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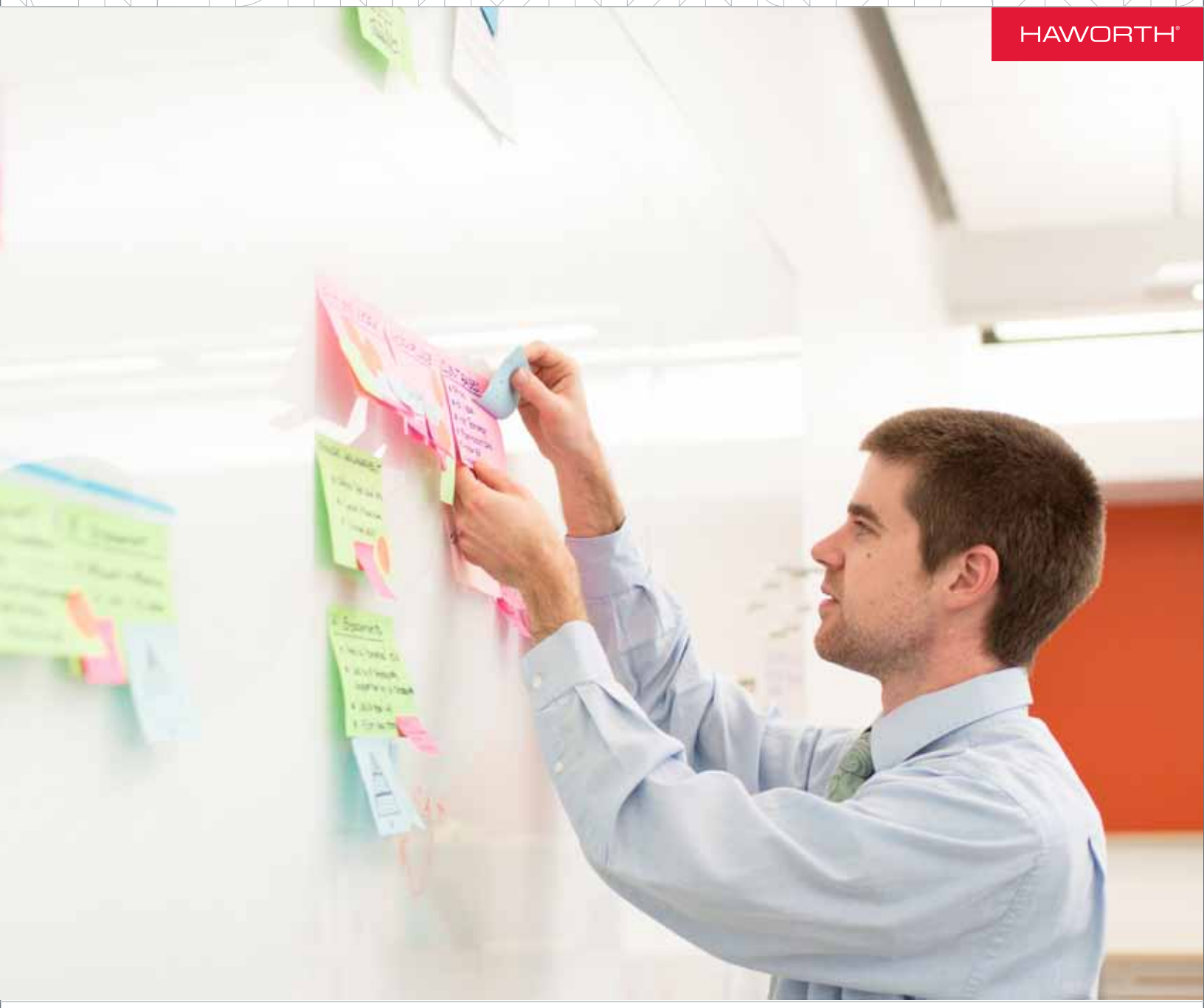

# Knowledge in the Workplace

by: Judy Voss

More and more of the economy is knowledge-based — it runs on a continuously-changing stream of integrated technologies, materials, ideas, and distribution methods which meet (or create) customer needs and wants. This paper is a basic overview of the difficulties of measuring knowledge outputs and the need to carefully weigh decisions about the work environment that could impact an organization's ability to effectively support its knowledge activities.

Raising the productivity level of knowledge workers is critical to economic growth because they are the clear and growing majority of today's workforce. By contrast, the total numbers of people making, growing, and transporting things is only a fifth or less of the workforce.

Examples of the increased value of knowledge in the economy include:

- The materials and manufacturing cost of a pair of Nike shoes has been estimated at about five percent of the total retail price. Much of the cost-price difference reflects the firm's ability to learn and tap into trends in consumer tastes, distribution, promotion, and so on.
- The amount of electronic information technology in a car is worth more than double the value of the materials that make up the car. As employees find new technologies and ways to integrate them into new products, they make up an ever-increasing portion of a car's value, while the labor and traditional material components continue to decrease.

The economic impact of knowledge as a product or service component and as an organizational asset become more clear in recent years. Still, while we have rapidly moved toward increased dependence upon knowledge work, we have not made equal progress in knowing how to value these outputs.

**The Value of Knowledge**

We are used to figuring out what a company's assets are by looking at its factories and offices. However, a growing percentage of asset value leaves those buildings at the end of the employee workday. More is at risk as inadequate documentation and storage systems meet ever-increasing quantities and types of knowledge outputs.

This kind of leverage shift in value creation has profound implications, especially for management theory and practice — many already realized, and many more still to come. The principal one is that in almost every organization the most important and valuable asset is knowledge. It cannot be managed in many of the ways we manage physical assets (Darling, 1996).

This difficulty in knowing what and how to measure can lead to slow and steady losses. NASA for example, found that much of what it "knew" about how to make a Saturn 5 rocket had been lost in employee retirements, dumped files, etc. The cost to recreate the missing pieces when a second generation of the rocket was developed was estimated at $15 billion.

Few companies are adept at managing what they know. A study of 80 companies conducted by the American Productivity and Quality Center found that 59 percent of respondents felt they were not doing enough to manage their intellectual assets. And most companies confuse data — which rushes dirty and unanalyzed from cash registers, engine sensors, and traffic counters — with information — which has been captured and analyzed. But real knowledge is neither data nor information. It comprises insights that are, for the most part, deep and strategic. Few companies manage their knowledge. And few know how much it costs when it's lost (Kurtzman, 1996).

The problem of managing knowledge is that it's hard to recognize the extent and depth of what you know and all the ways you could use it. It's hard to place a value on an idea, conversation, special levels of customer support, or early prototypes. It can be even harder to make knowledge-sharing contacts happen. Proven methods of accounting for knowledge outputs are very limited, and the time it would take seems daunting. Organizations end up looking at results in a macro sense and the individual knowledge components of drawings, research, brainstorming meetings, patent applications, etc. are often just lumped together on the expense side of the ledger.

Managers and investors woefully neglect intellectual inputs and outputs, though these far outweigh the assets that appear on balance sheets. Charles Handy, author of The Age of Unreason, estimated that the intellectual assets of a corporation are usually worth three or four times tangible book value. No executive

would leave his cash or factory space idle, yet if CEOs are asked how much of the knowledge in their companies is used, they typically say "about 20 percent." Imagine the implications for a company if it could get that number up just to 30 percent (Stewart, 1994).

Another difficulty in placing a value on knowledge is its potential for unpredictable growth.

Properly stimulated, knowledge and intellect grow exponentially. All learning and experience curves have this characteristic. As knowledge is captured or internalized, the available knowledge base itself becomes higher. Once a firm obtains a knowledge-based competitive edge, it becomes ever harder for competitors to catch up. Because the firm is a leader, it can attract better talent than competitors. The best want to work with the best. These people can then perceive and solve more complex and interesting customer problems, make more profits as a result, and attract even more talented people to work on the next round of complexity. Driving and capturing individuals' exponential learning has been the key to strategic success for most intellectual enterprises, from Bell Labs and Intel to Microsoft, McKinsey, and the Mayo Clinic (Quinn, Anderson, and Finkelstein, 1996).

**The Effects of Efficiency**

The push for productivity improvements will only intensify as markets continue to globalize and the speed of technological change and communication increases. As a result, workspace has been managed in a top-down manner, heavily focused on standardization as a means of achieving efficiencies. At the same time, the work itself has been increasingly done by self-managing teams or individuals who handle knowledge processes which are less and less standardized.

None of these efforts at maximum space efficiency are intrinsically wrong, but what is potentially damaging is that they can be undertaken so quickly, without an understanding of the complexities and challenges of optimizing human endeavor.

In the past, most companies aimed to enhance returns on investments in physical assets — property, plant, and equipment. Command and control structures made sense when management's primary task was to leverage such physical assets. For example, the productivity of a manufacturing facility is determined largely by senior managers' decisions about capital equipment, adherence to standardized practices, the breadth of the product line, and capacity utilization. With intellectual assets, on the other hand, individual professionals typically provide customized solutions to an endless stream of new problems (Quinn, Anderson, and Finkelstein, March-April 1996).

Because organizations are so well experienced in valuing physical assets, the real estate binge of the 1980s has become an obvious target for belt-tightening in the 1990s. Unused or under-used space is highly visible and the cost can be quickly calculated.

Real estate rationalization became a core activity of many organizations, declaring war on under-used space. "To reduce costs, they pursued the 'three L's of corporate real estate: consolidating locations, simplifying layouts, and renegotiating leases" (Apgar, 1995).

Non-financial benefits have also been achieved through these efforts. Employees from multiple facilities can work more efficiently when consolidated under one roof. When organizations can move to suburban locations, employees might enjoy a shorter commute. Large-scale layout alterations can allow more meeting spaces to be integrated where they are needed. The addition of impromptu, non-reserved meeting areas has also been a welcome change for many.

Because the real impacts of physical workspace changes on the knowledge side are rarely if ever tracked, alterations in employee performance, motivation, and quality are often not understood in a way that makes them useful for these decisions.

Within the office environment, there has been a strong trend toward individual workspace size reductions. There is also a strong trend toward universal workstations which give nearly all employees the exact same size and shape space, with the same furnishings.

These workspace management methods can be effective in reducing the overall square footage used and making it easier to move employees quickly from one area of a building to another. These changes can, however, encounter major obstacles to implementation because the baggage of existing status and reward systems tends to come along to new locations, and because the impacts of workspace changes aren't clearly known up front.

Some efforts have been made to learn about the effects of workspace characteristics to knowledge worker productivity.

**Inputs and Outcomes**

A major contribution to what we know about employee motivation is the equity theory, first proposed by J.S. Adams. It holds that people evaluate job inputs (their efforts, time, compliance, etc.) and outcomes (compensation, status, recognition, and sense of accomplishment). When comparing these, they can find themselves over-rewarded, equitably rewarded, or under-rewarded.

Richard C. Huseman and John D. Hatfield have done extensive research on the equity theory at work. They have observed that while some over-rewarded people feel guilt and strive to work up to a higher level, most just get used to the reward. Under-rewarded people however get upset and will try to restore equity by reducing their inputs.

Among the ways employees reduce their inputs are by doing less or careless work, coming to work late, forgetting to carry out instructions, taking extended breaks and lunch hours, using up sick days, and sabotaging their own work and the work of others. Increasing outcomes involves seeking more of

almost anything that will help restore a sense of equity — more pay or benefits, promotions, increased job security, and better working conditions. Therefore, one way to manage perceptions of equity is to manage employee outcomes (Huseman and Hatfield, 1990).

There have been several studies of financial rewards as influencers of workplace performance which support the equity theory. Another type of study was done by Jerald Greenberg of Ohio State to test the impact of an office setting on equity theory. The purpose of that study was to look at the physical office composition and implied status as a non-monetary influencer of performance.

In the study, 198 employees of an insurance firm were tracked during a facility remodeling. Workers were temporarily moved to different offices while the parts of the facility they formerly occupied were redone. Workers drew lots to determine randomly which offices they would occupy during the two week test.

The temporary offices could be equal to the status level of their former offices, or above or below their status levels by one or two job grades. Lower-status offices were recognizable as those typically assigned to trainees in which two or more workers shared space. There was no door and the desks and overall spaces were small. Higher-status spaces were recognizable as underwriter spaces, having doors, not being shared, and having larger overall dimensions, and bigger desks. Workers could be as much as one or two steps "overpaid" or "underpaid" by the new offices, relative to the offices they vacated and the jobs they held.

True to equity theory, those who were moved into higher-status offices sensed an "overpayment" and increased their performance, as measured by output. Those moved to lower-status offices decreased their performance. The control group in equivalent (or still in their regular) offices held to consistent performance.

During the first week of the moves, compared with the control group, the one-step overpaid group was significantly more productive and the one-step underpaid group was significantly less productive. Additional comparisons showed that those who were two-steps overpaid were significantly more productive than those who were one-step overpaid, and that those who were two-steps underpaid were significantly less productive than those who were one-step underpaid. Thus for the first week, all hypotheses were supported (Greenberg, 1988).

The results changed during the second week of the study. Although those who were underpaid by one or two steps maintained the reduced performance levels, the strongly positive reaction of persons moved to offices representing two steps of overpayment did not last. They fell back to the sustained performance levels of those who were one-step overpaid.

also took the workspace into account. A group of 600 volunteers from 92 companies agreed to complete an identical computer programming task in their regular offices and to complete a workspace questionnaire.

On average, the better-performing half of any group of programmers achieves results measuring twice those of the poorer-performing half. In this study, the highest-performing quarter of the test group achieved 2.6 times better output than the lowest quarter of the group. The highest-performers also reported more privacy, more space, and more control over interruptions than the poorest performers.

This doesn't mean that changing the physical work setting of the lowest quarter would necessarily improve their productivity by 2.6 times. The inferior working conditions were considered to be associated with an overall poorer attitude toward these programmers

| Environmental Factor | Highest-Performing 25 Percent | Lowest-Performing 25 Percent | All Performers |
|---|---|---|---|
| Average dedicated floor space | 78 square feet | 46 square feet | 63 square feet |
| Acceptably quiet workspace | 57 percent yes | 29 percent yes | 42 percent yes |
| Acceptably private workspace | 62 percent yes | 19 percent yes | 39 percent yes |
| Can you silence your phone? | 52 percent yes | 10 percent yes | 29 percent yes |
| Can you divert your calls? | 76 percent yes | 19 percent yes | 57 percent yes |
| Do people often interrupt you needlessly? | 38 percent yes | 76 percent yes | 62 percent yes |
| Does your workspace make you feel appreciated? | 57 percent yes | 29 percent yes | 45 percent yes |

(Aronoff and Kaplan, 1995, p. 71)

The test subjects were less sensitive to overpayment than to underpayment. As a non-monetary motivator, an office recognized to be two status levels above the occupants' job did not seem to reap lasting benefits for the organization or the individual.

Of concern is the lasting decrease in performance of those moved to smaller, lower-status offices. Workers perceiving reduced reward for their efforts can reduce their efforts, thus altering an organization's capacity.

### A Programming Example

A study by DeMarco and Lister (1987, pp. 77-70) on white collar performance that would be expressed in the style of management, social interactions, overall view of quality, and other aspects of the corporate culture. Under such circumstances, changing one aspect of a poor work setting would be unlikely to produce measurable gains (Aronoff and Kaplan, 1995, p. 71).

Organizations which had 18 or more people participating in the study were further analyzed to see what impact workspace was having. Within organizations, all performers tended to have the same space. Better types of workspaces were not being given to high-performing programmers as rewards.

However, when performance and work settings were compared between

organizations, there was a clear association of better workstations with better performance. DeMarco and Lister concluded that whether a better workplace improves individual performance or more productive workers gravitate to organizations with better work environments, there are measurable productivity benefits to be gained by improving the physical workplace environment.

The study did not provide conclusive proof that improvements to the physical work setting alone would produce significant productivity gains. However, it presented a strong case that good work environments and workers with high productivity tended to occur together, whatever the cause may be. The association of better work environments with better performance is consistent with the needs expressed by other knowledge workers (Aronoff and Kaplan, 1995, p. 71).

**Into the Unknown**

The goal for an organization's facilities should not necessarily be limited to having the most space-efficient workstations. The organization's larger goal is to have the most effective knowledge workers in its industry. Supporting the worker becomes critical to the larger goal.

Work-conducive office space is not a status symbol, it's a necessity. A company either pays for it by shelling out what it costs, or they pay for it in lost productivity. The creativity penalty exacted by the environment is insidious. Since creativity is a sometime thing anyway, we often don't notice when there is less of it. People don't have a quota for creative thoughts. The effect of reduced creativity is cumulative over a long period. The organization is less effective, people grind out the work without a spark of excitement, and the best people leave (DeMarco and Lister, 1987).

Since there is so little hard data about how best to support different types of knowledge workers, an experimental approach is needed. Internal beta sites for new office designs can be used to test their impacts before widespread application. Departments would need to be able to measure output changes that are relevant to those groups.

Another area that needs experimentation is office sizing. Although space standards based on hierarchy are fading, it's important to avoid overuse of the opposite extreme: one size fits all.

The tasks performed in an office are, at first glance, deceptively similar. Working at a desk with printed material or a computer, speaking on the telephone, and attending meetings are activities that every working person has experienced. Yet the person who performs certain tasks at a specific work setting, day in and day out, has a very different appreciation of which environmental factors contribute (Aronoff and Kaplan, 1995, p. 55).

Cookie-cutter stations are ideal for maintenance, planning, and ongoing management of physical assets. However, they are not always the best for the emerging and often unique tasks of the knowledge work taking place in them.

As Toffler has aptly described it, knowledge workers have become less interchangeable. In the industrial revolution, not only parts but people were designed to be easily replaced. However, as the knowledge content of work increases, the job becomes more individualized. Each person tends to use tools a little differently than the next and will approach a problem in his or her own way according to the unique skills and experience that person brings to the task (Aronoff and Kaplan, 1995, p. 14).

It's healthy to maintain an atmosphere of experimentation where workplace change is not seen as a failure of the former design and where variations are not seen as something to get under control. Collected data on output can be used to justify space differences between types of activity and work styles.

Some other ways to help prepare a workplace for the knowledge economy:

1. Get input. For maximum workspace potential, involve employees as much as possible in planning their offices. After all, they are the ones who will be living in the spaces. Knowledge workers' costs to their employers, and the value of their outputs, far exceed the costs of their offices over time.

   Choose furnishings and equipment that facilitate quick and cost-effective workspace change. Learn by researching the working conditions of the programmers, claims processors, or other professional occupations you house.

2. Build on experience, to a point. Once a workspace design is developed that appears to work well for one group, you may want to use it as a model for other groups. Tasks do vary however, and group workstyles differ. Additional adjustments could be needed to add more group space and less private space, or to create more private, quiet space, and so on.

   Also, the nature of knowledge work is that it changes. Workspaces will need to evolve over time and, as facilities projects, will never really be complete.

   In open plan offices, co-workers should be encouraged to modify the grid to put their areas together into small suites. When this is allowed, people become ingenious in laying out workspace, meeting space, and social space to meet their needs. Since they tend to be in interaction mode together or simultaneous inflow mode, they have less noise clash with each other than they would with randomly selected neighbors. The space has a vital quality because interaction is easy and natural. A degree of control over their space is viewed as an additional benefit (Aronoff and Kaplan, 1995, p. 14).

3. Respond quickly to needs.

A maintained workspace communicates respect to its inhabitants. Listening, and experimenting are important. Maintenance is key to showing that knowledge work and knowledge workers are respected. In the 1996 IFMA survey however, 30 percent of facility managers reported problems with response times and user feedback in the workplace. That could send a mixed message to the workforce.

Even though corporate facilities are very consciously designed at one level, at other symbolic levels they may be much less so. No organization consciously and explicitly wants to tell its employees that it doesn't care about their views on how to be productive. Yet many do this inadvertently by ignoring staff complaints about uncomfortable chairs, poor lighting, stuffy air, and poorly designed work surfaces. The damage is not just in the energy lost in trying to surmount these environmental obstacles, but in the more subtle and longer-lasting impressions such dysfunctional environments generate about the organizational leaders' real attitudes toward high performance, as opposed to concerns for cost or image (Becker and Steele, 1995, p. 39).

4. Learn more about the Knowledge Economy. Many organizations already incorporate some of the principles of valuing knowledge without making a formal program out of it, while others have Chief Knowledge Officers. Even if your organization has not yet begun to explore knowledge as a quantifiable resource, there are books and articles which can give you a basic understanding of these concepts.

   There are early indications that organizations are moving their cultures towards increased awareness of the value of knowledge work. Procter & Gamble for example, has a Victor Mill Society to honor its most innovative scientists and engineers, named after one of the company's most productive technologists. The Global Best Practices Group (a division of Arthur Andersen) found in a benchmark study that 79 percent of participants (including Eastman Kodak, Dow Chemical, Hewlett-Packard, and others) consider knowledge management central to business strategy.

   Holding the key to information — not the executive washroom — connotes status. You can tell how much you matter in an organization by counting the number of questions you're asked and decisions you're involved in. Knowledge has always mattered most in an organization, even in the old system (Berglas, 1996).

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