taguchi loss function. In this case, the iso-loss capability graph would be an excellent tool to manage process capability. The automobile industry is an example where this approach might be used.

### Example

The process under consideration is a spring water bottling operation. There are five quality variables in total (See Table 1). Three chemical analyses are routinely performed on the water in the bottling plant; the analyses measure the levels of calcium (Ca), magnesium (Mg), and potassium (K). There are also two important physical characteristics that are measured during the filling operation — fluid volume per bottle and cap torque. The process and data for this example were fabricated to help illustrate the use of capability graphs, but are similar to those experienced in practice.

These five characteristics are largely determined by the bottling plant's own operation. For example, the cleanliness and overall condition of the plant's filters and pumps affect the chemical composition of the water as bottled. The bottling plant must also contend with variation in the materials it receives from suppliers. Consider the water itself. The level of impurities in the incoming water varies depending on weather and other environmental conditions. Similarly, the plastic caps used in the bottling operation exhibit some variation in the smoothness of the threads and other edges. This affects the bottling plant's ability to properly tighten the caps on the filled bottles.

As discussed earlier, a complete capability analysis of the entire process should include:

- (1) Histograms of each of the five quality characteristics

**Table 1**  
**Data from Spring Water Bottling Operation**

	<i>Product Specifications</i>			<i>Sample Statistics</i>		<i>Calculated Indices</i>	
	Target	LSL	USL	Mean	Std. Dev	CR	$Z_T$
<i>Chemical Analyses</i>							
Ca (ppm)	41.0	38	44	41.5	0.5	0.50	1.00
Mg (ppm)	20.0	18	22	20.1	0.4	0.60	0.25
K (ppm)	3.0	2.5	3.5	2.50	0.24	1.44	-2.08
<i>Filling Operation</i>							
Volume (ml)	500	495	505	503.0	1.8	1.08	1.67
Cap Torque (N)	6	5.6	6.4	5.83	0.12	0.90	-1.42

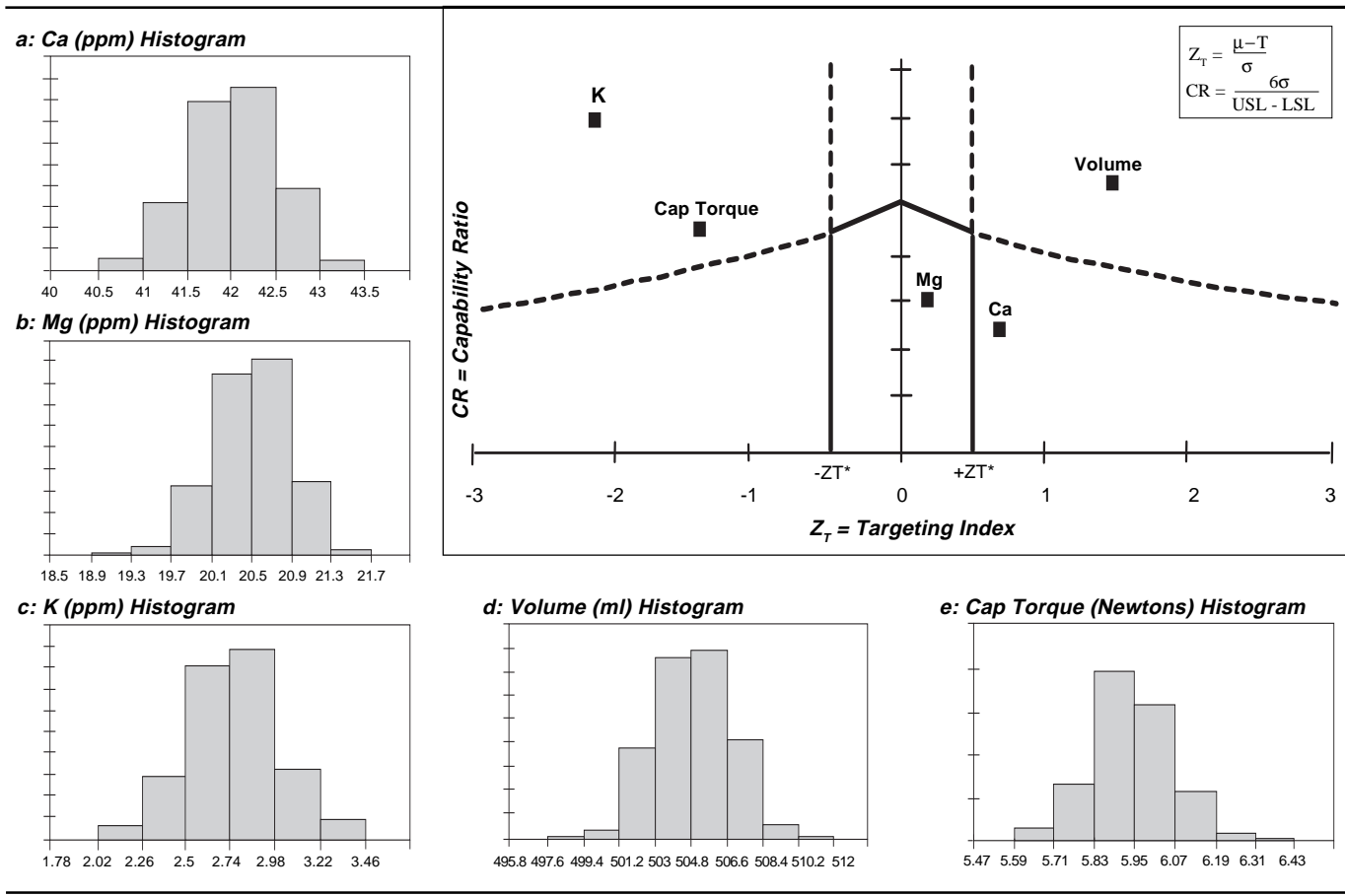
- (2) A capability graph as described in this article
- (3) An assessment of the results.

Consider this approach in the spring water bottling operation. Assuming that the plant employs an accurate and precise method for measuring each of the five characteristics, the data from the bottling plant floor can be used in the capability analysis. Managers and analysts should understand that this is a critically important assumption. The plant should explicitly verify the accuracy and precision of its measurement processes. The amount of measurement variation that is acceptable is up to the discretion of the process leaders and analysts, but it is reasonable to expect that the variability inherent in a method of measurement be no more than 10-15 percent of the total observed variability in the corresponding quality characteristic. Beyond that level, there is simply too much "noise" in the data. See Mitra (1998, 390) for a discussion on the impact measurement variability has on capability indices.

The data indicate that the plant's processes are in statistical control, meaning that the results are stable and predictable over time. After 500 observations, sample data are compiled to determine the process capability. The mean and standard deviation of the sample are believed to be representative of the entire population of finished product. The sample statistics for each quality variable, along with the product specifications, are shown in Table 1. These values are substituted into Equations (3) and (4) to generate values for the targeting and capability indices. These calculated values are also shown in Table 1.

The capability graph for the spring water bottling operation is shown in Figure 2, while the histograms for each of the five quality variables are in side charts a-e. Each black dot on the two-dimensional capability graph represents one of the quality variables. The maximum allowable variability ( $CR^*$ ) for all values of  $Z_T$  is depicted by the horizontal curve. In this case,  $Z_0 = 3$ , such that at

**Figure 2**  
**Capability Graph for Spring Water Bottling Operation**



$Z_T = 0$ ,  $CR^* = 1.0$ . The maximum allowable deviation from target ( $\pm Z_T^*$ ) is represented by the two vertical lines. In this example,  $Z_T^* = 0.5$ . Ideally, each quality variable would have a  $Z_T$  in the range of  $-0.5$  to  $+0.5$  and a  $CR$  less than  $CR^*$ . In other words, all of the black dots would fall inside the house-shaped region enclosed by the solid black lines.

In the water bottling operation, only one quality variable, Mg, meets both the targeting and variability criteria. In this case, management should focus on maintaining the Mg results. They should standardize whatever procedures the bottling plant or its suppliers are using to achieve the low variability and on-target performance. Likewise any future changes in suppliers, equipment, or procedures should be undertaken with care and only after the organization appropriately tests the effect of the changes on process capability.

As the capability graph shows, the variability in calcium in the water is acceptable, but the average level is too high. Here, we have a process that is capable of delivering consistent results, but the current results are above the target range. In situations like this one, it is usually fairly straightforward to “dial” the process down to target. However, it is important that

the reason for the mis-targeting be well understood before making any quick fixes. Sometimes, the operators may find that the production line runs more smoothly if they make an adjustment away from the customer target. Managers should bring these issues to the forefront if they want the operational changes to be fully supported by all members of the organization. In the spring water bottling plant, adjustments may include changing the rate of flow of the water through the filters or even changing the filtering type or arrangement.

The other three variables, volume, cap torque, and potassium level, are expected to be the most difficult to “fix.” Managers and operators must work together to determine the reasons why these quality characteristics have so much variability and are off-target as well. It is prudent to address the variability questions first. The primary sources of variation that the spring water plant must consider are its suppliers, the bottling operation itself (both equipment and procedures), and the plant’s measurement systems. Once variability is reduced to an acceptable level, shifting the process average to target is relatively easy.

The bottling plant’s goal is to get all five of the variables into the house-shaped region on the capability

graph. Meeting this goal will serve a variety of business objectives. On the cost side, running the plant under these improved conditions should reduce production expenses. Less variability in the product and process means less wear and tear on the machines. Furthermore, if the product's specifications are consumer-based, improving the process capability should lead to improved customer satisfaction with the product. This should minimize the costs associated with handling customer complaints. Better still, it will hopefully stabilize and perhaps even build sales among existing customers. Sometimes, improving process capability can help a company's bottom line in unexpected ways. In this case, the company's marketing organization could plan to upgrade their advertising campaign based on the plant's improved operations. New claims about the water's purity or taste, for example, may be attractive to consumers and may help the company sell more product.

### Summary and Conclusion

In this paper we defined and discussed process capability. We introduced to the literature a graphical approach that can be used to help visualize and report the capability of a process that has several quality characteristics. Two slightly different capability graphs were presented: one using an iso-defect approach and one using an iso-loss approach. Both types of graphs provide a means to periodically review a process' overall "health" and to prioritize a company's quality improvement activities. They are best used in conjunction with histograms, which provide an up-close look at individual quality characteristics. Because a process must be stable before its capability can be assessed, process control tools, like control charts, also serve an important role in managing product and process quality. Capability graphs are an important addition to the process analyst's toolkit, but they do not replace any of the other graphical tools on which organizations rely.

In practice, businesses can use these tools to make an initial assessment of their capability and then to measure their progress. Companies embark upon these improvement efforts because of the many advantages to delivering products and services that are consistently on-target. The example presented above demonstrated that a business can leverage process capability improvements made in one area of the organization (e.g. manufacturing) to advance a variety of business objectives including increasing revenue and decreasing costs.

All manufacturing companies should be concerned with managing the capability of their products and processes, and therefore could benefit from the use of capability graphs. And, as more and more service companies address the stability and capability of the processes within their organizations, capability studies and capability graphs should become more common in the service sector. ■

### References

- Bothe, D.R. 1997. *Measuring process capability*. New York: McGraw Hill.
- Boyles, R.A. 1991. The Taguchi capability index. *Journal of Quality Technology* 23(1):17-26.
- Chan, L.K., S.W. Cheng and F.A. Spiring. 1988. A new measure of process capability:  $C_{pm}$ . *Journal of Quality Technology* 20(3):162-175.
- Gilchrist, W. 1993. Modelling capability. *Journal of the Operational Research Society* 44(9):909-923.
- Johnson, T. 1992. The relationship of  $C_{pm}$  to squared error loss. *Journal of Quality Technology* 24(4):211-215.
- Kane, V.E. 1986. Process capability indices. *Journal of Quality Technology* 18(1):41-52.
- Kotz, S. and N.L. Johnson. 1993. *Process capability indices*. London: Chapman & Hall.
- Krehbiel, T.C. 1994. quality service and the Taguchi philosophy. *Mid-American Journal of Business* 9(1): 7-15.
- Mitra, A. 1998. *Fundamentals of quality control and improvement*. 2nd ed. Upper Saddle River, NJ: Prentice Hall.
- Nelson, P.R. 1992. Editorial. *Journal of Quality Technology* 24(4):175.
- Spiring, F.A. 1997. A unifying approach to process capability indices. *Journal of Quality Technology* 29(1):49-58.

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# ***Technology Support for Knowledge Management***

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## ***Abstract***

Finding the optimum way to leverage the resources of a firm remains a prominent issue for organizational management. Increasingly, firms are realizing that the ultimate organizational resource is the knowledge that resides in the minds of employees and is embedded in the processes, products, and services of the firm. Knowledge has been identified as the new basis of competition in a post-capitalist society and has been considered the only unlimited resource. The focus of knowledge management is to capture information which resides in the individual and group experience. This paper discusses the types of knowledge found in organizations, the reasons for which knowledge is sought, and the role of technology in the facilitation of the codification, conversion, and management of knowledge. Specific examples from companies such as Shell, Coopers & Lybrand, Chase Manhattan, and others illustrate the concepts presented.

## ***Introduction***

Knowledge management endeavors to create a permanent account of expertise which resides in the organization. This assembly of knowledge is made available to organizational members in order to conserve time and money when resolving familiar issues and challenges. Unlike material assets, the value of knowledge-based assets increases with frequency of use. When there is no deliberate effort to capture and share knowledge, key information may be lost or ignored.

The field of knowledge management is immature. While there has been a great deal of conversation both in academic and industrial circles, only a handful of companies have put knowledge management into practice. Most implementations of knowledge management have not been initiated. Delphi consulting group recently found that 70 percent of surveyed companies have only recently made their first investment in knowledge management or plan to do so over the next few years (Hibbard and Carillo 1998).

In confronting the complexity of leveraging their intellectual resources, organizations are faced with several issues. The

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***The focus of knowledge management is to capture information which resides in the individual and group experience.***

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first is to decide which knowledge is worth capturing and which tasks it will support. The second issue is to identify where in the organization the expertise resides and in what form it is to be found. Third, they must choose an appropriate delivery vehicle. The greatest contribution of information technologies to the knowledge management process is the speed and reach that they provide. Information technology can transfer context-specific, immediate, and accessible knowledge and assistance to workers on the job. There is a wide variety of technologies to support knowledge management activities. Of concern is the selection of the appropriate technology so that it has the desired impact—that it increases performance and is used. The purpose of this paper is threefold. First, the types of knowledge and knowledge-seeking strategies found in organizations are presented. Second, a taxonomy of knowledge management technologies is developed. It is derived from current industry practice and theories of knowledge conversion and emphasizes the need for organizations to appropriately match the type of technology to the form of knowledge. Finally, guidelines for the support of knowledge work are discussed.

## ***What is Knowledge?***

While there are several definitions of knowledge, most researchers agree that individuals in organizations possess two types of knowledge—tacit and explicit (Polanyi 1958). Tacit knowledge is personal and context specific, which is often developed over a long period of time through direct experience. Due to the extent of embedded learning that supports it, such knowledge is frequently difficult to formalize and communicate. Experienced pilots, for instance, understand the performance of an airplane by the feel of the controls in coordination with

sensory cues. Such knowledge is internalized and might not be readily transferable to a written report or step-by-step manual. Tacit knowledge also includes cognitive and technical elements. The cognitive element refers to mental models, working models of the world made by manipulating images in the mind. Mental models such as schemas, perspectives, beliefs, and viewpoints help individuals to perceive and to define their world. The technical element of tacit knowledge includes concrete know-how, craft, and skill.

Explicit knowledge is knowledge that is transmittable in formal, systematic language. The documented procedure by which a person files an insurance claim is a form of explicit knowledge. Similarly, engineering diagrams, organizational charts, contracts, and written correspondence are forms of explicit knowledge in which tacit mental models, perspectives, and thoughts are externalized.

Table 1 depicts the sources of tacit and explicit knowledge that exist both inside and outside of the organization. Most often we consider the human element as a primary source of knowledge material. However, knowledge is also found in the culture of the organization. Within the stories, language, and personal networks used by the organization's members are embedded values, viewpoints, and experience. Processes that involve the transformation of inputs into outputs have knowledge embedded in them. This concept would be represented by standardized operating procedures, by existing configurations of machinery, and by administrative structures such as job descriptions, titles, and roles. The ecology of the workplace portrayed by the physical layout also represents knowledge. Finally, knowledge can be found in resources external to the firm such as former employees, observers, news and other media, and regulatory bodies.

**Table 1**  
**Sources of Knowledge**

<b>Knowledge Location</b>	<b>Type of Information</b>
<i>Human</i>	Experiences, recollections, beliefs, values, perspectives, skills, know-how, crafts, formal records
<i>Culture</i>	Language, symbols, stories, frameworks, personal networks
<i>Transformations</i>	Knowledge of process, standard operating procedures, agendas
<i>Structures</i>	Organizational structures that follow and copy job descriptions, patterns, titles, and role labels
<i>Ecology</i>	Physical layout of the workplace
<i>External Archives</i>	Former employees, observers, news media, competitors, regulatory bodies

(adapted from Walsh and Ungson 1991)

## **Knowledge Seeking Strategies**

People seek knowledge because they expect it will help them function better and accomplish their goals. While someone might seek knowledge proactively, it is more common for people to do so reactively (Weick 1995). Typically, people seek sources of knowledge because they are prompted by a lack of fit between what they expect and what they encounter while engaging in task completion. For instance, a researcher conducting an experiment on drug interactions might observe unusual side effects. The occurrence of these effects prompts the researcher to seek more knowledge to help him explain his results.

A gap in expectations can result in an encounter with one of two situations. First, one may lack enough information; uncertainty exists. When more information is presented, uncertainty may decrease. When people are uncertain in a decision context, they do not know which decision option is best, but they do know that an answer is possible. An employee who must decide which product configuration is best for a customer may not be sure what to offer. Yet this task is clearly framed; some features come only with certain products, other features work only in conjunction with particular attributes. In this case, to provide the employee with information as to states, effects, or responses is sufficient to solve his/her problem.

Second, people can be confused about causal relationships. Their lack of understanding is based on the existence of multiple and conflicting interpretations of an event. For example, a design team is charged with the task of planning for the future. How shall the team do this? How far into the future? What is the scope of the planning? Should it concentrate on current or future technology? Confusion or equivocality exists because a shared interpretation of causation and preferences has not yet emerged. What people need is not more information, but rather different kinds of information such as values, preferences, and criteria. Much of the unstructured work in organizations involves the resolution of these equivocal situations (Daft and Macintosh 1981).

The process that is used to resolve these equivocal situations is more complicated than simply acquiring more information. People employ five strategies to come to a resolution when they encounter many possible interpretations. People check with others' interpretations (social interaction), they experiment (action), they check multiple sources of information (triangulation), they think about the phenomenon (deliberation), and they place the confusing event into context (contextualization) (Weick 1985; Weick and Meader 1993). These processes are summarized below.

### **Social Interaction**

People learn and acquire knowledge by comparing what they see, think, and experience with what other

members of the organization see, think, and experience. This affiliation seeks to arrive at a shared interpretation of the available information by soliciting and integrating the meaning which individual group members place on that information. For example: Suppose employees agree that a test result is highly unusual. Does that mean the result is due to a flaw in the experimental design? After discussion of the event, the answer for the employees might be that indeed there was a contamination of materials during the study.

### **Action**

Apprentices work with their masters to learn craftsmanship not through language, but through observation, imitation, and practice. In an organization, a person can take action, practice, or probe the environment and observe what happens. The individual then can see what behaviors, words, or gestures produce the desired result. S/he incorporates and internalizes this information into an understanding of the situation (Sanlick 1979). Both vicarious (e.g., role play) and direct experience can be effective in facilitating the development of skill. Vicarious learning might even be preferable in situations where the cost of failure is high or the speed of learning is important (Bandura 1977).

### **Contextualization**

In order to make sense of their environments, people relate phenomena to other comparable events or items (e.g., is this like the situation the company faced last year?). By using labels (what is it?), metaphors (what's it like?), and platitudes (how does it operate? what are the rules?), people link past events with the present and give meaning to them. The more diverse the contexts into which the event can be placed, the more numerous are the frames of reference through which to interpret a situation. For instance, a sales manager may be concerned with several poor monthly earning reports. Possible explanations include the sign of a long-term downward trend, a short-term correction, or a seasonal cycle. An industry expert may be able to give the sales manager a context in which to relate his experience by providing him/her with metaphors of similar historical events (e.g., It's like the yo-yo year of 1985).

Stories are another effective means of conveying and contextualizing explicit information. Story telling is one way that people try to make the "the unexpected expectable, hence manageable" (Robinson 1981, p. 60). Stories also serve as guides to conduct. They reduce the element of surprise, they act as a forewarning, and they simultaneously reduce the importance of events and the demands which they impose (McGrath 1976). People may fail to relate events in an effective manner, if they use incomplete information and rely on erroneous assumptions about the event at hand when interpreting a confusing situation (Weick and Meader 1993).

### **Deliberation**

Individuals learn about events when they reflect carefully and thoughtfully on previous events and circumstances. Partially formed connections incubate and become clarified. When people are overwhelmed with the pace or with the amount of information, they revert to the use of predefined stereotypes, heuristics, and categories.

### **Triangulation**

Individuals exchange knowledge through media such as documents, meetings, telephone conversations, and computerized communications networks. Speaking spatially, one can infer position or location in any dimension by referential sightings (convergence) from three positions, hence triangulation. Triangulation of existing information through sorting, adding, combining, and categorizing explicit knowledge (e.g., a database) can lead to new knowledge. An individual uses different measures and methods of analysis (e.g., observation, reports, conversations) of a phenomenon to converge on a reasonable and plausible meaning of the situation.

The support of knowledge work requires the facilitation of the transfer of knowledge. That is, mechanisms must be in place to transfer tacit knowledge to another party or to convert tacit knowledge to explicit knowledge (Nohaka and Takeuchi 1995). Socialization that takes place between people facilitates the transfer of tacit knowledge between them. Taking action or having a direct experience with a phenomenon can also provide a transfer of tacit knowledge. Tacit knowledge is converted into explicit knowledge when events, rules, and procedures are documented, or thoughts, values, viewpoints, and preferences are verbalized. This explicit knowledge can be used for triangulation, contextualization, or further deliberation. New forms of explicit knowledge are found when independent bodies of knowledge are combined. When previously explicit knowledge becomes an embedded part of the individual or of a system, it again becomes tacit and is internalized.

### **Information Technology in Support of Knowledge Work**

In supporting knowledge work, there should be a "fit" among the form of the knowledge, the activities individuals perform to seek the knowledge, and the support technology provides (Goodhue 1995; Goodhue and Thompson, 1995). To understand more fully what determines a good "fit," consider the case of Xerox. Xerox recognized the value of the knowledge exchanged when field representatives told "war stories" about problems they had encountered and how they resolved them (Orr 1987, 1990). The company equipped its representatives with telephone headsets so they could continue their conversations while on the road. The

system has been expanded to include a database which captures information submitted by the representatives.

In the case of Xerox, the knowledge of highest value was inside the minds of its salesforce. The key to the successful technology choice was twofold. First, it was clear that salespeople were able to codify their tacit experiences through stories. Second, it was recognized that the primary strategies which salespeople used to reduce equivocality were socialization and contextualization. Sharing stories was a familiar methodology to the people accessing those stories from the on-line repository.

Based on the strategies people use to seek knowledge, the different forms of knowledge, and the wide array of technology available to support knowledge, a taxonomy has been developed which fits the technology to the form of knowledge conversion and/or which transfer it best supports. Table 2 depicts the taxonomy. Each quadrant in the taxonomy is described below. Successful industry examples are provided to illustrate each approach and there is discussion of common problems.

**Table 2**  
**A Taxonomy of Knowledge Management Technologies**

	TO TACIT	TO EXPLICIT
FROM TACIT	<p><b>Intermediation</b> (<i>promote socialization and experience</i>)</p> <ul style="list-style-type: none"> <li>• Knowledge Maps</li> <li>• Simulations</li> </ul>	<p><b>Externalization</b> (<i>document, verbalize</i>)</p> <ul style="list-style-type: none"> <li>• On-line Discussion</li> <li>• Forums</li> <li>• Real time chat</li> <li>• Electronic Repositories</li> <li>• Push Technology</li> </ul>
FROM EXPLICIT	<p><b>Cognition</b> (<i>replicate the thought process</i>)</p> <ul style="list-style-type: none"> <li>• Expert Systems</li> <li>• Case Based Reasoning</li> <li>• Constraint-based reasoning</li> </ul>	<p><b>Combination</b> (<i>detect patterns in information</i>)</p> <ul style="list-style-type: none"> <li>• Statistical Analysis</li> <li>• Neural Nets</li> </ul>

**Tacit to Tacit: Intermediation**

As suggested earlier, one of the most troublesome aspects of tacit knowledge is the difficulty in making it explicit. Indeed, to do so may be prohibitively expensive and still may not yield satisfactory results (Feigenbaum, McCroduct, and Nii 1988). There are, however, some technologies an organization can use to maximize the likelihood that tacit knowledge becomes

accessible. Since people transfer tacit knowledge when they socialize with each other or experiment, technology which facilitates employee interaction or creates as closely as possible a realistic performance environment, will serve to transfer tacit knowledge.

Socialization requires that one know where to find the people who possess the desired expertise. Knowledge directories broker knowledge by matching the knowledge seeker with the best source for that knowledge. They attempt to depict the location of expertise in an organization. Much like a Yellow Pages telephone directory, the map serves to describe what knowledge resources are available to the firm and where to find them. British Petroleum's Virtual Teamwork project consists of a repository of commonly encountered problems and a listing of persons to consult to help solve the problem (Davenport and Prusak 1998). Similarly, Microsoft Corporation has developed a system whereby job positions are described in terms of the competencies which are required to fill the positions. Employees, in iterative sessions with their managers, are rated on the degree to which they have displayed these competencies on past projects. This information is stored in an on-line database. Project leaders can query the system to see which persons possess the skills needed for their project. The competencies are also linked to in-house educational offerings so that people might seek avenues through which to increase their competencies (Davenport and Prusak 1998).

In the case of workflow, people can be directed to the appropriate resources by using one of two approaches. In the case where the rules of the workflow are structured, direction can be handled explicitly. For example, if incoming paperwork is from England, the accounts payable clerk might automatically be put into contact with the corporate expert on European trade. In a less explicit situation, the workflow system would suggest the most appropriate individual to answer a question according to heuristic analysis of previous work performances by people in the organization (Koulopoulos 1999).

A realistic performance environment can be provided through the use of computer simulation. For instance, network repair specialists can develop their trouble-shooting skills using a simulated network. Interactive videos permit salesmen to practice their selling skills (Hibbard 1998). Simulations decrease the impact on the organization while allowing employees to refine their skills (Shank 1997).

Successful simulation is predicated on a number of assumptions. One of the assumptions is whether "reality" can be modeled to a sufficient extent. A second is an understanding and acceptance of the premises and assumptions embodied in the simulation. The knowledge seeker is bound by the constraints that the simulation and its designers impose. At a minimum, the organization should realize that a common mental schema is being created.

### ***Tacit to Explicit: Externalization***

Externalization refers to the codification and transfer of knowledge which can be explicitly expressed and captured. Several technologies such as electronic discussion forums, repositories, and “push” (all discussed later) can capture, classify, and distribute knowledge. Repositories and discussion forums are rich sources for the purpose of information triangulation and can provide more opportunities to receive information representing different contexts. These knowledge bases can add richness through the inclusion of judgements and alternatives.

*On-line Discussion Forums.* “Communities of best practices” provide an on-line forum for the sharing of knowledge when a company’s structure, geography, or information systems otherwise inhibit collaboration (Armstrong and Hagel 1997). In companies that are organized according to business process, employees with similar skills may be scattered throughout the organization, making it difficult for them to learn from one another. Shell Oil Company overcame this obstacle by developing a “community” where its design engineers share best practices through the use of a discussion database. Shell estimates that identifying a best practice at one refinery reaped \$3 million in savings. By adopting this approach more broadly, it has been estimated that Shell could save \$15 million to \$30 million in one year alone (Davis and Riggs 1999).

Professional services firm Coopers & Lybrand is using real-time communication on its intranet to share knowledge more easily during training. One of the partners for their strategy group stated, “The knowledge sharing comes from the debate and interaction,” (Hibbard and Carillo 1998, p. 54). In order to capitalize on the synergy and the creation of knowledge which takes place in the social environment, the firm will hold real-time on-line question and answer sessions using “chat” applications. The firm has already held chat sessions on its Tax News Network where clients interact with some of the firm’s tax consultants. In the future, the firm looks toward desktop videoconferencing for instructional delivery.

Socialization through electronic media requires special considerations. One area of caution is the possible existence of novelty effects where the focus of the participants is on the technology rather than on the event. Novice users of real-time chat often find themselves confused and disoriented. In a similar fashion, technological intervention does not necessarily remove the barriers found in face-to-face discussions, particularly when participants are identified (e.g., evaluation, apprehension, groupthink, etc.) (McGrath and Hollingshead 1993; Nunamaker et al. 1993). A recent interview with the Chief of Operations for the Metropolitan Water District of Southern California revealed that, despite the level of technological sophistication, compared to face-to-face meetings achieving the same quality of discussion eluded users of a

distance-bridging medium (Wachter 1998).

*Electronic Repositories.* An electronic repository of documents,

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***One area of caution is the possible existence of novelty effects where the focus of the participants is on the technology rather than on the event***

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forms, and status reports is one of the most widely implemented technologies. The knowledge management project of Platinum Technologies is to give its global sales force of 1,500 people one place to go for information. Salespeople wanted assurances that data was current. Using their intranet as a basis, documents on the firm’s products were stored and indexed. Last year, Platinum saw a \$6 million return on an investment of \$750,000. Platinum has increased its revenue per salesperson by an estimated 4 percent per year (Davis and Riggs 1999).

Chase Manhattan created a system to manage relationships after it discovered that relationship managers were not equipped with the knowledge that they needed to ensure that both the customer and the bank were benefiting from the relationship. Information about the bank’s policies and individual accounts was scattered and unreliable, making it impossible for relationship managers to properly identify and assess the options which were available to its customers. The new Relationship Management System combines Chase’s knowledge about its customers—loan history, deposits, investments, and so forth—with bank policies and product knowledge. In the first eighteen months during a restricted rollout, it has been conservatively estimated that the system has delivered at least \$11 million in increased revenues and reduced costs on a total investment of \$12 million. Chase projects \$17 million additional growth in revenue and cost reduction over the next two years (Waite & Company 1998).

Several problems, however, can arise with repositories. One of the greatest dangers is that people will experience information overload due to the sheer volume of material available to them (Miller 1978). When faced with too much information too quickly, people cannot cope. In response, they resort to inefficient processes (e.g., skip every third piece of information) (Weick 1995). People might curtail their search to only current information to make assimilation of the information more manageable.

*“Push” Technologies.* Instead of seeking knowledge proactively, people receive information directly through push technology. Knowledge is “pushed” at them through selectivity filters. Often the information is customized to meet the person’s information preferences. For example, collaborative filtering software is designed to look at the

patterns of usage of resources by an individual and to convey these preferences to other users who display similar patterns. Provided by vendors such as Firefly Networks, Inc., this software was initially designed to personalize consumer-oriented web sites. Web-based retailers like Amazon.com use such software to recommend books to customers according to their reading preferences and to the preferences of others with similar patterns. In a knowledge environment, collaborative filtering might be used to direct people to resources or to decision strategies when repeated patterns of inquiry are displayed (Hibbard and Carillo 1998).

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**...collaborative filtering software is designed to look at the patterns of usage of resources by an individual and to convey these preferences to other users who display similar patterns.**

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News filtering systems similar to those provided by Desktop Data, Inc. combine push technology with just-in-time delivery. Desktop Data's software selectively delivers news directly to the user's desktop. The news is tailored according to a detailed profile provided by the user and is delivered through Lotus Notes (Hibbard and Carillo 1998).

GrapeVINE has created a system which monitors multiple information sources and delivers them via e-mail to users. Items are marked raw or escalated. Escalated items are those which another person has flagged as particularly useful; other users whose profiles have indicated an interest in the item will be alerted and have opportunity to collaborate on how to characterize the item's significance. Raw information is information obtained directly from news services, databases, etc. (Davenport and Prusak 1998).

Push technologies provide a mechanism to reduce the information overload that is frequently found within repositories. People may find it more convenient to use varied sources of information to gain perspective or to compare with other information when content is targeted. However, they may still choose incomplete or lop-sided sources of information. Push strategies which are based on patterns of use can, unfortunately, preclude the "eureka" moment or synergy which occurs when two disparate ideas or bodies of knowledge become linked.

It has also been well documented that people select information in a format to which they have become accustomed (Weick 1995). Thus, more resources may not always prove to be beneficial, especially if the information is ignored due to its formatting. Further, when information is stored anonymously, users have problems identifying the pedigree of the information

and ascertaining its credibility. Finally, lack of a common language due to cultural or occupational differences can prevent clients from acquiring needed information. Thus, critical issues for knowledge capture and storage are the classification schemes used to categorize knowledge, the search mechanisms available, the volume of information presented to the user, the availability of thesaurus resources, and anonymity.

#### ***Explicit to Explicit: Combination***

Using advanced statistical packages and document or data warehouses, a clustering approach can be used to identify hidden relationships or connections among separate bodies of knowledge within the corporate database (Davis and Riggs 1999). For example, an integrated document management and data warehouse tool used by a supermarket chain keeps track of similarities in buying trends for beer and diapers. Managers confirmed the pattern, leading them to shelve beer and diapers in close proximity. The proximity of product combinations gave rise to even more "co-purchases" (Frappaolo 1998).

#### ***Explicit to Tacit: Cognition***

Cognition is the application of knowledge which has been exchanged through the preceding three functions. This is the ultimate goal of knowledge management. Cognition can refer to what happens to an individual when knowledge becomes an embedded part of his/her nature. It can also refer to the capture of the thought process which has the knowledge of experts embedded in it. In the discussion below, we refer to the latter context.

*Expert Systems.* While a thorough treatment of expert systems is beyond the scope of this paper, expert system technology can be used to codify the knowledge of experts for a very narrow problem domain (See Feigenbaum, McCroduct, and Nii 1988 for a full treatment). Expert systems directly codify business rules and procedures into software that is designed to act like a human expert. Well documented cases of the use of expert systems include: American Express's Authorization Assistant which determines which prospective customers are good credit risks; Digital Equipment's XCON which assists technicians in configuring VAX equipment. The usefulness of expert system technology is predicated on the quality that the knowledge and rules governing the manipulation of the knowledge remain fairly stable over time and that the problem is structured in nature.

Case-based reasoning classifies cases of incidents according to characteristics and solutions of problems (Kolodner 1993). It has been effective particularly for the codification and distribution of knowledge about the resolution of customer problems. Several organizations use this technology in the form of help or assistance desks to aid representatives who work to solve customer problems with products or services (Foley 1999).

Neural networks also capture expertise, but in a different way. Instead of reliance on pre-programmed rules to infer relationships, neural networks learn relationships by detecting patterns in the data or cases which are fed to it. One of the problems with neural networks is the relative lack of capability to present to the client the process used to arrive at a particular conclusion. This lack of capability and the time which is required to train and retrain a neural net has persuaded Fidelity Investments to discontinue use of their installation (Davenport and Prusak 1998).

### **Guidelines**

If the attention to knowledge is already present in the organization, technology can expand access and ease the problems of getting the right knowledge to the right person at the right time. Firms may already have the infrastructure in place for some of the technologies. The following guidelines provide practical suggestions for the evaluation and selection of an appropriate knowledge management technology:

*Value*—Begin with a recognized business problem which relates to knowledge. Attack the problem and identify its knowledge components. Then consider the delivery mechanism.

*Infrastructure*—Assuming that the method fits the task, the deployment of on-line discussion groups and push technologies offers perhaps the least risky and most cost effective, immediate way to take advantage of the existing infrastructure in a networked environment. Other technologies require comparatively substantial investment of time, money, and talent.

*Maintenance*—Knowledge directories and maps, repositories, and some artificial intelligence methods require constant upkeep to remain effective. This is particularly true if the material is time sensitive. Resources need to be devoted toward maintaining the currency of material.

*Time*—Case-based reasoning and expert systems offer the rapid use of knowledge to make quick decisions for very structured, narrow problems. Resolving immediate customer service issues lend themselves well to the use of these technologies. Most technologies, however, are best used in environments where the knowledge user has considerable time to assimilate the materials at his/her disposal. Fast paced, real-time interaction can make deliberation more difficult. Slower, careful reasoning is arduous when members must act quickly (Shure, Rogers, Larson, and Tassone 1962).

*Sophistication*—To effectively sift through knowledge repositories, one must possess some expertise or have a solid idea of what one is seeking. Repositories and push technologies require that the user be somewhat sophisticated

or well versed in the subject matter which is sought. Artificial intelligence technologies require less understanding because the knowledge has been embedded in the system itself.

*Corporate Culture*—“Know thyself.” Preliminary findings indicate that corresponding behavioral, cultural, and organizational changes must take place. One who is unmotivated or unrewarded will not search or contribute to the best of on-line repositories.

At this stage of evolution in knowledge management, there are no universal solutions. To date, conventional wisdom suggests that the most essential thing is to get started with something. Understand, however, that technology per se is not a worthy goal in the process. ■

### **References**

- Armstrong, J. and A. Hagel. 1997. *Net gain*. Boston: Harvard University Press.
- Bandura, A. 1977. *Social learning theory*. Englewood Cliffs: Prentice-Hall.
- Daft, R. and N. Macintosh. 1981. A tentative exploration into the amount and equivocality of information processing in organizational work units. *Administrative Science Quarterly* 26:207-224.
- Davenport, H. and L. Prusak. 1998. *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press.
- Davis, B. and B. Riggs. 1998. Get smart. *Information Week* (April 5): 40-50.
- Feigenbaum, E., P. McCarduck, and H. Nii. 1988. *The rise of the expert company*. New York: Times Books.
- Foley, J. 1999. Holding the customer. *Information Week* (April 5): 34-38.
- Frappaolo, C. 1998. Four basic functions. *Computerworld* (Feb. 23): 6.
- Goodhue, D. 1995. Understanding user evaluations of information systems. *Management Science* 14:1827-1844.
- Goodhue, D., and R. Thompson. 1995. Task-technology fit and individual performance. *MIS Quarterly* 22:213-236.
- Hibbard, J. 1998. The learning revolution. *Information Week* (March 8): 44-60.
- Hibbard, J. and K. Carillo. 1998. Knowledge revolution. *Information Week* (January 5): 49-54.
- Kolodner, J. 1993. *Case-based reasoning*. San Mateo, California: Morgan Kaufman Publishers.
- Koulopoulos, T.M. 1999. Make knowledge accessible to all. *Information Week* (April 5): 17-20.
- McGrath, J. 1976. Stress and behaviors in organizations. In M.D. Dunnett (Ed.), *Handbook in industrial and organizational psychology*. Chicago: Rand McNally.
- McGrath, J. and A. Hollingshead. 1993. Putting the group back in GSS research. In Jessup, L. and J. Valacich (Eds.). *Group support systems: New perspectives*. NY: Macmillian.
- Miller, J. 1978. *Living systems*. New York: McGraw-Hill.

- Nohaka, I and H. Takeuchi. 1995. *The Knowledge Creating Company*. New York: Oxford University Press.
- Nunamaker, J., A. Dennis, J. Valacich, D. Vogel, and J. George. 1993. Group support systems: Experience from the lab and field. In Jessup, L. and J. Valacich (Eds.), *Group support systems: New perspectives*. NY: Macmillian.
- Orr, J. 1987. Narratives at work. *Field Service Manager* (June):47-60.
- . 1990. Sharing knowledge, celebrating identity: Community memory in a service culture. In D. Middleton and D. Edwards (Eds.). *Collective remembering*. London: Sage.
- Polyani, M. 1958. *Personal knowledge*. Chicago: University of Chicago Press.
- Robinson, J. 1981. Personal narratives reconsidered. *Journal of American Folklore* 94:58-85.
- Sanlick, G. 1979. Field simulations for organizational behavior research. *Administrative Science Quarterly* 24(4):638-649.
- Shank, R. 1997. *Virtual learning*. New York: McGraw-Hill.
- Shure, G., M. Rogers, I. Larson, and J. Tassone. 1962. Group planning and task effectiveness. *Sociometry* 25:263-282.
- Wachter, R.M. 1998. Personal interview with Jay Malinowski.
- Waite & Company. 1998. Trends in enterprise knowledge management. Lotus Corporation white paper.
- Walsh, J. and G. Ungson. 1991. Organizational memory. *Academy of Management Review* 16(1):57-91.
- Weick, K.E. 1995. *Sensemaking in organizations*. Thousand Oaks, California: Sage Publications, Inc.
- Weick, K.E., and D. Meader. 1993. Sensemaking and group support systems. In Jessup, L. and J. Valacich (Eds.). *Group support systems: New perspectives*. NY: Macmillian.
- Weick, K.E. 1985. Cosmos vs. chaos: Sense and nonsense in electronic contexts. *Organizational Dynamics* 14:51-69.

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# ***Disclosure of Year 2000 Issues in Corporate Financial Reports***

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## ***Abstract***

The Year 2000 represents a significant challenge for many organizations. Financial report users, which include investors, creditors, suppliers, customers, employees, as well as others, have an interest in knowing how organizations are dealing with the Year 2000 issue. There could be significant negative consequences for organizations that fail to properly address the Year 2000 issue. Public corporations that have material issues associated with the Year 2000 issue are required by the United States Securities and Exchange Commission (SEC) to disclose specific information in their annual financial reports. This paper introduces the Year 2000 issue and reviews the development of public corporation annual report disclosures that are required and recommended by the SEC. The annual reports of 51 companies, which had fiscal years ending in the last half of 1998, were selected from the S&P 500 and were examined for the quality and quantity of Year 2000 disclosures. While all of the companies examined provided some Year 2000 disclosures, very few of the companies provided all of the required and recommended practices set forth by the SEC and some appeared to report in a severely deficient manner.

## ***Introduction***

As individuals, companies, not-for-profit organizations, and governments prepare for the calendar to turn from 1999 to 2000, a significant issue confronts virtually everyone. Will the computer systems and microchips that control so many activities in today's economy continue to function correctly? This issue is called the Year 2000 issue, the Y2K problem, or the Millennium Bug. The Year 2000 issue is the result of computer programs being written with only the last two digits to represent the year. Many computer programs use MM/DD/YY to format dates. As an example, October 12, 1998 would be represented as 10/12/98 as opposed to the more complete format of 10/12/1998. The result is that these computer programs may not properly recognize the year when it begins with 20 rather than 19 and may fail or provide erroneous results. Predictions about the effects of the Year 2000 issue range from the insignificant

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***Users of financial reports of public companies have an interest in knowing if the companies are addressing the Year 2000 issue on a timely basis and will avoid the adverse consequences.***

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to the devastating. Some of the more ominous predictions include an inability of governments to provide critical services, disruption of normal business activities, and an economic recession or depression. The Gartner Group has estimated the cost to fix the Year 2000 problem to be between \$300 and \$600 billion (Gartner Group 1996). The costs associated with not fixing the Year 2000 problem are not known.

While the Year 2000 issue and the solutions to it have been known for some time, there is concern that all of the solutions may not be implemented in time to avoid some of the adverse consequences. Users of financial reports of public companies have an interest in knowing if the companies are addressing the Year 2000 issue on a timely basis and will avoid the adverse consequences. This paper will trace the development of the required and recommended financial report disclosures of the Year 2000 issue as established by the United States Securities and Exchange Commission (SEC). It also will examine the quantity and quality of disclosures of the Year 2000 issue as required and recommended by the most recent SEC pronouncement for the published annual financial reports of publicly traded corporations selected from the S&P 500 Index.

## ***Development of Year 2000 Disclosure Requirements***

The SEC has the statutory authority to establish the disclosure requirements for publicly traded companies that come under its jurisdiction. The SEC requires companies to include a Management's Discussion and Analysis (MD&A) section in their annual financial reports. The MD&A section is to address the company's

financial condition and results of operations, including specific information on liquidity, capital resources, and any material events or uncertainties known to management that would cause the reported information not to be indicative of future operating results or financial condition (SEC Regulations S-K). The Year 2000 issue will require disclosure by most public companies in the MD&A section of their annual reports.

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***The Year 2000 issue will require disclosure by most public companies in the MD&A section of their annual reports.***

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The SEC addressed the Year 2000 issue in May 1997 when the Division of Corporation Finance updated its Current Issues and Rule Making Projects outline to discuss the need for public companies to disclose information relating to the Year 2000 issue. The Division was concerned that the failure of public companies to adequately address Year 2000 issues could have a material impact on the financial results of the companies. On October 8, 1997, the Divisions of Corporation Finance and Investment Management jointly issued *Staff Legal Bulletin No. 5*, which reminded entities having disclosure obligations that the SEC's rules and regulations apply to Year 2000 issues. The *Staff Legal Bulletin No. 5* was revised and issued on January 12, 1998, to provide more specific guidance for the disclosure of Year 2000 information. Normally when the SEC requires public companies to disclose material information, it utilizes a general reporting framework for such disclosures. This allows some flexibility for companies to comply with the disclosure requirements. The revised *Staff Legal Bulletin No. 5* is an exception to the traditional guidelines in that it provided specific requirements and recommendations for the disclosure of Year 2000 information.

Early in 1998 the SEC conducted an extensive survey of 1997 reports filed by public companies to evaluate the disclosure of Year 2000 issues. A Year 2000 Task Force from the Division of Corporation Finance examined 1,023 filed reports on Form 10-K, 10-KSB, 10-Q, and 10-QSB to check on the disclosure of eight categories of information relating to Year 2000 issues. The companies were randomly selected in twelve industry groups and included sixty-six small business filers. The Task Force found that many companies were not following the specific guidance provided in the revised *Staff Legal Bulletin No. 5*. Table 1 presents some of the significant findings from the survey.

The survey results suggested that many companies were not providing all the required or recommended Year 2000 disclosures. For example, 43 percent of the companies provided no disclosure regarding their plan to address the Year 2000 issue. A majority of the companies (64%) provided no disclosure concerning the timetable for completion of the assessment and/

or the remediation plans. Approximately half (51%) of the companies did not provide any disclosure regarding Year 2000 evaluation of material relationships with third party entities. With respect to cost information, 92 percent of the companies had no disclosure concerning historical cost information and 78 percent had no disclosure regarding estimated costs.

While there was some improvement in Year 2000 disclosures in the 1997 reports compared to the 1996 reports, the SEC was not completely satisfied with the quality or quantity of the disclosures and in the summer of 1998 issued a formal SEC Interpretation, "Disclosure of Year 2000 Issues and Consequences by Public Companies, Investment Advisers, Investment Companies, and Municipal Securities Issuers," that superceded *Staff Legal Bulletin No. 5*. Although the Interpretation applies to a variety of entities, this project only examines public companies. The SEC provides guidance, which encompasses requirements and recommendations on accounting and reporting matters, in Staff Legal Bulletins and Interpretations. Staff Legal Bulletins are issued by the SEC staff and Interpretations are formal pronouncements of the Commission. While Interpretations are of a higher order, the guidance of both Staff Legal Bulletins and Interpretations must be followed for accounting and reporting purposes. In the case of the Year 2000 issue, the Interpretation was most recently issued and its requirements and recommendations clearly supercede the earlier issued *Staff Legal Bulletin No. 5*.

The Interpretation provides requirements and recommendations to public companies for the disclosure of Year 2000 issues in the MD&A. The SEC expects "...that for the vast majority of companies Year 2000 issues are likely to be material, and therefore disclosure would be required" (SEC Interpretation). The Interpretation became effective August 4, 1998. Public companies with June 30, 1998 fiscal year-ends and companies with year-ends thereafter need to follow this interpretation for their 1998 annual reports. Quarterly reports after the release date must be filed utilizing the Interpretation guidelines.

A corporation is required to provide Year 2000 disclosure in its MD&A if:

1. its assessment of its Year 2000 issues is not complete, or
2. management determines that the consequences of its Year 2000 issues would have a material effect on the company's results of operations, or financial condition, without taking into account the company's efforts to avoid those consequences (SEC Interpretation).

The SEC does not consider that a corporation's assessment is complete until third parties, such as suppliers and customers, with which the company is materially involved, are Year 2000 ready. In addressing the second requirement for disclosure, corporations must

weigh the consequences of not being Year 2000 compliant in time.

Once a corporation meets the requirements to make Year 2000 disclosures in its MD&A, the following four categories of information need to be discussed:

1. the company's state of readiness;
2. the costs to address the company's Year 2000 issues;
3. the risks of the company's Year 2000 issues; and
4. the company's contingency plans. (SEC Interpretation).

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**Table 1**  
**Results of Year 2000 Task Force Survey\***

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1. <i>Assessment</i> – the extent to which the company has assessed the seriousness of its Year 2000 technology problems if no corrective action is taken.			
About to be started	9%	Still in progress	56%
Completed	27%	No disclosure	8%
2. <i>Plan</i> – the extent to which a company described its plan to remedy its Year 2000 technology problems.			
General description	44%	Detailed description	9%
Plan is fully implemented	4%	No disclosure regarding plan	43%
3. <i>Timetable</i> – the time frame with which a company intends to complete its assessment and/or its remediation plan.			
By the end of 1998	19%	Other than the end of 1998	17%
No disclosure regarding timetable	64%		
4. <i>Relationships</i> – whether a company plans to evaluate or is evaluating the Year 2000 technology problems of those entities with which it has material relationships.			
Disclosure regarding evaluation of material relationships			49%
No disclosure regarding evaluation of material relationships			51%
5. <i>Historical costs</i> – the amount of money a company has already spent on Year 2000 issues to date.			
Disclosure regarding historical costs			8%
No disclosure regarding historical costs			92%
6. <i>Estimated costs</i> – amount of money a company estimates it will spend on Year 2000 issues.			
Disclosure regarding estimated costs			22%
No disclosure regarding estimated costs			78%
7. <i>Materiality</i> – whether a company disclosed that the Year 2000 issue is material to its business and if so, the level of materiality.			
Year 2000 issues could be material			9%
Year 2000 materiality is unknown at this time			5%
Year 2000 issues are not material as to remediation costs or operations			67%
No disclosure regarding materiality of Year 2000 issues			19%
8. <i>Cautionary language</i> – whether a company warned investors that, because the effects of Year 2000 technology problems cannot be known until the Year 2000, actual effects may differ from the company's predictions.			
<i>Statutory safe harbor language,</i>			7%
• specifically mentions Year 2000 issues; and			
• appears physically near the other Year 2000 disclosure			
<i>Statutory safe harbor language:</i>			6%
• specifically mentions Year 2000 issues: but			
• does not appear near to or in the same section as the other Year 2000 disclosure			
<i>Statutory safe harbor language:</i>			59%
• does not:			
- mention Year 2000 issues; or			
- appear near to or in the same section as other Year 2000 disclosure			
<i>Disclosure includes general cautionary language with the Year 2000 disclosure</i>			43%
<i>No disclosure regarding the statutory safe harbor or general cautionary language on Year 2000 issues</i>			19%

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\*Source: SEC Year 2000 Disclosure Task Force Survey, 1998.

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In some corporations this information may need to be provided by business segment or subdivision. Additional information may need to be disclosed for companies with particular Year 2000 circumstances.

In discussing a corporation's state of readiness, more than a cursory description of the Year 2000 issues should be made. The SEC suggests a description in non-technical, plain English as would be given to a board of directors. The SEC wants companies to discuss both information technology (IT) and non-information technology (Non-IT) systems. Non-IT systems are embedded technology systems that control many machines and electronic equipment with micro controllers. Non-IT systems can be more difficult to assess and repair than IT systems. In many cases, Non-IT systems which are not Year 2000 compliant must be replaced because they cannot be easily repaired. Companies should disclose where they are in the process of becoming Year 2000 compliant with both their IT and Non-IT systems. This description of the company's state of readiness should include a description of Year 2000 issues as they relate to material third parties.

Material costs to address the company's Year 2000 issues must also be disclosed. Both historical costs incurred to date and remaining estimated costs of remediation are to be discussed. A breakdown of costs between software and hardware should be provided. There should be an identification of the source of funds for Year 2000 costs and an indication of the percentage of the IT budget used for remediation. Also, there should be an explanation of any other IT projects that have been deferred due to Year 2000 efforts and what effect this delay has had on the financial condition and results of operations of the company.

The risks of the company's Year 2000 issues must be discussed by describing the "most reasonably likely worst case Year 2000" scenario facing the company (SEC Interpretation). If the materiality of the Year 2000 effect is uncertain, this uncertainty must be disclosed and also how the corporation intends to cope with this uncertainty. Corporations must disclose estimated material lost revenue due to Year 2000 issues if known. There should be a description of any independent verification and validation processes used to assure the reliability of the corporation's stated risk and cost estimates.

A company must describe in its contingency plans how it is preparing to handle the most reasonably likely worst case scenario. If a company has not established a contingency plan, it should disclose that it does not have such a plan. Furthermore, the company should state whether it intends to create a contingency plan and its intended timetable for doing so. The SEC suggests the use of a chart to provide Year 2000 disclosure. It is felt that a chart can reduce lengthy Year 2000 disclosures that may overwhelm other disclosures.

Since many of the actual outcomes of the Year 2000 issues will not be known until after January 1, 2000, much of the disclosure represents forward looking information. Companies

may utilize the safe harbor provisions under the Private Securities Litigation Reform Act of 1995 or may provide general cautionary language. While not required by the SEC Interpretation, cautionary language relating to Year 2000 disclosures was a data collection item for this project.

A very good example of Year 2000 disclosures can be seen in the 1998 Becton Dickinson annual report. Becton Dickinson's Year 2000 disclosures meet almost all of the requirements and recommendations of the SEC Interpretation, including a chart. A copy of that company's Year 2000 disclosures is presented in Appendix 2.

### **Survey of S&P 500 Index Companies**

In order to evaluate the results of the new SEC guidance for Year 2000 disclosures, public companies that are in the S&P 500 Index were selected. Companies in the S&P 500 Index are the largest publicly traded companies and it was expected that these companies would have significant Year 2000 issues. It was also expected that these companies would most likely do the best job of complying with the SEC guidelines for Year 2000 disclosure since these companies are followed by the largest number of financial analysts and are audited by the world's largest public accounting firms. Fifty-two companies were identified as having fiscal years ending from June 30, 1998 to September 30, 1998. Annual reports and Form 10-Ks were obtained from fifty-one of the companies through direct contact with the company and/or through the use of the SEC EDGAR system. Appendix 1 lists the fifty-one companies used in this project. Information on one company was not available to be included in this project. The MD&A section of each company was analyzed to determine the quality and quantity of Year 2000 disclosures as required by the SEC Interpretation. The survey findings are summarized in Tables 2, 3, and 4.

Table 2 describes the state of readiness of the companies in the survey. All but one company described their

**Table 2**  
**The Company's State of Readiness**

• Description of Year 2000 issues is provided	69%
• Company has a plan to address its Year 2000 issues	98%
• Company discloses a target date for becoming Year 2000 compliant	90%
• Description of Year 2000 issues as they relate to material third parties is provided	98%
• Discusses both IT and Non-IT systems	53%
• Describes any independent verification and validation processes used	6%
• Presents Year 2000 information in chart form	4%

plans to address the Year 2000 issues and how those issues relate to material third parties. Most of the companies, 90 percent, provided a target date for becoming Year 2000 compliant. A date during 1999 was the most common target date presented. Even though the SEC is requesting that all companies include a general description of Year 2000 issues, only 69 percent of the companies in this survey provided a description of the issue. Only about half of the companies presented information about the IT and Non-IT systems. Two items regarding a company's state of readiness had virtually no disclosure by the companies. Only 6 percent of the companies described any independent and validation processes used and only 4 percent utilized a chart as part of the Year 2000 disclosures. The SEC had suggested that the use of a chart might reduce the length of the Year 2000 disclosures. However, the companies that used a chart still had very extensive Year 2000 disclosures.

Disclosures relating to the costs of addressing the Year 2000 issues are presented in Table 3. While 96 percent (49) of the companies made disclosures regarding costs incurred to date, fourteen of the companies stated that the costs were not material without stating specific dollar amounts and thirty-five companies disclosed dollar amounts. The percentage of companies making other types of cost disclosures dropped significantly. Only 70 percent (36) of the companies disclosed information on the total estimated costs of remediation. Of the thirty-six companies that presented this information, three stated that the costs were not material. With respect to the source of funds for Year 2000 costs, only 39 percent (20) of the companies surveyed presented this type of information. Cash flows from operations was the most common source of funds identified. Finally, disclosures of the percentage of IT budget used for Year 2000 remediation and deferral of IT projects due to Year 2000 were rarely mentioned by the companies in the study.

Table 4 presents the results for the disclosure of the Year 2000 risks and contingency plans and the inclusion of cautionary language. All of the companies presented cautionary language with respect to the Year 2000 issues. Most of the companies, 90 percent (46), indicated that they

could be materially affected if the Year 2000 issues are not satisfactorily addressed. While the SEC expected a presentation of the worst case scenario, only 33 percent (17) of the companies provided this information. The most common worst case scenarios disclosed involved material third parties such as key suppliers of products and services, major distributors, business partners, and customers. Several companies with international operations identified their worst case scenarios as involving their international operations. Because of the strong possibility that most businesses could face problems of material third parties not being Year 2000 compliant, having fewer than one third of the companies disclose this as a worst case scenario appears to be a point of concern. Although only 10 percent (5) of the companies indicated that they currently had Year 2000 contingency plans, 82 percent (42) of the companies were either in the process of developing or intending to develop such contingency plans.

**Table 4**  
**Disclosure of the Company's Year 2000**  
**Risks and Contingency Plans**

• Company could be materially affected if issues are not satisfactorily addressed	Year 2000 90%
• Worst case scenario is presented	33%
• Year 2000 contingency plans exist	10%
• Company intends to prepare or is preparing Year 2000 contingency plans	82%
• Cautionary language is included	100%

### **Summary and Conclusion**

The Year 2000 issue represents a significant problem for many organizations. This project examined the development of the Year 2000 issue disclosure requirements in the MD&A section of annual reports of public corporations and reviewed the current requirements and recommendations for these disclosures as specified in the SEC Interpretation. An examination of the current disclosure practices of selected companies from the S&P 500 Index was performed. The survey revealed that all of the surveyed companies disclosed some information on the Year 2000 issues. This project found that in the case of some required items of disclosure, companies are disclosing at a greater rate since the SEC Interpretation was issued. In this study 98 percent of the companies disclosed their plans to address the Year 2000 issues. The SEC study, which was based on 1997 data, found that 43 percent of the companies made no disclosure of a plan to remedy Year 2000 problems. Another example where there was a dramatic increase in the disclosures was in the area of costs incurred to date on Year 2000 issues. This

**Table 3**  
**Disclosure of Costs to Address**  
**the Company's Year 2000 Issues**

• Disclosure of costs incurred to date	96%
• Disclosure of total costs of remediation	70%
• Disclosure of the source of funds for Year 2000 costs	39%
• Disclosure of percentage of IT budget used for Year 2000 remediation	2%
• Disclosure of deferral of IT projects due to the Year 2000 and the effect of such deferral	2%

study indicates 96 percent of the companies are disclosing such information. The SEC study had only 8 percent of the companies making disclosures of costs incurred. A third instance where there was a significant increase in comparison to the SEC study was in the disclosure of estimated costs to remedy the Year 2000 problems. Only 22 percent of the companies in the SEC study made such disclosures while 70 percent of the companies in this study made these disclosures.

Although it appears that there has been much improvement on reporting of items that are required by the SEC, there is still substantial room for improvement. This study found that only 33 percent of the companies presented their worst case scenarios. This appears to be a severe reporting deficiency. Some of the reporting deficiencies appear easy to remedy. The situation that about one third of the companies in the survey failed to provide a general description of the Year 2000 issues could be easily remedied.

Finally, very few companies are providing the recommended disclosures made in the SEC Interpretation. Some disclosure items, such as the percentage of the IT budget used for Year 2000 remediation and presentation of Year 2000 information in chart form were rarely mentioned by the fifty-one companies in this survey. As companies become more aware of the SEC Interpretation, financial report users can hope for a higher quality of reporting of the Year 2000 issue as the companies release their quarterly and annual financial reports in 1999. ■

## References

- Becton Dickinson and Company. 1998. Annual Report.  
 Gartner Group. Year 2000 problem gains national attention, Gartner Group advises U.S. Congress on issue. 1996. <<http://gartner4.gartnerweb.com/public/static/aboutgg/pressrel/pry/2000.html>> (9 January 1999).  
 SEC corporation finance year 2000 disclosure task force survey. 1998. <<http://www.sec.gov/news/extra/y2kcfy.htm>> (14 July 1998).  
 SEC Interpretation. 1998. Disclosure of year 2000 issues and consequences by public companies, investment advisers, investment companies, and municipal issuers. <<http://www.sec.gov/rules/concept/33-7558.htm>> (31 July 1998).  
 SEC Regulations S-K17 C.F.R. section 229.303 (1998).  
 SEC Staff Legal Bulletin No. 5, 6 Fed. Sec. L. Rep. (CCH) para. 60,005 at 50, 115 (Jan 12, 1998).  
 SEC Staff Legal Bulletin No. 5. Revised January 12, 1998, found at [www.sec.gov/rules/other/slbcf5.htm](http://www.sec.gov/rules/other/slbcf5.htm), July 25, 1998.

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## Appendix 1

### S & P 500 Companies with Fiscal Year Ends From June 30, 1998 to September 30, 1998

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Air Products and Chemicals, Inc.	Mallinckrodt Inc.
Alberto Culver	Micron Technology
Andrew Corporation	Microsoft Corporation
Apple Computer	Morton International
Archer-Daniels-Midland	Meredith Corporation
Ashland Inc.	National Service Industries
Automatic Data Processing, Inc.	Oneok Inc.
Auto Zone Inc.	Pall Corporation
Bear Stearns Companies	Parametric Technology
Becton Dickinson and Company	Parker Hannifin
Briggs & Stratton	Peoples Energy
Browning-Ferris Industries	Perkin Elmer
Cardinal Health	Proctor & Gamble Company
Cisco Systems	Ralston-Purina Group
Clorox Company	Raychem Corporation
Data General	Rockwell International
Delta Air Lines	Sara Lee Corporation
Disney (Walt) Company	Scientific-Atlanta
Emerson Electric	Seagate Technology
Franklin Resources	Seagram Company
Harris Corporation	Silicon Graphics
Helmerich & Payne	SunAmerica
IKON Office Solutions	Sun Microsystems
Johnson Controls	Sysco Corporation
KLA -Tencor Corporation	Walgreen Company
Lucent Technologies	

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## Appendix 2 Year 2000 Readiness Disclosure\*

### General

The Company has developed and is well into implementing a Company-wide Year 2000 plan (the 'Plan') with the intent to ensure that its computer equipment and software and devices with date-sensitive embedded technology will be able to distinguish between the year 1900 and the year 2000 and will function properly with respect to all dates, whether in the twentieth or twenty-first centuries (such functionality is referred to below as being 'Year 2000 compliant'). An inability to function accurately with respect to all such dates could result in a system failure or disruption of operations, including a temporary inability to process transactions, receive orders, send invoices or engage in other customary business practices.

The Company's Plan includes a series of initiatives to ensure that all of the Company's computer equipment and software will function properly into the next millennium. "Computer equipment (or hardware) and software" includes systems generally thought of as information-technology dependent, such as accounting, data processing, and telephone equipment, as well as systems not obviously information-technology dependent, such as manufacturing equipment, telecopier machines, and security systems. These systems may contain embedded technology, which requires that the Company's Plan include broad identification, assessment, remediation and testing efforts.

Based upon its identification and assessment efforts to date, the Company believes that certain of its computer equipment and software will require

replacement or modification. In addition, in the ordinary course of business, the Company periodically replaces computer equipment and software, and in so doing, seeks to acquire only Year 2000 compliant software and hardware. The Company presently believes that its planned modifications or replacements of certain existing computer equipment and software will be completed on a timely basis so as to avoid any of the potential Year 2000-related disruptions or malfunctions of its computer equipment and software that it has identified.

### Project

The Company's Plan consists of four major focus areas: information-technology ('IT') systems; non-IT systems; third-party considerations; and products.

The tasks common to each of these areas of focus are: (i) the identification and assessment of Year 2000 issues; (ii) prioritization of the identified issues; (iii) assessment of compliance; (iv) remediation; (v) testing; and (vi) design and implementation of contingency and business continuation plans.

The Company is utilizing both internal and external resources to ensure that it is Year 2000 compliant prior to any currently anticipated impact of the new millennium. The following table set forth below summarizes, by focus area, the current status and projected dates of completion for each of the related tasks:

### Estimated % of Completion/Projected Date of Completion

Focus Area	IT Systems	Non-IT	3rd Party Considerations	Products
Identification and Assessment of Year 2000 Issues	100% Completed	100% Completed	100% Completed	100% Completed
Prioritization of Identified Issues	100% Completed	100% Completed	100% Completed	100% Completed
Assessment of Compliance	100% Completed	80% June 1999	15% September 1999	100% Completed
Remediation	60% September 1999	30% June 1999	— September 1999	75% June 1999
Testing	30% September 1999	15% June 1999	— September 1999	75% July 1999
Contingency and Business Continuation Plans	— September 1999	— June 1999	— September 1999	50% May 1999

### IT Systems

The IT Systems section focuses on the Company's computer hardware and software. The Company estimates that as of October 31, 1998, it had completed approximately 55% of the effort it believes necessary or prudent to adequately address the potential Year 2000 issues it has identified in connection with its IT systems. The balance of the work is underway and is scheduled for completion on or about September 1999. The testing process is continuous, as hardware or software is remediated, upgraded or replaced. The Company is in the early stages of contingency and business continuation planning which it expects to complete on or about September 1999.

### Non-IT Systems

The non-IT Systems section includes the hardware, software and associated embedded computer technologies that are used to operate Company facilities, equipment and other activities that are not related to IT systems. The Company estimates that as of October 31, 1998, it had completed approximately 50% of the initiatives that it believes necessary or prudent to adequately address potential Year 2000 issues affecting its non-IT systems. The Company intends to commence its non-IT systems contingency and business continuation planning in January 1999 and have all phases of the Plan relating to non-IT systems completed on or about June 1999.

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## Appendix 2 Year 2000 Readiness Disclosure\* (continued)

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### **Third-Party Considerations**

The Company is in the process of identifying, prioritizing and communicating with critical suppliers, distributors and customers to determine the extent to which the Company may be vulnerable in the event those parties fail to properly identify and remediate their own Year 2000 issues. Detailed evaluations of the most critical third parties have been initiated through questionnaires, interviews, on-site visits and other available means. The Company intends to monitor the progress made by those parties, test critical system interfaces and formulate appropriate contingency and business continuation plans to address third-party issues identified through its evaluations and assessments.

### **Products**

The mission of the products team is to identify any Company products that are not Year 2000 compliant and determine and implement on a timely basis appropriate remedial steps. The Company has completed its identification of such products and estimates that it will have completed the necessary upgrades and replacements required to make such products Year 2000 compliant by June 1999. Contingency and business continuation planning with respect to products that may prove to be non-Year 2000 compliant is scheduled to be completed by May 1999.

### **Costs**

The total cost of the Company's Year 2000 Plan is not expected to be material to the Company's financial condition. The estimated total cost of the Plan is approximately \$15 million, and is being funded through operating cash flows. As of September 30, 1998, the Company had incurred approximately \$2.5 million in costs related to its Year 2000 identification, assessment, remediation and testing efforts. Of the total remaining anticipated costs of the Plan, approximately \$2 million is attributable to the purchase of new software and hardware and approximately \$4 million is attributable to contingency and business continuation plans. The remaining \$6.5 million relates to the repair, reprogramming or modification of hardware and software, of which approximately \$4 million represents the redeployment of existing resources.

None of the Company's other information technology projects have been delayed or deferred as a result of the implementation of the Plan.

### **Risks**

The Company presently believes it has an effective Plan in place to anticipate and resolve any potential Year 2000 issues in a timely manner. In the event, however, that the Company does not properly identify Year 2000 issues or the compliance assessment, remediation and testing is not conducted on a timely basis with respect to the Year 2000 issues that are identified, there can be no assurance that Year 2000 issues will not materially and adversely affect the Company's results of operations or relationships with third parties. In addition, disruptions in the economy generally resulting from Year 2000 issues also could materially and adversely affect the Company. The amount of potential liability and lost revenue that would be reasonably likely to result from the failure by the Company and certain key third parties to achieve Year 2000 compliance on a timely basis cannot be reasonably estimated at this time. A contingency plan has not yet been developed for dealing with the most reasonably likely worst case scenario, and such scenario has not yet been clearly identified. The Company expects to complete its analysis and contingency planning by September 30, 1999.

The estimated costs of the Company's Plan and the dates by which the Company believes it will have completed each of the phases of the Plan, are based upon management's best estimates, which rely upon numerous assumptions regarding future events, including the continued availability of certain resources, third-party remediation plans, and other factors. These estimates, however, may prove not to be accurate, and actual results could differ materially from those anticipated. Factors that could result in material differences include, without limitation, the availability and cost of personnel with the appropriate training and experience, the ability to identify, assess, remediate and test all relevant computer codes and embedded technology, and similar uncertainties. In addition, Year 2000-related issues may lead to possible third-party claims, the impact of which cannot yet be estimated. No assurance can be given that the aggregate cost of defending and resolving such claims, if any, would not have a material adverse effect on the Company.

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\*Source: Becton Dickinson and Company 1998 Annual Report (pp. 38-40).

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# ***A Documentation Model for the Contemporary Accounting Information System***

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## ***Executive Summary***

This article examines some of the problems with documentation in accounting information systems (AIS). At present, there is no standard for documentation and there is a wide variety of techniques and documentation items found in such systems today. The “constituents” of the AIS who are users, maintainers, and auditors, need high quality, consistent, and useable documentation in order to carry out their jobs effectively. As a prelude to developing a model for AIS documentation, the article reports the results of a survey of accountants who use documentation in their work. The survey identified thirty items believed by the respondents to be important for inclusion in documentation packages. These items centered on the database, analysis and design, and control and security areas. Based upon the review of the literature and the findings of the documentation survey, the article concludes by proposing a model package which would provide basic documentation for a general AIS overview, database, analysis and design, user instructions, and control/audit/security components. User needs and preferences coupled with the system environment would indicate items which could be added to the basic documentation package proposed here.

## ***Documentation: Is Anyone Happy with It?***

The development of modern accounting information systems (AIS) has directly paralleled the rapid evolution of information technology from centralized, mainframe, legacy systems of earlier years to the current client-server, networked, microcomputer based environment of today. While the “Information Age” of accounting has been welcomed by many users of accounting systems, advances in technology have not always been accompanied by parallel advances in documentation for the AIS. In fact, a significant problem area with systems development has been the lack of a standard documentation methodology for existing and new or upgraded systems.

The “constituents” of good documentation are numerous and include everyday users of systems, those who develop and maintain systems, and those who must examine and audit the systems. Thus, the need for standard, high-quality AIS

documentation is evident and the time is opportune for the development of a standard model for AIS documentation. The purpose of this article is to examine existing documentation patterns and propose a model documentation package which could serve as a basis for consideration by the constituent groups who would benefit from better documentation.

Documentation may be one of the most maligned aspects of many accounting systems. In fact, the systems field literature

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***...a significant problem area with systems development has been the lack of a standard documentation methodology for existing and new or upgraded systems.***

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is replete with complaints about documentation—the lack of it, poor quality, and the non-standard nature of available documentation. For example, consultant A. R. Young (1989) wrote about what may be a common perception about documentation. “Documentation is similar to cafeteria food: Regardless of its content and appearance—how good it really is—it is something to gripe about.” Another common complaint is that system developers don’t write documentation for users but tend to describe instead of explain (Noble, 1984). Even when documentation is available, “it is often in unclear language that baffles computer users” Johnson (1995).

Klinner and Friday (1988) wrote that a lack of time often leads to poor documentation:

Systems analysts are often pressed to bring one system on-line and to begin another project. In the typical business environment, documentation is viewed as a luxury to be done at some later date. Unfortunately, “later” rarely seems to arrive. If the documentation is completed at all, it is cranked out only as time allows. (p. 27)

In a study of users, Puscas (1989) found that most users felt documentation manuals were generally not easy

to use or well written and that indexing and cross-referencing was insufficient, making information hard to find. Too often, documentation is created with the ideas that “the user will be able to figure this out” or that “the user will be bright enough to understand this” while clearly this is not always the case (Schorer, 1998).

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**Accountants... have come to realize  
... that adequate documentation is  
absolutely essential for the effective and  
efficient operation of their systems.**

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Accountants, as major system users, realize through experience that adequate documentation is absolutely essential for the effective and efficient operation of their systems. Gallegos et al. (1987) summarized the importance of documentation when he wrote:

Simply stated, documentation is the CIS (computer information system) it describes. That is, a viable system does not exist unless it is documented fully. The reliance on documentation may be necessary because people make mistakes. People forget. Also, in the CIS field, people change jobs frequently. Thus, in a well-run CIS department, documentation is the insurance policy that assures continuity of service. (p. 190)

Van Name and Catchings (1996) reinforced Gallegos’ argument. “Companies should always keep documentation on computer configuration because the employee who originally set up the system may leave.” In addition, the development of the systems themselves should be under the control of good documentation as Gallegos notes:

Documentation itself is an essential control on the development process. ...The documentation of systems development efforts must be more than a history, or a record of milestones. Documentation must be able to guide and direct the activities of the project team. (p. 260)

Finally, Gallegos stated that examination of internal control systems by internal and external auditors can be greatly facilitated by the availability of adequate documentation. “The auditor’s bias often is to begin the building of understanding by reviewing existing documentation. If deficiencies exist in project documentation, the auditor is likely to point them out” (p. 260).

This assertion is supported by the *Statements on Auditing Standards No. 55 and No. 78* (AICPA 1988, 1995) which mandate the auditor’s “inspection of entity documents and records” in order to obtain an understanding of internal control procedures in place. In her extensive work entitled *Handbook*

*of Internal Accounting Control*, Wallace (1991) summarized the importance of documentation to auditors and their clients:

As already suggested, documentation is an integral part of both general controls and is essential to a well-controlled EDP system. You should recommend that clients make documentation standards an integral part of systems design and implementation, program testing and changes, operations and the interface with EDP users. The documentation process can be thought of as a means of providing answers to the basic questions—why, how, what, when, and who?

Finally, the most definitive work in the area of systems and controls, *Internal Control—Integrated Framework*, published by the Treadway Commission (Coopers and Lybrand 1992), described the importance of documentation in relation to the auditors’ attest function this way:

The nature and extent of documentation normally will become more substantive when statements about the system or evaluation are made to additional parties. Where management intends to make a statement to external parties regarding internal control system effectiveness, it should consider developing and retaining documentation to support the statement.

This language was incorporated into the official, professional auditing literature in *SAS No. 78* (1995) which amended the earlier *SAS No. 55* (1988).

Unfortunately, the professional literature is not very specific about what items the documentation should include. Further, because no uniform standard exists to guide developers in their documentation of new or existing systems, problems for users and auditors can result. Users can be hampered in employing a system efficiently. At the same time, CPA firms are being asked to cap the costs of audits and perform services with fewer billable-hours. The wide variety of existing documentation styles results in systems documentation which often does not effectively meet the needs of any constituent of a system. Within a single company, the AIS documentation for systems developed at different times may range from none at all on smaller, end-user systems to manually produced, out-of-date materials for older, legacy systems to extensive, online documentation produced by a CASE software package with accompanying narratives of the system.

While more types of documentation are available to users and auditors than ever before, more may not be better. In fact, a minimalist approach advocated by Oatey and Cawood (1997) and Manning (1998) provides illustrations of practical tasks rather than conceptual information about the system. This approach has been taken by the *Microsoft Office 97* printed manual while the concepts of how to use various software features is provided in on-line form.

In order to determine what would constitute an optimal package of documentation for a modern AIS, the authors have consulted relevant AIS books, CASE packages, and the systems field literature. In addition, to find out what AIS users and auditors felt about various documentation components, a survey was sent to a sample of these two groups and the results are reported later in this article. The purpose of the survey was to determine which documentation components are deemed to be most valuable by both users and auditors. Based on the review of the literature and the survey results, a model documentation package is proposed as a standard for accounting information systems. The authors believe this first attempt to develop a documentation standard will have potential benefits for both system users and auditors.

Investigation of existing documentation patterns indicates that documentation packages often include many of the following twelve components:

1. A clear statement of objectives and user needs for the system.
2. Resources required by the system: hardware, software, personnel, data, etc.
3. Benefits to be derived from the system by its use.
4. Format of input screens and data forms used by the system
5. Report formats, screen designs, frequency, distribution, retention, and disposal policies.
6. Testing procedures; initial development and periodic at the time of maintenance or for audit purposes.
7. Predecessor systems or procedures which may impact the present system or need to be investigated subsequently.
8. The logic of design of the system in narrative or chart form.
9. Macro capability if any; macros implemented or commands available to the user.
10. Backup and recovery procedures for hardware, software, personnel, and data considerations.
11. Current procedure manuals for users and operators.
12. Logic charts for example: data flow diagrams, identity diagrams, flowcharts, narrative descriptions, data dictionary, code listings, test data.

These twelve documentation categories cover the three classes of documentation mentioned by Romney et al. (1996): development documentation (1 - 8, 12); operations documentation (9, 10, 11); and user documentation (9, 11). The structure of existing documentation packages varies widely, both in the items included and in the basic structure of the package. Romney et al. (1996) suggest a documentation package which is based upon the systems development process itself: analysis, conceptual design, hardware and software acquisition, physical design, implementation, operation and maintenance.

Often the resulting documentation package is a product of the CASE tool used in the development of the system. Laudon and Laudon (1998) point out that many CASE tool kits contain many, if not all, of the following key features:

1. Diagramming tools for logic charts.
2. Syntax verifiers to validate the accuracy and completeness of specifications entered in conformance with a structured methodology.
3. Prototyping tools such as screen, report, and menu generators.
4. Information repository which is a database of screen and report layouts, data definitions, program code, project schedules in a coordinated, standardized, and integrated format.
5. Code generators to produce executable code from higher level specifications.
6. Narratives or checklist of development methodologies to assist in monitoring and controlling the development process.
7. Project management tools for project scheduling and resource estimation and budgeting.

In addition, CASE tools often contain text editing modules for the creation of narratives and other written documentation, and may contain a graphics editor for the creation of charts, graphs, and tables.

### ***The Documentation Questionnaire***

In order to assess what users and auditors felt about the importance of various documentation items and to form the basis for the proposed model presented later, a questionnaire was formulated, pretested, and sent to a sample of accounting practitioners. The questionnaire consisted of 44 common documentation items mentioned in the literature and often found in AIS documentation packages. The respondents were asked to rate each of the 44 items on the basis of the importance of the item for the successful analysis, design, acquisition, implementation, or operation of accounting systems in their organization using a four-point importance scale. The four-point rating range was from a 4 representing "The item is of vital importance" to a 1 representing "The item is not important." In addition, the questionnaire contained eight demographic questions regarding the use of documentation, industry type, types of soft-ware used, and extent of computerization of major accounting systems. The questionnaire was mailed to 300 members of the American Institute of Certified Public Accountants who are members of the Information Systems Interest Section. Two mailings resulted in the return of seventy-two questionnaires of which sixty (a 20% response rate) were useable in the statistical analysis.

In order to examine the question of non-response bias, the second-mailing (late responders) was compared to the first-mailing (early responders). A chi-square test of homogeneity on all variables to be analyzed was used to test for the homogeneity between the early and late responses. The chi-square statistics failed to reject the null hypothesis of no difference at a significance level of .05. This indicates that the responses from the two mailings were not significantly different and can be treated as one sample for analysis purposes.

### Demographics of the Respondents

The participants in the study were chosen based on their interest in the use of computers in accounting and information systems. Of the useable responses in the statistical analysis, thirty were from persons in public accounting practice and thirty were from the user side of accounting (non-public CPA's).

As part of their position, thirty-six of the respondents prepare documentation for accounting systems. The frequency of use of system documentation in their work shows that over 88% use documentation ranging from several times per year to everyday (Table 1).

**Table 1**  
**Frequency of Use of System Documentation in Work**

Frequency	Number	Percent
Everyday	7	11.9%
Several times per week	10	16.9%
Several times per month	16	27.1%
Several times per year	19	32.2%
Never	7	11.9%

Integrated database systems are used by thirty-eight (64.4%) of the respondents for accounting applications in their organizations. The most commonly automated accounting applications were the inventory, cash control and accounts payable systems.

### Survey Results

The respondents were asked to rank each of forty-four items as to their importance in system documentation. The mean responses for each of the forty-four documentation items are presented in Table 2.

On an overall basis, a mean of 3.0 or higher was used as a threshold to determine that the respondents felt an item was very important. On the basis of this measure, nine of the forty-four items stand out: control and security specifications, output screen designs, vendor evaluation results, data entry procedures, computer operator instructions, user training plans, error/exception instructions, narrative descriptions, and user manuals. The rating of these nine items as very important is not surprising as all of them relate directly to the smooth operation and securing of a system.

**Table 2**  
**Overall Means and Means for Public and Non-Public CPAs**

<i>Documentation Item:</i> <i>(Scale: 1 = no importance</i> <i>4 = vital importance)</i>	<b>Overall Mean</b> <b>n=60</b>	<b>Means Public CPA's</b> <b>n=30</b>	<b>Means Non-Public to CPA's</b> <b>n=30</b>
User manuals	3.550	3.633	3.467
Data entry procedures	3.283	3.267	3.300
Error/exception instructions	3.250	3.067	3.433
Computer operator manuals	3.233	3.367	3.100
User training plans	3.183	3.067	3.300
Narrative descriptions of system	3.117	3.167	3.067
Control and security specifications	3.017	2.800	3.233
Vendor evaluation results	3.000	2.800	3.200
Output screen designs	3.000	2.733	3.267
Conversion plan and schedule	2.950	2.800	3.100
Vendor selection criteria	2.949	2.793	3.100
Audit plans	2.917	3.033	2.800
System flowcharts	2.917	2.700	3.133
System performance standards	2.917	2.667	3.167
Data base structure	2.900	2.700	3.100
Output specifications	2.900	2.600*	3.200*
Testing plans and data	2.900	2.733	3.067
Software change authorizations	2.850	2.700	3.000
Control and security tables	2.800	2.467*	3.133*
File layouts	2.767	2.533*	3.000*
Document flowcharts	2.767	2.767	2.767
Data flow diagrams	2.733	2.500	2.967
User interview summaries	2.683	2.433	2.933
Requirements costing analysis	2.650	2.367*	2.933*
Questionnaires, responses, analysis	2.650	2.467	2.833
Post implementation review report	2.600	2.500	2.700
Procedure observation summary	2.600	2.533	2.667
System maintenance log	2.567	2.600	2.533
User requests for systems work	2.533	2.300	2.767
Data dictionaries	2.500	2.267	2.750
Systems run schedule	2.492	2.241	2.783
Systems analysis reports	2.467	2.467	2.467
Structure diagrams	2.441	2.233*	2.655*
Report distribution lists	2.441	2.207*	2.667*
Capital budgeting analysis	2.433	2.200*	2.667*
System financing reports	2.417	2.300	2.533
Program source listings	2.417	2.367	2.467
Benchmarking results and rankings	2.400	2.133	2.667
Work measurement reports	2.367	2.100	2.633
Prototype specifications	2.367	2.067	2.667
Decision trees or tables	2.350	2.267	2.433
Feasibility study	2.317	2.033*	2.600*
Requests for proposal	2.305	2.067*	2.552*
Hierarchy charts	2.305	2.167	2.448

\* Indicates the difference between means of public and non-public CPAs is significantly different at less than the .05 level as shown by Fisher's Exact Test.

A second tier of documentation items was considered to be of at least moderate importance. This tier consisted of items having an overall rating of 2.5 to 2.99, according

to the responses of both the public and user accounting groups. These items were: document flowcharts, system flowcharts, data base structure, vendor selection criteria, systems performance, user training plans, testing plans and data, conversion plan and schedule, post implementation review report, and audit plans. Again, there are no surprises in this list because these items relate directly to effective design and implementation of systems and to adequate review and audit of operating systems. In all, thirty of the forty-four items were rated by the respondents at a 2.5 level of importance or higher. These thirty items have been included in the model of documentation proposed later in this article.

In comparing the responses from the CPAs in public practice to those in user capacities, some interesting differences are noteworthy. As a group, public accountants consider their documentation needs from the auditing point of view while accountants in the user area consider their documentation needs from the day-to-day operating necessities. Nine of the forty-four items were statistically different between the two groups of respondents as shown by Fisher's Exact Test at the .05 level or less (Ferguson, 1976). The means of these nine items are indicated by asterisks in Table 2. Of the eighteen items mentioned as moderately to very important by the CPAs in public practice, three areas of documentation stand out: database items, items related to the systems analysis and design phase, and control/security items.

Of the forty-four items considered, only software change authorizations was considered vitally to moderately important by nonpublic accounts, while minimally important by the majority of public accountants. The following items were considered minimally important by both the public and nonpublic accountants: hierarchy charts, system financing reports, decision trees or tables, program source listings, system maintenance log, and systems run schedule. This finding is not surprising because most of these items have an internal, operational focus.

### ***Recommendations for a Model Documentation Package***

Table 3 presents a model documentation package based upon the findings of the survey and the items mentioned in the literature which balances the needs of both users and auditors.

The model package includes all items identified on the questionnaire of at least moderate importance to the respondents. Is this an "ideal" documentation package for all accounting and financial systems which will satisfy general users and auditors alike? It is doubtful that any single documentation approach could equally satisfy both groups—as their needs differ significantly. The authors believe that the model proposed here could accompany accounting systems as a basic package and be supple

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**Table 3**  
**Proposed Model Documentation Package for Accounting Information Systems**

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***General System Documentation:***

Narrative description of system; system flowcharts; and document flowcharts.

***Rationale:***

These items give a big picture view of the system, its objectives and goals.

***Database Documentation:***

Database structure; data flow diagrams; and data dictionaries.

***Rationale:***

The pervasiveness of databases in accounting systems mandates these items. Users, developers, and auditors all find these items essential.

***Systems Analysis and Design Documentation:***

User training plans, vendor evaluation results; output screen designs; conversion plan and schedule; vendor selection criteria; system performance standards; output specifications; testing plans and data; file layouts; user interview summaries; requirements costing analysis; questionnaires, responses, analysis; procedures observation summary; and user requests for systems work.

***Rationale:***

These items are produced by the systems development process often using CASE tools. Auditors and users often find these items useful in gaining a detailed understanding of a new system.

***User Oriented Documentation:***

User manuals; data entry procedures; and error/exception instructions.

***Rationale:***

These items are essential for end-users to successfully use a system and for the training of new users. May be the primary documentation in end-user developed systems.

***Control, Security, and Audit Documentation:***

Computer operator manuals; control and security specifications and tables; audit plans; software change authorizations; post implementation review report; and system maintenance log.

***Rationale:***

Often of most interest to auditors in planning audit procedures but also needed by system security personnel and systems managers.

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mented with additional items as individual circumstances and preferences warrant.

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***Traditional, hardcopy documentation remains popular with users, but so-called “softcopy” or online types of documentation are becoming very commonplace.***

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Even when the content of documentation has been determined, the medium of presentation to the user must be determined. Traditional, hardcopy documentation remains popular with users, but so-called “softcopy” or online types of documentation are becoming very commonplace. Online documentation has several advantages over its hardcopy counterpart. Many entry and exit points are possible for the user. Online versions can be updated and corrected more quickly, particularly in network environments. Sophisticated search facilities and hyper-text methods, which provide vast linking capabilities of topics, are possible with online technology. However, online documentation can be harder to read, is not port-able without a computer, and not accessible at all when the system is not operating. Despite all these factors, the overriding reason why online documentation is becoming so common is its dramatically lower cost. Denton and Kelly (1992) report that online documentation has a cost advantage of one-tenth that of printed documentation.

Buyers of software products today invariably find online tutorials and context-sensitive help facilities built right into the products. Increasingly however, the generous, hardcopy documentation manuals formerly provided by developers are shrinking into small, pamphlets as online documentation grows. It is unclear that users truly prefer this approach given the growing market for third-party software book titles. Notwithstanding, it appears that as software prices fall and printing costs rise, the trend toward more online and less hardcopy documentation will continue.

### **Conclusions**

In this article, we have reviewed the literature about documentation, reported the results of a documentation user survey, and proposed a model documentation package for accounting systems. While it may be easy to take good documentation for granted when it is available, the effective use of any system depends significantly upon the availability of good documentation. Any documentation package needs to consistently balance the needs of the different constituents who will have contact with the system.

In summary, the results of the survey and the literature review disclose that the needs of documentation constituents encompass the following five areas:

1. Good documentation is a necessity for internal users in their day-to-day operations. In the event that problems occur, documentation can provide the tools necessary to aid in correcting the situation.
2. Documentation also provides the tools that internal auditors need to perform the functions of evaluating the systems, improving upon the systems efficiency, and evaluating the reliability of the output for both financial statements and internal usage.
3. Public accountants use the documentation for two purposes: reviewing internal controls and planning the audit procedures. If system documentation is both up to date and adequate, the time necessary for the audit can be decreased, thereby decreasing the client firm’s bill. Documentation is a necessary tool for auditors to determine the reliability of the system and the resultant output for financial reporting purposes.
4. Consulting and management advisory services provided by outside vendors consists of an array of possible services including reengineering projects, upgrading an existing system, and developing and installing entirely new systems. Documentation is a necessity in the performance of these services in an efficient and effective manner.
5. Those who must maintain and upgrade systems throughout the life of the system rely heavily upon the documentation. Good documentation virtually always makes this process much easier. Missing or outdated documentation will often have to be reconstructed or updated before maintenance can take place.

Finally, the developers of documentation need to keep in mind that flexibility and adaptability is necessary to fully meet user needs. Any standard or model documentation will fulfill only a portion of those items necessary for the successful operation and maintenance of a system. The particular circumstances of the company, the environment, and user preferences will likely indicate additional components (if any) to be included in the AIS documentation package. ■

### **References**

- AICPA. 1988. Statement on auditing standards no. 55. *Consideration of the internal control structure in a financial statement audit.*
- AICPA. 1995. Statement on auditing standards no. 78. *Consideration of the internal control structure in a financial statement audit: An amendment to statement on auditing standards no. 55.*

- Coopers & Lybrand. 1992. *Internal control-integrated framework*. Committee of Sponsoring Organizations of the Treadway Commission.
- Denton, L. and J. Kelly. 1992. *Designing, writing, and producing computer documentation*. New York: McGraw Hill.
- Ferguson, G. A. 1976. *Statistical analysis in psychology and education*. 4th ed. New York: McGraw-Hill.
- Gallegos, F., D.R. Richardson, and A.F. Borthick. 1987. *Audit and control of information systems*. Cincinnati, OH: Southwestern Publishing Co.
- Johnson, E. 1995. Computer documentation: Writing about technology. *Computers and the Humanities* 29(5):409.
- Klinner, P.A. and K.K. Friday. 1988. How well do you write user documentation. *Journal of Systems Management* (December):27-30.
- Laudon, K.C. and J.P. Laudon. 1998. *Management information systems*. 4th ed. New York: Macmillan.
- Manning, A.D. 1998. Minimalism beyond computer documentation. *IEEE Transactions on Professional Communication* 41(3):200.
- Noble, B.P. 1984. Documenting computer systems. *Venture* (Sept.):18.
- Oatey, M. and M. Cawood. 1997. Minimalism as a framework. *IEEE Transactions on Professional Communication* 40(4):265.
- Pascas, M.L. 1989. A survey of technical computer users resulting in guidelines for the development of technical computer documentation. Ph.D. diss., Northern Illinois University.
- Romney, M.B., P. Steinbart, and B.E. Cushing. 1996. *Accounting information systems*. 7th ed. Reading, Mass: Addison-Wesley Publishing Co.
- Schorer, P. How to create zero-search-time computer documentation. *Technical Communication* 45(1):110.
- Van Name, M.L. and B. Catchings. 1996. Even in disaster, practice makes perfect. *PC Week* 13(38):10.
- Wallace, W.A. 1991. *Handbook of internal accounting controls*. 2d ed. Englewood Cliffs, NJ: Prentice-Hall.
- Young, A.R. 1989. Good documentation isn't good enough. *Technical Communication* (Third Quarter):196-200.

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# ***Building OM Curriculum for the New Millennium:***

## ***Industry Perceptions***

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### ***Abstract***

This paper studies current trends in the teaching of operations management. Research questions focus on how well operations management curriculum in American business schools match employers' perceptions of required skills. Through surveys of both universities and business firms, we assess the value of general skills such as communication, team building and mathematical modeling. We also assess the importance to employers of incorporating specific computer-based applications into the curriculum, and well as the value of building stronger management information system (MIS) skills in operation management majors.

### ***Introduction***

Two major changes in the business environment of the 1990s have been globalization and the transformation of our industrial economy to a knowledge- and information-based service economy. These changes have posed a number of new challenges to the operations management field. In both the manufacturing and service sectors, there is continuous pressure to increase productivity and remain competitive in a global marketplace. The use of powerful information systems will be required to effectively achieve these goals in the next millennium. The operations management curriculum must continually adapt to changes and challenges presented with each new era.

Students studying in American universities over the next decade will have a significant impact on business operations, and on the health of the U.S. economy. Increased global competitiveness suggests a need for high quality operations management programs in this country. But, there are few operations management degree programs in the U.S., and those that exist are quite diverse. Researchers often criticize existing programs as being inadequate or antiquated (Raiszadeh and Etkin 1989; Bregman and Flores 1991; Coleman and Smith 1994; Willis and Bass 1994; Bandyopadhyay 1994; Wilson 1995; Hammond, Hartman and Brown 1996).

The goal of this study is to determine how well operations management programs have identified and integrated recent

industrial developments and directions. We focus on current trends in operations management with special interest in the integration of technology. We are concerned with both the integration of specific computer-based applications as well as the promotion of the skills necessary to design and support information systems. We are also interested in assessing the value of more general skills such as communication, team building and mathematical modeling.

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***How will [do] operations management programs identify and integrate recent industrial developments and directions?***

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This paper reports the results from surveys of both U.S. business schools and U.S. firms employing operations management majors. The information gained from this study may assist operations management programs in identifying current trends in business, and more closely aligning their curriculum to meet the changing needs of U.S. businesses.

### ***Literature Review***

The field of operations management has become one of the most challenging areas of business due to national and global events that have occurred recently. Many articles have been written about these changes and their impact on operations management curricula. One study indicates multiple trends: 1) a shift in emphasis from manufacturing to service; 2) an increased emphasis on global issues; 3) an increased emphasis on quality related issues; 4) an increased emphasis on strategic issues in operations management; and 5) an increased emphasis on issues related to supply chain management and JIT manufacturing (Weinstein and Sanders 1997).

Many papers indicate a need for expanding operations topics and techniques. Wilson (1995) suggests that operations curriculum lack a historical component leading

to a shallow understanding of current issues and topics. Several studies (Bandyopadhyay 1994; Clinebell and Clinebell 1995; Hammond et al. 1996) cite deficiencies in terms of the technology used in operations management programs. Other research suggests that, in the face of an ever-growing list of operations management topics and techniques, there is an increased need for focus, and a reduction in the components covered in the operations management curriculum (Raiszadeh and Etkin 1989; Bregman and Flores 1994). Some propose a shift away from the theoretical approach to a more applications-oriented perspective (Bregman and Flores, 1994). Hammond et al. (1996) recommends the focus should move more towards practitioner objectives. Bregman and Flores (1994) and Coleman and Smith (1994) recommend that programs should de-emphasize quantitative techniques in favor of management and develop strategies for integrating service operations into the curriculum. Dellana, Bass, and Herbert (1998) indicate that business schools need to more effectively communicate to local industry their efforts to improve quality.

### **Research Questions**

Curriculum reengineering is a vital activity of any educational institution (Sandman 1993-1994). A major strength of a business school's curriculum is its ability to adapt efficiently to the changing needs of business. Continuous feedback from the business community, as well as from students, faculty and alumni provide new directions for operations management programs.

Driven by the integration of business principles in industry, Northern Illinois University has developed an integrated undergraduate business core curriculum (Bishop et al. 1998). Four three-hour core courses (finance, management, marketing, and operations management) were combined to form a twelve-hour block: nine hours of lecture and three hours of seminar, covering business principles taught by a cross-functional team of instructors. Following this major change in the business core, an ad hoc curriculum team was formed to re-evaluate the operations management degree program in light of an increasing number of students and decreasing level of program funding. The team was to assess the currency and relevancy of the operations management undergraduate curriculum, with the goal of continuous improvement in educational quality. The team conducted weekly lunch meetings with the entire operations management faculty throughout the semester.

The faculty agreed on some necessary changes to the operations management curriculum:

- 1) a need to identify a "new," more relevant core,
- 2) a need to sequence certain courses within the core
- 3) a need to provide a means of establishing a linkage between courses.

They indicated there was less agreement on other changes. Faculty debated the need for integration of specific computer-

based applications such as simulation software. There was further uncertainty about the value of the technical skills necessary to design and support information systems. They discussed the need to provide a more balanced coverage of manufacturing and service operations management. Finally, faculty debated the obligation to build better communication and team building skills into the curriculum. The following research questions are addressed in this paper, which are loosely based on the discussions and inquiries generated from the meetings:

### **Academia**

- What is the current employment outlook for operations management majors?
- What are the current trends in operations management instruction?
- What specific course topics are changing in demand (increasing/decreasing)?
- What software applications are viewed as useful to operations management majors?

### **Business Community**

- What skills would businesses target for improvement among prospective employees?
- Do employers place value on certain undergraduate specializations?
- What courses do employers consider important?
- What software application skills do employers consider important?

In order to have a leading-edge curriculum, universities must be aware of trends in companies that employ their majors. Moreover, business school curricula must be designed to prepare students to meet the challenges of today's technology-based, highly competitive global marketplace. The results of this study are generalizable to any operations management program in the U.S. that requires direction on how to reengineer their curriculum.

### **Methods**

#### **Academia Survey**

A survey instrument was developed to address our research questions for academia. A two-page questionnaire was then sent to the department chairs of business schools with undergraduate degree programs in operations management or the equivalent. Sixty schools were obtained from the *McGraw-Hill Directory of Management Faculty* (Hasselback 1996). A total of nineteen usable questionnaires were returned, yielding a response

rate of about 32 percent. All of the respondents were at AACSB accredited universities. Only three of the nineteen universities had limited admissions programs. The universities were located throughout the country with seven in the Southeast, six in the Northeast, five in the Midwest, and one in the Southwest region. No responding universities had less than 5000 students. About 60 percent of them had at least 15,000 students. Department enrollment ranged from less than 100 to over 400 students. About half (53%) of the departments responding had less than 200 operations management majors.

**Business Survey**

To address our research questions for the business community, two separate groups were surveyed—regional firms and national firms. We were interested in Chicago area firms because their responses would be directly applicable to our curriculum and our students. We were also interested in national trends and the implications for a broader curricula and student base.

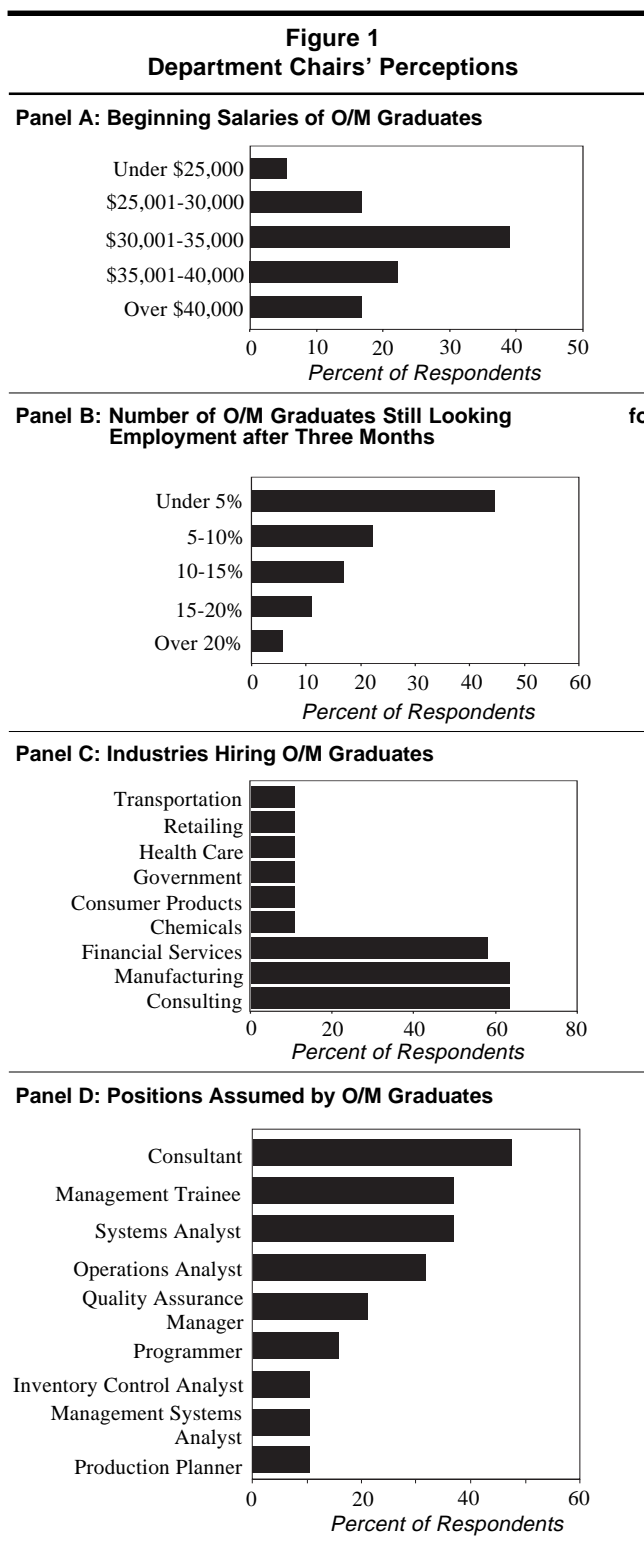
The regional group was comprised of 300 Chicago area companies that actively recruit and hire our operations management majors. They represent all the companies that were listed in our departments’ employer database. Surveys were addressed to specific contacts at each company. A total of fifteen surveys were returned as undeliverable. Out of the remaining 285 surveys, sixty-eight surveys were returned yielding a response rate of 24 percent. Firms ranged in size from under 1,000 employees (23%) to over 10,000 employees (43%). Major industries represented were manufacturing, consulting, and transportation.

The national group consisted of a random sample of 1000 businesses located throughout the U.S. Firms were obtained from the *Standard and Poor’s Directory of Corporations and Executives* (1996). These surveys were addressed to the “Director of Operations” at each of these businesses. A total of sixty-four surveys were returned as undeliverable. Out of the remaining 936 surveys, forty-five (4.8%) were returned completed. There was a broad distribution of industries represented in the survey of national businesses. Most common were manufacturing firms and financial service organizations. Thirteen of the businesses were located in the Midwest, two in the Southeast, eighteen in the Northeast, three in the Southwest, and six in the Western region (three firms did not include their geographic location).

**Results from Academia**

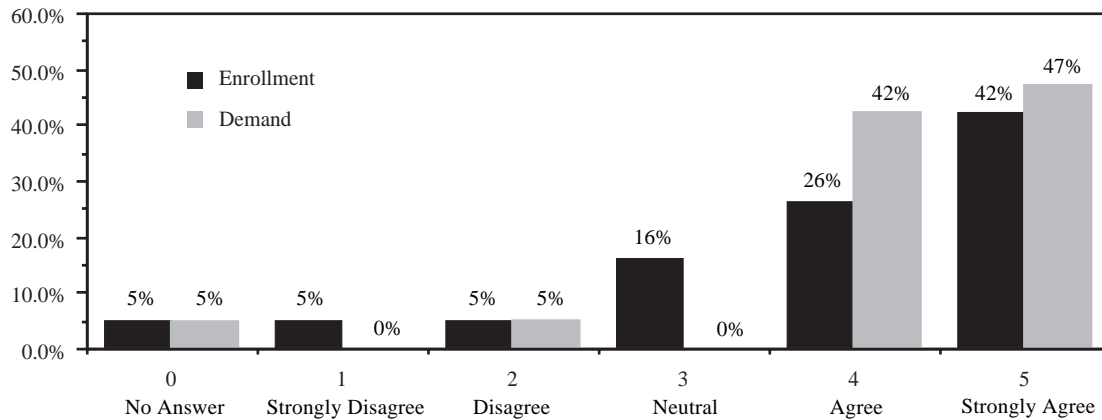
**Current outlook for operations management majors**

Our first research question for academia dealt with the current employment outlook for operations management majors. Our findings are highlighted in Figure 1. Most department chairs reported that their graduates earned at least \$30,000 upon graduation (Panel A). They also stated that most of their graduates had jobs within three months of



graduation (Panel B) and most were hired into consulting, manufacturing, or financial service industries (Panel C). Chairs indicated that the top positions assumed were consultant, management trainee, systems analyst, and operations analyst (Panel D).

**Figure 2**  
**Department Chairs' Perceptions on Growth in Operations Management**  
**Student Enrollment and Demand**



Department chairs were asked to react to the statements “enrollment in your department is growing,” and “demand for your students is growing,” using a five-point Likert scale, where 1 indicated strong disagreement and 5 indicated strong agreement. In most cases, operations management chairs felt that demand for operations management graduates and enrollments were growing. (Figure 2).

**Current trends in operations management instruction**

Our second research question to department chairs focused on current instructional trends in the operations management curriculum. Most respondents indicated that their department will emphasize internships more in the future (83% strongly agree or agree). Other instructional trends included greater emphasis on practical applications over theory (72% strongly agree or agree), and greater emphasis on MIS skills (71% strongly agree or agree). Schools also desire to integrate their

degree with MIS (67% strongly agree or agree). They reported greater use of real business projects (61% strongly agree or agree), student teams (56% strongly agree or agree), industry speakers (50% strongly agree or agree), and greater emphasis on communication skills in the future (50% strongly agree or agree) (Table 1).

Over 73 percent of the respondents agreed that their departments regularly consult with industry on curricular issues. Areas of specialization within the operations management degree offered by these schools include MIS (74%), logistics (58%), service operations management (58%), manufacturing (53%), and quality management (47%).

Departmental chairs perceived the skills in greatest demand by employers of operations management graduates to be communication skills (84%), MIS skills (68%) and team skills (63%). Soft skills (37%) and mathematical modeling skills (32%) were rated considerably less important by these chairs.

**Table 1**  
**Instructional Trends in Operations Management Perceived by Department Chairs**

	<i>Mean Score</i>	<i>Std. Dev.</i>	<i>Strongly agree/ agree (%)</i>	<i>Strongly disagree/ disagree (%)</i>	<i>Neutral (%)</i>
Increased emphasis on internships	4.056	.639	83%	0%	17%
Emphasis on practical application over theory	3.833	.618	72%	0%	28%
Desire to integrate degree with MIS	3.778	.943	67%	11%	22%
Increased emphasis on real business projects	3.722	.669	61%	0%	39%
Increased emphasis on MIS skills	3.706	.686	71%	6%	23%
Increased emphasis on student teams	3.667	.686	56%	0%	44%
Increased emphasis on communication skills	3.500	.514	50%	0%	50%
Increased use of industry speakers	3.444	.984	50%	11%	39%
Increased use of cases for instruction	3.389	.778	44%	12%	44%
Increased emphasis on “soft” skills	3.333	.686	44%	12%	44%
Increased emphasis on math modeling skills	2.722	.826	17%	39%	44%

**Table 2**  
**Courses Perceived by Department Chairs to Have Increasing/Decreasing Demand**

<i>Course Title</i>	<i>Respondents Indicating Increasing Demand (%)</i>	<i>Respondents Indicating Decreasing Demand (%)</i>
Service Operations Management	76.9	0.0
Decision Support Systems	72.7	0.0
Telecommunication	71.4	0.0
Database	57.1	0.0
Operations Strategy	46.2	7.7
Resource Planning and Control	45.5	9.1
Systems Analysis and Design	41.7	0.0
Quality Management	40.0	6.7
Manufacturing Systems	33.3	16.7
Advanced Hardware and Software	30.8	7.7
Computer Programming	28.6	14.3
Logistics Management	27.3	18.2
Purchasing	22.2	11.1
Business Communications	21.4	0.0
Computer Simulation	16.7	8.3
Statistical Analysis	14.3	0.0
Inventory Management	8.3	25.0
Management Science	6.3	25.0
Decision Theory	0.0	11.1
Non-linear Programming	0.0	37.5
Queuing Theory	0.0	40.0
Linear Programming	0.0	40.0

**Changing demand for operations management courses**

Our third research question dealt with changing demand for various courses. The greatest number of department chairs perceived service operations management, decision support systems and telecommunication to have increasing demand relative to other courses (Table 2). Of the top eight courses perceived as increasing in demand, four are courses typically taught in a MIS curriculum (decision support systems, telecommunications, database, and systems analysis and design). Courses in linear programming, queuing theory, non-linear programming, management science and inventory management appear to have decreasing demand.

**Software applications useful to operations management majors**

Our final research question to academia focused on useful software applications for operations management majors. Specifically, department chairs were asked about the importance of various software using a five-point Likert scale. For each package, respondents were asked whether they thought knowledge of the software was important to prospective operations management employers. A response of 1 indicated “not important” and a response of 5 indicated “highly important.” Of perceived importance were spreadsheets, (e.g. EXCEL), word processing, (e.g. MS Word), presentation packages, (e.g. Power Point), and database software, (e.g. MS Access). Statistical software, (e.g. SAS), decision application software, (e.g. STORM), and simulation software, (e.g. SLAM) were also valued by department chairs (Table 3).

**Results from the Business Community**

**Skills in which businesses would like to see improvement**

Our first research question posed to the business community dealt with skills that they would target for improvement among prospective employees. Businesses surveyed reported they would particularly like to see improvements in communication skills, MIS skills and team skills. Of lesser importance was the development of math modeling skills. Also mentioned was the need for improved organizational skills, time management techniques, and problem solving skills. The results for both Chicago area businesses and national companies are found in Table 4.

**Table 4**  
**Skills Employers Target for Improvement**

<i>Skills</i>	<i>Chicago Respondents (%)</i>	<i>National Respondents (%)</i>
Communication Skills	62%	82%
MIS Skills	49%	36%
Team Skills	40%	64%
“Soft” Skills	34%	31%
Math Modeling Skills	18%	13%

**Table 3**  
**Importance of Software Perceived by Department Chairs**

	<i>Mean Score</i>	<i>Std Dev.</i>	<i>Important (%)</i>	<i>Not Important (%)</i>	<i>Neutral (%)</i>
Spreadsheets	4.722	0.575	94%	0%	6%
Word Processing	4.500	0.857	89%	5%	6%
Presentation	4.444	0.705	89%	0%	11%
Database	4.389	0.778	94%	6%	0%
Statistics	3.889	0.758	67%	0%	33%
Decision Application Software	3.500	0.924	56%	17%	27%
Simulation	3.167	1.098	39%	27%	34%

**Table 5**  
**Value of Specialization within OM Degree**

<b>Specialization</b>	<b>Chicago Respondents (%)</b>	<b>National Respondents (%)</b>
MIS	92%	85%
Logistics	81%	40%
Manufacturing	63%	59%
Quality	61%	78%
Service Operations	52%	55%

**Table 6**  
**Courses Required or Helpful for Obtaining OM Positions**

<b>Course Title</b>	<b>Chicago Firms (%) Indicating Required or Helpful</b>	<b>National Firms (%) Indicating Required or Helpful</b>
Business Communication	92.6	99.3
Telecommunication	89.7	68.9
Database	88.2	64.4
Advanced Hardware and Software	88.2	73.3
Computer Programming	88.2	62.2
Logistics Management	82.4	46.7
Inventory Management	79.4	66.7
Quality Management	77.9	64.4
Management Science	76.5	66.7
Operations Strategy	75.0	62.2
Decision Support Systems	72.1	46.7
Statistical Analysis	72.1	57.8
Manufacturing Systems	72.1	55.6
Resource Planning and Control	70.6	55.6
Systems Analysis and Design	70.6	51.1
Linear Programming	66.2	46.7
Purchasing	66.2	62.2
Computer Simulation	66.2	46.7
Decision Theory	64.7	53.3
Non-linear Programming	61.8	37.8
Service Operations Management	58.8	55.6
Queuing Theory	55.9	44.4

shading indicates majority of respondents agreed

### ***Undergraduate specialization valued by employers***

The second research question to the business community dealt with their perceived value of certain undergraduate specializations. Approximately 92 percent of the executives surveyed in the Chicago area and 85 percent of those from the national survey stated they place value in a specialization in MIS within the operations management degree. About 81 percent of Chicago area respondents valued a specialization in logistics, versus about 40 percent of the national group. Over half of the respondents in both groups also valued a specialization in manufacturing and service operations management.

### ***Courses considered important by employers***

Our third research question to the business community focused on courses they perceived as important for obtaining an OM position within their firm. Specifically, employers were asked to indicate if certain courses were required or helpful for obtaining employment (Table 6). At the top of the list for both sets of employers was business communication. The majority of Chicago area respondents felt that all courses listed were required or helpful.

Table 7 highlights those courses for which a majority of respondents felt there was increasing demand. Courses include business communication, database, quality management, advanced hardware and software, logistics management, inventory management, telecommunications and operations strategy. About 19 percent of the national firms and 8 percent of the Chicago firms cited decreasing demand for courses in non-linear programming.

### ***Software application skills considered important by employers***

Our final research question asked employers how important it was for prospective employees to have knowledge of certain software applications. To address this question, we asked business executives their perception of the importance of specific software using a 5-point Likert scale. For each package, respondents were asked whether knowledge of the software was important for prospective operations management employees. A response of 1 indicated "not important" and a response of 5 indicated "highly important." Of importance to both local and national respondents were word processing and spreadsheets. Simulation packages, statistical software, and decision application software were viewed as less important by businesses surveyed (Table 8).

## ***Discussion***

The transformation of our economy into a knowledge- and information-based service economy has posed many challenges for operations management programs. In this paper, we look at recent trends in operations management. Our findings suggest that operations management

**Table 7**  
**Courses Perceived by Operations Management Employers to Have Increasing/Decreasing Demand**

<b>Course Title</b>	<b>Percent of Chicago Firms Indicating Increasing Demand</b>	<b>Percent of National Firms Indicating Increasing Demand</b>	<b>Percent of Chicago Firms Indicating Decreasing Demand</b>	<b>Percent of National Firms Indicating Decreasing Demand</b>
Business Communication	87.5	82.1	0.0	3.6
Database	72.3	54.2	0.0	0.0
Quality Management	67.7	73.7	6.5	5.3
Advanced Hardware and Software	63.6	60.0	4.5	0.0
Systems Analysis and Design	60.0	45.0	2.5	0.0
Computer Programming	59.2	34.6	2.0	15.4
Logistics Management	59.0	50.0	2.3	6.3
Inventory Management	52.2	75.0	2.2	5.0
Telecommunication	50.0	73.9	0.0	4.3
Operations Strategy	50.0	56.5	0.0	4.4
Decision Support Systems	48.7	13.0	0.0	8.7
Statistical Analysis	47.5	45.0	2.5	10.0
Resource Planning and Control	46.2	52.6	0.0	10.5
Manufacturing Systems	42.5	62.5	2.5	6.3
Computer Simulation	35.9	22.7	2.6	13.6
Management Science	31.7	19.1	2.4	4.8
Decision Theory	31.6	25.0	5.3	8.3
Purchasing	29.7	35.0	5.4	10.0
Service Operations Management	29.4	41.2	2.9	11.8
Queuing Theory	20.0	28.6	5.7	14.3
Linear Programming	12.8	22.2	7.7	11.1
Non-linear Programming	10.5	0.0	7.9	18.8

shading indicates majority of respondents agree

**Table 8**  
**Perceived Importance of Software to Businesses**

	<b>Mean Score</b>	<b>Std Dev.</b>	<b>Important (%)</b>	<b>Not Important (%)</b>	<b>Neutral (%)</b>
Word Processing					
<i>Chicago Respondents</i>	4.044	1.202	68%	15%	17%
<i>National Respondents</i>	3.394	1.433	45%	32%	23%
Spreadsheets					
<i>Chicago Respondents</i>	3.897	1.186	76%	12%	12%
<i>National Respondents</i>	3.636	1.207	55%	13%	32%
Presentation					
<i>Chicago Respondents</i>	3.657	1.274	46%	28%	26%
<i>National Respondents</i>	2.323	1.113	10%	58%	32%
Database					
<i>Chicago Respondents</i>	3.279	1.232	60%	19%	21%
<i>National Respondents</i>	2.781	1.040	19%	35%	46%
Simulation					
<i>Chicago Respondents</i>	2.682	1.217	11%	57%	32%
<i>National Respondents</i>	1.774	.939	05%	83%	12%
Statistics					
<i>Chicago Respondents</i>	2.531	1.154	28%	38%	34%
<i>National Respondents</i>	2.258	1.087	10%	57%	33%
Decision Application Software					
<i>Chicago Respondents</i>	2.190	1.090	19%	46%	35%
<i>National Respondents</i>	1.774	.989	07%	83%	10%

programs are attempting to respond to changes in the field. Industry trends towards quality, strategy, and service are being met by increased emphasis on courses related to these topics. Moreover, schools and industry respondents agree on the decreasing importance of courses in linear programming, non-linear programming, queuing theory, and in math modeling skills.

Operations management programs integrate technology into their curriculum in a variety of ways. By including MIS topics and courses in their curriculum, operations management programs are promoting the skills necessary to design and support information systems. Industry respondents place value on an MIS specialization within the operations management degree, and four of the eight courses deemed to have increasing significance to operations management employers are MIS oriented: telecommunications, advanced hardware and software, database, and systems analysis and design.

Operations management programs also see the importance of integrating specific computer-based applications such as spreadsheets, word processing, presentation packages, and database software into their curriculum. Survey respondents from both academia and industry rank the importance of software applications similarly. However, companies in the national survey ranked the software lower in importance than did both the Chicago area businesses and the academicians.

Our findings may be demonstrating recent trends as they counter earlier studies. The assertion that business schools place little emphasis on using computer-based software to solve business problems (Bandyopadhyay 1994; Clinebell and Clinebell 1995; Hammond et al. 1996) is not supported by this research.

Findings from our surveys suggest that business schools are attempting to organize curricula to meet the needs of the business community. The majority indicated that their operations management department regularly consults industry on curricular issues. OM departments also appear to be shifting away from a theoretical approach to a more applications-oriented perspective. They expose students to real-world experiences through an increased emphasis on real business projects and a growing use of industry speakers in the classroom. There is also greater emphasis being placed on internship programs. Corporations report greatest demand for prospective operations management employees who possess communication, MIS, and team-building skills. In turn, the majority of department chairs surveyed state that their faculty will emphasize communication skills, MIS skills, and team projects more in the future.

Some differences between department chairs and employers were noted. Industry managers suggested growing demand for courses in business communication, advanced hardware and software, computer programming, logistics, and inventory management, while educators did not indicate this demand. Educators, however, noted growing demand for courses in service operations management and decision support systems, which was not reflected to the same degree by our industrial

respondents. Employers perceived the importance of standard software applications to be less than their academic counterparts, with only spreadsheets and word processing perceived as important by the national respondents, with a mean score greater than 3 on a 5 point scale. The Chicago respondents also perceived presentation packages to be important. Educators ranked spreadsheets, word processing, presentation, database, statistics, decision application packages and simulation software as important.

### ***Practical Applications for Educators***

The intent of our study was to survey programs and industries throughout the United States to understand and identify current trends in operations management, and to augment the current literature base. It is possible, as with any survey study, that our samples may not represent the views of all operations management employers, or of all operations management programs. Also, our response rate from national companies was disappointing. Due to the glut of surveys, it has become increasingly difficult to obtain responses from industry. Nonetheless, our findings provide valuable insight into current trends that should be considered by all professionals engaged in operation management program development and review. The most obvious of these trends are summarized as follows:

- Building strong MIS skills into the OM curriculum.
- Increased integration of MIS topics in the operations management core, including telecommunication, decision support systems, database, systems analysis and design and advanced hardware and software.
- Increased use of computer-based tools in the operations management curriculum, particularly spreadsheets, word processing packages, and presentation packages.
- Increased focus on communication and team-building skills.
- Increased course offering in the areas of operations strategy, quality and service operations management.
- Greater emphasis on internship programs, and the use of practical applications over theory.
- Expanded role of the business community in the classroom through the use of real business projects, and industry speakers.

The ultimate goal of curriculum assessment in the field of operations management is to continually improve course content and better prepare students for operations management careers. Through on-going research, as well

as the development of relationships with industry, operations management departments can become more responsive to business needs and industry trends. ■

## References

- Bandyopadhyay, J. 1994. Redesigning the POM major to prepare manufacturing managers of the 1990's. *Production and Inventory Management* 35(1): 26-30.
- Bishop, T.R., T.S. Vaughan, F.R. Jensen, N. Hanna and D. Graf. 1998. A cross-functionally integrated undergraduate business core curriculum. *Mid-American Journal of Business* 13(1): 65-71.
- Bregman, R. L. and B.E. Flores. 1991. OM curriculum: Challenges for the 1990's, and beyond. *Operations Management Review* 8(2): 47-50.
- Clinebell, S. and J. Clinebell. 1995. Computer use in the management curriculum. *Journal of Education for Business* 71(1): 30-37.
- Coleman B. J. and S.J. Smith. 1994. A proposed typology for the production and operations management core course. *Journal of Management Education* 18(3): 332-341.
- Dellana, S.A., K.E. Bass and F.J. Hebert. 1998. Managers' reactions to total quality management in U.S. business schools. *Mid-American Journal of Business* 13(1): 73-82.
- Hammond, D. H., S.J. Hartman and R.A. Brown. 1996. The match between undergraduate academic instruction and actual field practices in production/ operations management. *Journal of Education for Business* 71(5): 263-266.
- Hasselback, J. 1996. *McGraw Hill directory of management faculty, 1995-1996*, New York: McGraw Hill, Inc.
- Raiszadeh, F. and L. Ettkin. 1989. POM in academia: Some causes for concern. *Production and Inventory Management* 30(2): 37-40.
- Sandman, T. 1993-1994. A framework for adapting a MS/MIS curriculum to a changing environment. *Journal of Computer Information System* 34(2): 69-73.
- Standard & Poor's Corporations. 1996. *Standard & Poor's register of corporations, directors and executives*. New York: Standard & Poor's Corporation.
- Weinstein, L. and N. Sanders. 1997. What should colleges of business be teaching about operations management: Are we teaching what industry wants? *1997 Proceedings of the Decision Sciences Institute*, San Diego, CA, 1:3.
- Willis, T.H. and K. Bass. 1991. A profile of academic offerings in production/operations management. *Operations Management Review*. 8(2): 36-42.
- Wilson, J. 1995. A historical perspective on operations management. *Production and Inventory Management* 36(3): 61-66.

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## ***Faculty Internships in Family Business***

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### ***Abstract***

Faculty internships in family business offer potential benefits to faculty, students, and the community by blending academics with real world business. The purpose of the paper is to report how faculty internship experiences in family businesses enhance the goals of continuous improvement of curriculum and research output in a business school. The University of Toledo Center for Family Business embarked on a pilot faculty internship program during the summer of 1998. We detail the background for the Stranahan Faculty Program at the University of Toledo, discuss the program implementation, and report the final organizational level assessment.

### ***Introduction***

The University of Toledo Center for Family Business embarked on a pilot faculty internship program during the summer of 1998. For a program such as this to become successful, it is important that benefits accrue to both the participating faculty and family businesses and, ultimately, to our students. The purpose of this paper is to report how the inputs of the program (faculty, college, and organization), the internships themselves, and the outputs of the program enhance the goals of continuous improvement of curriculum and research output in a business school. The following sections in the paper include a general discussion on faculty internships, an outline of the Stranahan Faculty Program at the university, and an explanation of the program's implementation. The report concludes with an assessment of the program and a discussion of the future of the Stranahan Faculty Program.

### ***Literature Review***

Collaboration between faculty members and business leaders continues to grow in a number of disciplines. Such cooperation helps focus relevant topics as faculty members plan curriculum that will benefit the future employees of businesses. In order to achieve this goal, faculty need to be aware of training necessary for postgraduate employment success, and also need to have

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the practical knowledge necessary to convey this information to students. Faculty internships are common ways of enhancing this relationship. Levy (1988) argues that, although time and experience tend to enhance teaching performance, being removed from practitioner experiences can diminish the quality of classroom material taught. Faculty internships give educators an opportunity to sharpen their knowledge base of practical applications to better illustrate conceptual topics. Participating firms also gain by helping faculty to produce graduates that have improved training for entering postgraduate employment, and by having direct exposure to the university environment, they are more aware of the services provided by business faculty.

Accounting is one discipline where faculty internships have been among the most prevalent. Herring and Dykes (1987) argue that more accounting faculty members are interested in pursuing faculty internships due to academia's need for more practical classroom applications and the American Assembly of Collegiate Schools of Business (AACSB) move toward requiring accounting faculty to have experience in public accounting firms. Accounting faculty contribute technical expertise, additional manpower during busier time periods, training assistance, and informal reviews. In addition, public relations, recruiting, and marketing efforts may be enhanced for participating firms.

Moreover, Friedlob and Trapnell (1988) point out that faculty internships bring real-life experiences to faculty members in internal auditing programs. They suggest that micro-internships, defined as a few days to a week, provide an alternative to longer programs in an attempt to reduce costs to faculty and companies, to increase exposure to more areas within the sample time period, and to broaden the number of faculty that may be able to participate.

A variety of articles have been specifically published concerning the outcomes of faculty internships in other programs. Table 1 summarizes their objectives and findings.

Designing appropriate guidelines for the successful partnership between business and faculty is vital to the success of a faculty internship program. Kulesza (1994) highlights important steps used by ITT Automotive in initiating their pilot faculty internship program. These steps include the establishment of clear expectations for faculty, the time commitment required, the necessary framework in order for faculty to complete their project, and the procedure for reviewing the outcome of the internship. Lee (1988) further argues for the need to designate a primary contact person within the sponsoring company and to determine the extent of client confidentiality as vital to the success of a faculty internship program.

Realizing that family businesses make up nearly 90 percent of all businesses in this country, faculty internships in family

business have the opportunity to integrate important training needs unique to family businesses into existing university curriculum. With the explosion of centers for family business throughout this country and implementation of curriculum directly related to working in a family businesses, the timing seems appropriate for universities to consider the partnership between family businesses and faculty in this growing discipline. Because of educational training and tradition, most business school curricula are built around a corporate, large firm framework.

Internships also allow business faculty to educate themselves firsthand on differences existing between family business and other businesses. Some of the areas where family businesses differ include management dynamics, human resources issues (how to handle employment of family versus nonfamily members), evaluation techniques, compensation and benefits issues, ownership, and career paths. Since a majority of business school graduates will be working for small and family

**Table 1**  
**Literature Review of Faculty Internship Programs**

<b>Study</b>	<b>Parties Involved</b>	<b>Objective of Program</b>	<b>Findings</b>
Levy (1988)	Boston office of Coopers & Lybrand and Bentley College's Department of Accountancy	To enhance teaching effectiveness, to update and refamiliarize participant with auditing practice, to learn about the future of public accounting, to bring an objective and critical academic perspective to the practitioner, and to promote goodwill between academe and the profession	Participants shared a renewed appreciation for the accounting profession; are more secure with their instincts; can respond to questions from students based on current, reliable experiences; enhanced credibility with colleagues and students, new ideas to share, and new "war stories" to tell; better empathy toward issues of overtime, family/career conflict, deadlines, and client pressure.
Balakrishnan, Brown, Dunlap, and Pahl (1995)	Two year relationship between Alcoa and MIT faculty	To examine and improve medium-term process planning decisions at the Alcoa based plant (Lafayette) while giving faculty a chance to benefit from relevant research	Resulted in improvement in the operations area at Alcoa. As a result of the partnership, the plant was able to reduce tube drawing efforts by 20 percent and led to future academic experiences in terms of student thesis research and of faculty classroom use of "war stories" gained in the process.
Friedlob and Trapnell (1988)	Blue Cross and Blue Shield of South Carolina and Clemson University	Micro-internship (one week program) designed to acquaint faculty member with the audit functional areas and to allow faculty member to participate as fully as possible in an ongoing audit	Micro-internship provided hands-on experience at a low cost to company while allowing faculty member to sharpen his skills to bring back to the classroom.
Black (1993)	The University of Wisconsin-Stout and Textile/ Clothing Technology Corporation	Insuring "that apparel manufacturing skills taught in the classroom are applicable to the real world," promoting "the apparel industry and the students who are preparing for it in a positive light," and focusing on the "impact of changing needs of the apparel industry on education today and in the future [being] prepared to act on change" (Black, 1993, p. 35)	Based on faculty experiences, the university's curriculum now includes an international specialization, two new courses have been developed, and computers have been more relevantly included in the classroom.
Ettlie (1995)	The Michigan Joint Manufacturing Initiative (MJMI) and faculty at the University of Michigan	The three-way partnership is designed to solve real problems in manufacturing, bridging the gulf between engineering and business	Faculty benefit from exposure to a manufacturing facility and the opportunity to sharpen and update their skills which are then transferrable to the classroom.

businesses, faculty internships in family business provide a valuable link in properly preparing students for employment in such organizations.

### **Background for Stranahan Faculty Program**

The idea for the Stranahan Faculty Program was initiated by members of the University of Toledo Center for Family Business (CFB) Curriculum/Research (C/R) Committee. The mission of the committee, which consists of faculty and center members, is to incorporate family business issues into the curriculum and research of the College of Business Administration. Family business members and faculty identified a need to foster real world experience in the classroom and concluded that a faculty internship would be effective. The committee was responsible for initiating the new Entrepreneurship, Family and Small Business Major, including a new “Dynamics of Family Business” course. There existed a desire to enhance faculty development for these initiatives.

The Stranahan Faculty Program was developed to blend the business and academic worlds with benefits to each, and most importantly, to the student. Faculty desired to further their professional education, research opportunities, and business experience. Family businesses saw the opportunity to show faculty their business and improve their operations through faculty expertise.

The CFB and C/R Committee wanted to impact teaching, curriculum, and research, resulting in an ultimate goal of better preparing students to establish careers in family businesses as family members or nonfamily members.

### **Pilot Program Description**

The Stranahan Foundation had previously endowed the CFB with a three-year matching challenge grant of \$250,000 annually. The CFB successfully met the challenge, establishing more than \$1,000,000 in endowed funds in 1995. After the decision was made to pursue the pilot faculty internship program, the Stranahan Foundation was approached again for their support. Specific faculty were initially interviewed by the associate director and director of the CFB to ascertain interest. A draft proposal was written by the director and the CBA director for External Grants and Promotions. The following purpose was included:

*In keeping with the mission of the University of Toledo Center for Family Business, the Stranahan Faculty Program enhances opportunities for continuing professional education and research as it provides service to its membership. Faculty members bring with them the global perspective of academics; host firms contribute the social and economic realities of family business. As a result of this exchange of expertise and skills, faculty will integrate the unique culture of family enterprise directly into the classroom, their research and service in the community.*

*Graduates of the College benefit from this ongoing interaction and will enter the community and workforce as professionals skilled in the dynamics of family business.*

Kulesza (1994) discusses the importance of setting clear expectations and time commitments for the faculty and the framework from which the internship will operate. Based on this mission, and consistent with Kulesza (1994), the program was designed with the responsibilities for each constituent as appears in Table 2.

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**Table 2**  
**University of Toledo Stranahan Faculty Program**  
**Responsibilities for Participants**

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### **Faculty Participation**

- Identify specific expectations for success, including implementation of those goals throughout the program and long-term within their academic career.
- Meet with matched family businesses to coordinate objectives and develop a common measurable set of goals.
- Commit a minimum of 160 on-site hours immersed in each aspect of the business's daily operations to understand the culture and environment.
- Participate in assessment on an ongoing basis with the company and the C/R Committee, concluding with a paper proposing specific recommendations. Prepare a written comparison of original expectations with the reality of their experience and its impact in their classrooms and research.

### **Organizational Participation**

- Identify specific expectations for faculty to be integrated into the business and a project for faculty to complete and provide recommendations to the company.
- Communicate and organize their company so that everyone is aware of the program and its projected outcomes.
- Provide appropriate environment through commitment of time, resources, personnel, and facilities as a contribution to the faculty learning experience.
- Participate in ongoing assessment process and compensate faculty for recommendations at agreed upon amount.

### **College (Center C/R Committee) Participation**

- Solicit funding from an external source, the College, and the family business for two internships as a pilot for 1998 with more permanent funding as a long-term goal.
  - Create a budget to include external faculty funding for: program participation and for approval of comparison paper of expectations and realities; family business payment to faculty for useful recommendations; and College contribution to faculty for program. Oversee budget and compensation.
  - Select family businesses and faculty applicants and facilitate their coordination of expectations and projects.
  - Lead the continual monitoring and assessment of the program so that the program's purpose is being met and constructive revisions are incorporated.
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### Internship Framework

Securing funding serves as a primary basis for the establishment of the program. The proposal for the internship program was submitted to the Stranahan Foundation in December 1997 and approval was granted for two internships with an award of \$20,000. Faculty members would receive \$8,000 each with the opportunity to receive an additional \$2,000 for writing a paper detailing how their experiences in a family business will enhance their classroom. Additional compensation was secured through the College of Business Administration (\$4,000). Volunteer family businesses, one whose CEO is a member of the C/R committee and another whose founder was Chair of the Advisory Board of the CFB were paired with two faculty members; one, the associate director of the CFB and another, a management professor. Goals and objectives were obtained from each business and intern after initial meetings were held to discuss the program and projects for the faculty. This planning occurred from February until June 1998 when the program began. Each company agreed to award up to an additional \$3,000 in merit

compensation for each faculty intern upon completion of the summer internship. The merit compensation would be contingent on faculty making useful recommendations to the family business based on the project assigned in each case. Maximum compensation per faculty member meeting all expectations was \$15,000.

The Stranahan Foundation Faculty Internship program is analyzed in terms of the inputs, the implementation process, and the outcomes (see Table 3).

### Inputs

*Faculty.* In order to have a successful program, successful coordination must take place on the faculty, organizational, and college level. Recruiting of individual faculty members and host companies is essential. The Center for Family Business Director and Associate Director began recruiting efforts for the internship program early in the fall semester of 1997. Interest was solicited through memorandums to the entire faculty discussing the program, college-wide faculty meetings,

**Table 3**  
**Model of Relationships Between Inputs, Implementation, and Outcomes of Family Business Internships**

	Inputs to Model	Implementation	Outcomes of Interest
Faculty	Need for upgrading of professional skills and knowledge	Learning new skills and applications within a family business context	Improved teaching, with more focus on current topics and problems
	More research needed for family business problems and concerns	Study of the business problem with a specific theory grounding aids understanding	More focused and current research projects that address the unique needs of family businesses
Organization	Need for different perspectives	Presentation of problem or situation	Receive independent and academic perspective
	Skill/training needs of employees	Faculty engages in jobs that use skills	Better understanding and use of skill competencies required of family business employees
	Desire to participate in education process	Mentor/engage faculty in family business	Community and educational initiatives and relationships
College	Need for mentoring and faculty training in family business issues	Faculty participation in specific areas of interest for improvement	Better understanding of how family businesses operate and involve nonfamily employees
	Curriculum improvement needs	Faculty look at a broad range of issues that are typically missed in more traditional curricular revisions	Improved, more "real world" curricula across a broad spectrum of subjects
	Need for improved relationships with businesses, alumni, etc.	Engagement on a more personal level with family business people	Improved understanding of each party's perspectives and needs, as well as increased potential for donations and student placements

and one-on-one contact with faculty members considered most likely to be interested in such a program.

Next, host companies were recruited through a memorandum circulated to the entire Center of Family Business membership, as well as individual recruitment through members of the Curriculum and Research committee and the Center Advisory Board. The goal was to invite two host companies to the pilot summer program.

The Curriculum/Research committee considered interested faculty members and host companies and agreed upon two matches in early December.

### **Implementation**

*Internship Experience 1.* One faculty internship took place at a manufacturing firm with plants located throughout the region. The firm has grown dramatically since its founding in the 1970s, but recently has experienced reduced sales growth. For the first time in their history, the work force was reduced about a year ago.

The internship consisted of conducting a needs assessment related to training. The faculty member chosen did not have academic training in human resources. Meetings were held in December and March to formalize the arrangement and to review the process. The faculty member initiated an aggressive reading agenda in order to familiarize himself with issues related to a needs assessment. The 160 contact hours began during the first week of June. The Vice President responsible for human resource issues met with the faculty member outlining the project. Because of the faculty member's lack of academic training in human resources, the Vice President prepared the survey questions used during the needs assessment. In addition, she circulated a memorandum to all employees notifying them of the project.

The first step in the process for the faculty intern involved making contact with each member of the organization's executive team to have them review their respective areas. By doing so, the faculty member became aware of issues specifically related to a particular area. This also allowed the faculty intern to familiarize himself with overall directions and goals of the company. As a result of the interview process with the executive team, six organizational questions were developed by the faculty intern that were added to the needs assessment developed by the Vice President.

Following the meetings with the executive team members, the faculty intern had complete autonomy to decide when and in what order to interview employees. Employees at the corporate headquarters and a local plant were interviewed first. Where possible, face-to-face interviews took place. Phone interviews were used only when employees were at distant locations or were locally inaccessible due to their position (sales). Interviews ranged from fifteen to forty-five minutes. The faculty intern took specific notes on questions related to

the needs assessment. Employees were also asked six questions developed as a part of discussions with the executive team. Due to the more personal nature of these questions, employees were told that responses to these six questions were completely confidential. Prior to interviewing employees at the local plant, the Vice President made a follow-up phone call to set the ground work for the needs assessment to take place in that environment. In order to maximize efficiency, the faculty intern called ahead and arranged to interview each of the local plants' employees. Because the other plant locations were several hours away, the CEO arranged for the faculty intern to accompany him on scheduled company chartered flights to those locations. The faculty intern set up interviews for these employees on-site during his time at each place.

Following the completion of the interview process, the faculty intern met with the Vice President and discussed how the final report should be presented and to be debriefed. The faculty intern prepared a 65-page report complete with observations and recommendations based on the needs assessment and six additional organizational questions. The faculty intern also presented a two-hour final presentation for the executive team concerning the findings.

*Internship Experience 2.* The second internship took place at a small organization that has approximately 150 employees. Its primary products are private-label janitorial and sanitary supplies that are sold to wholesale distributors across the United States. The organization only recently established a presence in international markets, and about 5 percent of their annual sales come from overseas distributors.

The structure of the company is team-based, with seven teams (and their associated team leaders/coaches) forming the plant and back office. During the past year the organization has been pursuing the goal of ISO-9002 certification. To that end, the Quality Assurance Manager has been working with each of the teams to write their work procedures and work instructions. After meeting with the President and Vice President of Operations, it was decided that this internship would focus both on the faculty member learning an ISO-9002 implementation and in identifying human resource issues that may affect and influence the success of process and product quality in the organization.

During the actual 160 contact hours spent with the company, the faculty member worked in seven different departments and on two shifts. The jobs ranged from palletizing products to be shipped, running some of the machinery, pulling product from inventory, and packing boxes of product for shipping. Working closely with the Quality Assurance Manager to develop ISO-9002 audits in preparation for their impending certification audit in 1999 was also a main feature of the internship. In addition, time was spent in the front office learning about screening art work, order entry, customer service, human resources, marketing/sales, and purchasing.

Of all jobs performed, however, a primary one was participant observer, listening to shop floor employees, supervisors, office personnel, and top management speak of their observations and concerns about ISO-9002 certification and other day-to-day human resource issues. As part of the outcome for the top management of this family business, the faculty member wrote a detailed report that raised red flags, offered suggestions, and facilitated further discussions about the efficacy of the ISO-9000 process. Ultimately, the organization decided not to pursue actual certification but rather to address many of its human resource needs by hiring a human resource generalist.

### **Outcomes**

Kulesza (1994) points out the importance of evaluating the outcomes of a pilot internship program. The outcomes of the Stranahan Faculty Internship Program were evaluated on a faculty, organizational, and college level.

*Faculty Level.* On the individual level, the faculty internship program was beneficial to participating faculty members in the areas of professional development, research, and course development. The first faculty member who participated in the internship program taught the initial "Dynamics of Family Business" course during the Fall semester of 1998. The faculty member indicated that his experiences and observations assisted him in many facets of teaching the course, including firsthand experience in the training needs necessary for success in a family business. He was able to bring "war stories" back to the classroom on many of the topics covered in the course. In addition, his association with the Curriculum/Research Committee gave him a wealth of guest speakers on the various topics covered in the course. The course evaluations indicated that the most positive aspects of the course included the use of guest speakers from the participating family businesses (cited by 91% of the students responding to essay questions), the knowledge and enthusiasm of the faculty member (cited by 73% of the students), and effective use of group projects involving a series of interviews with family businesses on course topics (cited by 55% of the students). All three of these aspects of the course were directly enhanced by the faculty internship. The second faculty member who participated in the internship program believes that, as a direct outcome of the internship, the knowledge gained concerning ISO certification will be able to be directly applied to an Executive MBA course that deals with quality metastandards and management issues surrounding quality programs. This course will be taught in an upcoming semester.

*Organizational Level.* On the organizational level, faculty members offer family businesses outsider objectivity, analysis of proposed changes, enhanced communication with the business college, and needed project information. The family business who sponsored the first faculty internship reported

that the contributions of the faculty member served as a basis for launching a full scale training program in the months that followed. The family business who sponsored the second faculty internship reported that as a direct result of the internship, the organization was able to gain perspective about some of its processes through a different set of eyes than its normal participants. That, in turn, gave it a unique vantage point for seeing how changes may affect employees, systems, and processes in its plant and office operations.

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*College Level.* On the college level, the faculty internships will have positive effects in the areas of student involvement, student career placements in family businesses, student organizations, and academic majors. Faculty members who participate in the Stranahan Faculty Internship Program will become mentors for future student interns placed with family businesses. In 1997, the University of Toledo received a grant to form a student-run family business internship program. The program is directed by a student oversight committee and the Office of Professional Education Programs (OPEP). As part of their internship requirements through this program, students will be matched with faculty members who themselves have participated in a family business internship.

A second benefit of the faculty internship on the college level will be in the area of student career placements in family businesses. As more faculty members participate in the internship program, a wider network will emerge where faculty members can facilitate the interview process between family businesses and graduating students through the Placement Office on campus. Family businesses traditionally have not registered with the placement office because of their erratic hiring needs, their somewhat common lack of depth in their human resources area (that would not permit intensive campus recruiting), and lack of knowledge about placement office activities. With the faculty link in place, a stronger working relationship can be developed between the participating family businesses and graduating students.

Other beneficiaries of the faculty internships on the college level are the Family Business Student Association and related student organizations. The Family Business Student Association was recently recognized in *Nation's Business* (March 1998) as a model student organization in

this area. The organization is geared toward students who come from or have an interest in starting or working for a family business. Through participation in the faculty internship program, faculty are more likely to serve as a resource to the student organization in terms of guest speakers and advising; and, in turn, faculty will more likely to recommend involvement in the organization.

Another college-wide area that benefits from the internship program is the Entrepreneurship, Family, and Small Business (EFS) major. The major was launched in December, 1997, and has been well received by the students. All of the courses except one in the six-course major were constructed from existing courses crossing three academic departments. The internships will enhance the major in two ways. First, professors teaching courses within the major, who also participate in the internship programs, will bring their family business experiences into the courses, thus making them more applicable to students who pursue careers in this area. Second, the one new course ("Dynamics of Family Business") will see a pool of potential instructors who otherwise would have been uncomfortable teaching in a relatively new discipline.

The internships should also promote faculty involvement in the research area in terms of grants and research collaboration. The Center for Family Business sponsors a faculty research grant program annually awarded up to two research grants for faculty submitting proposals for research in areas of interest to family businesses. Again, because of the newness of the family business area, many interested faculty members may not be comfortable with submitting a proposal. Exposure to family businesses through the internship program should enhance submissions as faculty members see relevant research ideas from their experiences. Also, participating faculty members should see opportunities for research collaborations, in general, as they are exposed to a greater set of family business contacts through the program.

### ***Final Organizational Level Assessment***

An evaluation took place in August 1998 including representatives from each family business, each faculty member, members of the C/R committee, the dean of the College, a trustee from the Stranahan Foundation, and the director of the CFB. It was a productive session with positive suggestions for a new proposal for 1999.

The reports written by the faculty were submitted to the Stranahan Foundation and approved so that, by the end of August, all payments were made to the faculty from the Stranahan Foundation, the host family businesses, and the College. Each company paid the maximum in merit compensation for recommendations from the faculty. These internship experiences were extremely valuable for reinforcing and enhancing what is taught about organizations. Several

outcomes were achieved through these experiences. First, the connections made between the organizations and the college and faculty members helped each to better understand the respective roles they play in a learning community. The participating organization serves as a valuable "classroom," particularly for learning more about and applying the knowledge, skills, and abilities taught in the college classroom. Likewise, the faculty serves as a valuable resource for organizations that may have fallen into routine, "business as usual" practices that no longer are efficacious. Because the faculty are able to "see" through different lenses than insiders, they can offer the participating organization current thoughts on applying alternative ways of doing things.

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***...the connections made between the organizations and the college and faculty members helped each to better understand the respective roles they play in a learning community.***

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Another outcome of the pilot project was the realization that the projects chosen should, in and of themselves, be a teaching tool. As a result, faculty members should be "learning through doing." Faculty will be able to take the experience gained from the projects and incorporate them into classroom instruction. The scope of the project should be broad enough to allow autonomy for accomplishing it, but not so broad as to be incapable of finishing in the time allotted. Thus, the project goals need to be carefully thought out, communicated to all parties involved (and this includes on-site employees who would be working with a faculty member), and evaluated throughout the project's duration by the faculty member and the organization. In this way, clear outcomes and learning objectives can be achieved for both participants.

Because the faculty members chosen for these internships had a great deal of business experience, though not necessarily in the areas in which they worked, expectations about what they would find were very similar to the realities experienced. One benefit for the classroom is to have professors who are able to explain both the "theory" and the "practice." One complaint about some faculty is that they often do not understand the practice part of the equation. Therefore, in future internship "matches" between companies and faculty, we believe a benefit for the classroom would be to encourage those faculty without a great deal of recent business experience to participate in order to gain "real world" knowledge about their areas.

A follow up telephone survey of participating family businesses took place six months after the completion of the internship to assess faculty internship program.

Organizational contacts indicated that the three greatest benefits of the program from their perspective included receiving an independent and academic perspective in an aspect of their business, participating in the educational process of students by assisting in faculty development, and developing a greater overall connection with the university and its program. They also indicated that curriculum in the College could be improved with greater use of guest speakers from family businesses, greater participation of faculty in Center forums, and continued participation of faculty in the Stranahan Faculty Internship Program. They believed that the internship program would assist faculty in improving curriculum in all three areas. Finally, they indicated that career preparation for students would be enhanced as more faculty members participated in the internship program. They believe that faculty members will better be able to advise students on the value of family businesses as a career option as a direct result of their own experiences in the internship program. Their main concern was

the need for frequent communication between the contact at the family business and the curriculum/research committee. Since neither of these businesses had had a faculty intern working with them, additional guidance was suggested in creating better accountability between the intern, the business, and the Curriculum/Research Committee in accomplishing the specific mission of the internship. Table 4 provides suggestions for enhancement of the guidelines specified in the original proposal.

### **Conclusions**

Faculty internships in family business offer tremendous opportunities for not only the faculty, but also the students, the university, the community, and the family businesses themselves. These experiences combine academic knowledge and real world experience in achieving improvement in a business school's curriculum

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**Table 4**  
**Guidelines for Enhancement of the Stranahan Faculty Program**

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#### **Recruitment:**

- Identification and selection of participants with optimal compatibility and enthusiasm is crucial to the success of the residency.
- Opportunity for participation will be extended to all Center family businesses.
- Identification of prospective family business participants will begin in the Fall to assure an adequate pool of hosts and sufficient time for the development of potential projects.
- Consideration will be given to all full-time, tenured or tenure-track faculty members regardless of their academic discipline and external experience with business.
- To maintain the administrative, intellectual, and experiential integrity of the program, residencies will continue to be offered to just two faculty and two host companies.
- Participants in the 1998 program will help to explain the program to potential participants.

#### **Selection:**

- The Center's Curriculum/Research Committee will develop specific guidelines to assist faculty and businesses articulate their goals and objectives within the context of the program's overall purpose and benefits.
- C/R Committee will facilitate one-on-one meetings between potential faculty and companies in order to clarify and match their respective goals and objectives.
- Faculty will be considered for participation only upon assurance that they will return to their teaching position in the College of Business Administration for the following academic year. This stipulation assures immediate integration of their experience into the classroom.
- Host businesses will identify the individual with whom the faculty member will be working directly. This will facilitate communication within the business itself, between the participants, and with the Center.

#### **Residency Implementation:**

- Based on their matched goals and objectives, faculty and host family businesses will define and execute a specific project.
- Upon completion of the residency, faculty members will provide recommendations to the business specific to that project. The manner in which these recommendations are presented will be determined by the nature of the project, the company's needs, and the faculty's expertise.

#### **Evaluation:**

- The C/R Committee will help to design assessment procedures that will assure the Center's ongoing involvement in monitoring and tracking the residency. These assessment procedures will assure continuity and flexibility in implementation. As well, they will foster accountability to the College and the Stranahan Foundation and provide a stronger foundation for the program's annual final assessment.

#### **Distribution of Results:**

- A paper describing their experiences with the Stranahan Faculty Program has been written for publication and presentation at a professional conference. The primary purpose of this paper is to educate others about the experiences of the faculty internship program. In addition, it establishes the program as a model for other faculty residency programs and brings recognition to the University, the College, and the Center for innovative programming in the areas of family business and faculty development.
  - A 1999 Center Forum will focus on the Stranahan Faculty Program, with presentations to include the perspectives of faculty, business, and the Center administration.
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and fostering increased research output. In this paper, we detail the experiences of our Stranahan Faculty Program at the University of Toledo. The future is positive for the Stranahan Faculty Program. The College and Center have developed a good partnership with the Stranahan Foundation, including an appreciation of their missions. Faculty are enthusiastic and several family businesses and faculty have already shown interest in participating in 1999. The blending of academics with real world business is beneficial to each, as well as to the students and the community. Innovative curriculum, teaching methods, and classroom projects are being developed. The program serves to encourage economic development projects between the University and family businesses. The Center looks forward to continually improving an effective program for many years. ■

## References

- Balakrishnan, A., S. Brown, D. Dunlap, and R. Pahl. 1995. Interdisciplinary industry-university collaboration: Lessons from an operations improvement project. *Interfaces* 25(5):12-41.
- Black, S. 1993. Champions of doers. *Bobbin* 35(4):4-36.
- Ettlie, J. 1995. How you can help shape manufacturing and education. *Production* 107(4):8-19.
- Friedlob, G. and J. Trapnell. 1988. Faculty micro-internships: OJT that is priceless and painless. *The Internal Auditor* 45(6):10-13.
- Herring, R. and L. Dykes. (1987). Should you set up a faculty internship in your firm? *The Practical Accountant* 20(2):71-73.
- Kulesza, C.S. 1994. The faculty internship program at ITT Automotive. *Management Accounting* 76(1):43-46.
- Lee, P. 1988. Faculty internships in public accounting. *The CPA Journal* 84-86.
- Levy, E. 1988. Educators and practitioners: A faculty internship experience. *Massachusetts CPA Review* 62(4):11.

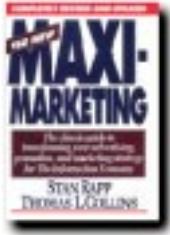
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## ***The New Maximarketing***



by Stan Rapp and Thomas Collins  
New York: McGraw-Hill: 1996

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“Ours is the Ultimate multi-option society and the consumer is the undisputed king.” (Rapp and Collins 1996, 21). This quote elegantly summarizes the purpose for *The New Maximarketing*. Today’s society seems to demand more and expect to pay less. *The New Maximarketing* is a book about changing the way managers think about the customers and advertising practices to reconcile them with the Information Age. Rapp and Collins outline a seven-step process for revamping and reenergizing the marketing function within businesses operating in the Information Age.

The authors begin by reviewing the problems and challenges facing today’s marketplace. From population changes to the decline of brand loyalty to the “demassification of society,” today’s marketplace is fast paced and information filled. The biggest challenge, according to Rapp and Collins, is the “splitting of the mass market into ever multiplying, ever-changing, sets of mini-markets that demand a continually expanding range of options, models, types, sizes, colors, and customizations,” or “demassification.” They make an important point in this regard. Product offerings in some categories have become so numerous, it is sometimes difficult for the customer to make a choice. Whether purchasing Coca-Cola or Kleenex, every marketer is trying to reach the most demanding of niches. According to the authors, the essence of the maximarketing revolution is “an emerging, dominant selling process that uses the information economy to transform marketing to work in an information culture.”

The first step in overcoming the challenges presented by the information society in the information economy is to maximize target selection. Rapp and Collins define five ways to maximize target selection: *fishing*, *mining*, *panning*, *building*, and *spelunking*. Although the authors assign catchy names to their target market selection methods, they do not make any new revelations in the area of target marketing. One important new development in the field of target marketing, advanced as a result of the Information Age, is that of “concentrated targeting.”

Amazon.com used this strategy when positioning its product exclusively to web users. Amazon’s success with this strategy, however, is a good example of the primary risk involved. The cybermarket has low barriers to entry and Amazon’s strategies were quickly duplicated by the competition (Clemente 1998). Perhaps the biggest contribution that this chapter makes is the emphasis the authors put on winning over your *competitor’s* best customers. The authors argue that emphasis should be placed on the *best* customers, falling back on the old 80/20 rule. Further, the authors suggest actually *giving* the casual customer to the competitor.

Once the marketer has successfully maximized target selection, Rapp and Collins suggest maximizing media exploration. This second step requires that the reader take into consideration new media, old media, and old media used in a new way. Exploring all of the possibilities with an open mind is the key to winning prospects. Many media changes have evolved at the onset of the information superhighway, resulting in both opportunities and challenges for the marketer in the twenty-first century. Some of these changes include a consolidation and declining daily newspaper readership, a decline in national network viewership, consistent cable television growth and penetration, growth in niche talk radio, a decrease in mass market magazine circulation, and an increase in the number of special interest magazines.

The evolution of the information superhighway and its effect on the media listed above has in turn led to the evolution of a new form of media. After describing a list of creative marketing tools using both current and new technologies such as telephone, CD-ROM, video, fax, floppy disk, and e-commerce, Rapp and Collins describe companies who have begun to use *inbound* calls instead of *outbound* calling to communicate the marketing message. They use several less than exciting examples of companies putting these tools to work. As a result, the reader is left somewhat empty handed without any really creative ideas that companies have used to go out on the edge to market their products by exploring new media opportunities. For example, WaterJoe, a water product with added caffeine, has become popular among college students as a result of college event sponsorships and an irreverent web site. Ford Motor Company introduced a creative Internet-driven sales promotion when introducing the 1999 Mercury Cougar. Ford began by luring customers to the Mercury Cougar web site ([www.cougar.com](http://www.cougar.com)) with banner advertising that offered a chance to “Win A Cougar for Yourself and a Friend.” After arriving at the web site, customers were asked to enter the sweepstakes by providing detailed demographic

information. Using the demographic information, Ford mailed targeted customers 1999 Mercury Cougar gifts consecutively for three weeks, including a 1999 Cougar T-shirt, Postcards, and holograms. Rapp and Collins argue that companies that combine old and new media will maximize the tools of the Information Age.

The authors bring back an advertising tool that is both underused and undervalued to maximize the *accountability* of each medium described in step three of the maximarketing process. Making each advertising dollar accountable by using “Caples” testing is the key to maximizing accountability, argue the authors. John Caples described what has now become better known as *split-run testing* in his 1974 book *Testing Advertising Methods* (Caples 1974). Caples describes testing the effectiveness of one advertisement versus another, as the only sure way to determine which advertisement will yield better results. Split-run testing involves preparing two identical advertisements with a single different test variable. Rapp and Collins advocate using split-run testing for every marketing communication no matter the medium. According to them, Campbell’s Soup “Soup is Good Food” perhaps could have been improved had split-run testing been used. By using Campbell’s successful advertising campaign as an example the authors are essentially arguing that every campaign can use improvement or “maximization.”

In addition to using split-run testing on all advertising to maximize accountability, the authors indicate advertising that does not include a direct response element has inherent diminished effectiveness. By including a direct response call to action, the marketer can assess the response and effectiveness of an advertisement. Further, if split-run testing is performed *before* said advertisement is run, the marketer has essentially run the best advertisement and can expect a certain degree of success. This is an interesting proposal and one that, when suggested, leaves the reader to wonder to why more advertisers *don’t* include a call to action in some format.

Maximizing advertising impact, step four in the maximarketing process, requires that marketers analyze the *left brain-right brain* argument that has plagued advertising agencies for years. Although science has since shown the left brain-right brain theory more useful as a metaphor than as scientific fact, advertisers have long disagreed on which approach works best to reach the customer. The left brain approach requires the use of logic and language, while the right brain approach requires the use of creativity and intuition. “From the Maximarketing viewpoint, whether your advertising should stir up more activity in the prospects left or right brain depends on what you are selling, to whom, and in which medium.”

Rapp and Collins advocate using one of three approaches, *left brain*, *right brain*, or *whole brain*. Using the left brain approach is appropriate when the product is a unique, high

involvement, intangible, or high-ticket item. The use of the right brain approach is appropriate when the product is a parity product, low involvement, tangible, or low price item. The whole brain approach should be used “whenever possible” and “wherever appropriate” by incorporating elements of both logic and language, and creativity and intuition. “Whole brain communication that combines the dream image and the persuasive argument is the secret ingredient that is so often missing in brand-building awareness advertising, and that can do so much to increase its effectiveness.”

The fifth step in the maximarketing approach is to maximize promotional results. The authors rely on the Information Age to pave a better way to effective promotions. “Today’s sales promotion is the child of the demassified market. Product proliferation has inevitably led to intensified competition and intensified sales promotion. But today’s sale promotion can be a problem child: greedy, costly to feed, often bad-mannered, and sometimes downright destructive.” “The new sales promotion of the Information Age will increasingly be seen as ‘datamotion’—the use of information in a database—to direct the right weight of promotion to each prospect or customer and to get the best immediate response for the least money.” According to them, sales promotion has become a big business with many companies spending, as much as 70 percent of their marketing dollars on promotion (Landler 1991).

Rapp and Collins say the new and improved sales promotion must follow three valid guidelines:

1. More and better testing of promotional options.
2. Use the promotion to lead to the sale, *plus* help build a proprietary database.
3. Make the promotion a part of the advertisement.

By testing promotions using the split-run testing method, they believe marketers can determine, in advance, which promotional tools will be the most effective in increasing sales. The authors cleverly suggest that using the promotion to build a proprietary database and making the promotion part of an advertisement can accomplish two goals simultaneously, thus the advertising works twice as hard for the marketer. By creating a promotional offer that requires the customer to call or write to obtain the offer, priceless demographic and buying information can be obtained. The Upjohn Company used this strategy in the late eighties to roll out a hair regrowth product named Rogaine. Advertisements, strictly constrained by FDA regulations, required the customer call for a \$10.00 coupon and video describing the benefits of the Rogaine product. Upjohn was able to immediately weigh the effectiveness of the advertisement *and* build a proprietary database by using a direct response promotion within advertisements for the product.

Step six in the maximarketing process is to maximize customer involvement. Too often, companies “fail to bridge the gap between the advertising and the sale.” This idea does not end with mere customer satisfaction programs, but includes embracing programs that “raises prospect-handling to the same level of attention and care that customer-handling has received in recent years.” Rapp and Collins have constructed the ideal “bridge” by advocating five structural components:

1. *Activation.* The “first step must be to engage the prospect in a dialogue, in two-way communication—an offer of where to find it, or more information, or a sample.”
2. *Information.* The company should follow activation with “warm, friendly, persuasive, detailed follow-up information about the product.”
3. *Persuasion.* The information included in the follow up should “take the reader by the hand and lead him or her emotionally from a present problem to the ultimate benefit.”
4. *Propulsion.* Turn the “sometime” into “right now” and propel the customer into action.
5. *Completion.* Make it easy to complete the sale by taking “great care in designing a clear, simple, inviting, and friendly order form.

By creating a bridge between the advertising and the sale, potential lost sales can be salvaged and consumer goodwill created.

The final step in the maximarketing process is to maximize customer cultivation. “With rare exceptions, making a sale should not be the end of a relationship with a customer but rather the beginning, or continuation of one.” The authors emphatically argue that the database is a priceless tool that can help companies fully realize the Lifetime Customer Value (LCV). Instead of focusing on today’s, tomorrow’s, or even the sales of next week, Rapp and Collins petition the reader to consider the value of a customer over an entire *lifetime*. Examples of companies who have successfully developed databases that realize and reward the LCV include American Airlines AAdvantage program (the first frequent flyer program) and Marriott’s Honored Guest Awards Program (frequent stay program).

Several models that can help readers achieve maximized customer cultivation include the *reward model* as described previously, the *contractual model*, and the *education model*. The contractual model is one in which all or part of the program cost is totally or partially funded by an enrollment or subscription fee. Nintendo publishes a 115 page magazine for its video game buyers that gives readers video game tips and stories about obtaining success over the most challenging video games. Nintendo charges \$18.00 for the subscription. The

education model provides prospects in the database with useful information periodically throughout the year. Earth’s Best Baby Food, a relatively new entry into the baby food market, provides families who enroll in the Earth’s Best Family Program three issues of *Family Times*, a newsletter full of informative articles about baby food safety, child psychology, and child rearing, to name a few.

These models, although not new to marketing, arm the reader with tools for using information most likely sitting stagnant in a company database. According to Rapp and Collins, “The right customer-care and customer-reward programs help you to retain the loyalty of your present customer despite the best efforts of your competitors to steal them away.”

*The New Maximarketing* is a holistic approach to incorporating many of the tools born from the Information Age into tools for success in both large and small companies alike. *The New Maximarketing* is well organized, easy to read, and packed with both domestic and multinational success stories that keep the reader both interested and riveted by the sheer creativity born out of competitive necessity. This book is a must read for marketing professionals, academia, and students. Marketing professionals can readily adopt and adapt many of the strategies described in *The New Maximarketing* to fit the needs of any size company. Academia and students will be amazed at how creatively companies begin to think when faced with the changes brought on by the Information Age. Today’s pacesetters can’t afford to rest on their laurels for very long. In the same way, no one trendy marketing approach is ever going to be your pathway to a permanent competitive advantage in the Information Age. ■

## References

- Caples, J. 1974. *Testing advertising methods*. 4th ed. Englewood Cliffs, New Jersey: Prentice Hall.
- Clemente, P. 1998. *The state of the net: The new frontier*. New York: McGraw-Hill.
- Landler, M. 199. What happened to advertising. *Business Week* (Sept.2):68.
- Rapp, S. and T. Collins. 1996. *The new maximarketing*. New York: McGraw-Hill.

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