5. TECHNOLOGY: IMPLICATIONS FOR HRM

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ABSTRACT

Technology has had a dramatic impact on organizational environments. The changes necessitate that Human Resource Management (HRM) take aggressive steps to adapt and to add value to organizations. This chapter focuses on implications for HRM, particularly in the areas of job analysis, selection, and performance management. Directions for both research and practice are discussed.

INTRODUCTION

Technology is ubiquitous. It has infiltrated our daily lives and intertwined itself into organizations and society in general. Technologically-aided interaction is now simply a matter of course and something that is typically taken for granted. While technology has become an integral and almost unnoticed feature in our daily tasks, the impact of technology in organizations has been dramatic. What is possible, how quickly it can be done, and how it can be done, are all fundamental characteristics of work that technology has changed.

The purpose of this chapter is to examine implications of technology for the effective management of people. We will not review specific technologies in any detail here. Rather, we identify some of the general organizational realities that have resulted – or have the potential to result – from extant technology.
Given these characteristics, the thrust of the chapter will be on implications for HRM research and practice. We will particularly focus on the staple HRM functions of job analysis, selection, and performance management.

To what are we referring when we use the term “technology”? As a generic description, we offer that technology consists of mechanical, electrical, and other extra human structures, processes, and phenomena that are used to aid or enhance performance. Given this broad description, what are we referring to as technology can range from mechanical tools to virtual connections among workers. Of course, it is computer hardware and software that has recently had broad sweeping impact on performance in organizations. The pace of change, due in large part to technology, is now quicker than ever before. Communication capability, adaptability in structure and process, and global competition, all made possible through technology, change possibilities, expectations, and criteria at ever increasing speed. Whatever the particular type of technology, we think there are some generic influences that result from its increased presence in organizations.

**INFLUENCES OF TECHNOLOGY**

The influence of technology can, at a very general level, be classified as being in the domain of either content or process. That is, technology can influence the content of an activity as well as the way it is carried out. Table 1 presents a description of some of the major facets of the influence of technology and examples of how these features of technology affect the content and process of work. Our purpose in presenting this typology is not to be exhaustive, but to broadly capture some of technology’s major impacts on the workplace.

**Table 1.** Impact of Technology in the Workplace.

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<th>Facets of Technology</th>
<th>Work Characteristics</th>
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<tr>
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<td>Content</td>
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<td><strong>Shortened Completion Times</strong></td>
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we use the term “technology?” As a generic y consists of mechanical, electrical, and other phenomena that are used to aid or enhance a process, what we are referring to as technol- gies virtual connections among workers. Of l software that has recently had broad sweep- nominations. The pace of change, due in large than ever before. Communication capability, s, and global competition, all made possible ities, expectations, and criteria at ever ticular type of technology, we think there are from its increased presence in organizations.

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Technology in the Workplace.

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<tr>
<th>Characteristic</th>
<th>Content</th>
<th>Process</th>
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<tr>
<td>Nature of Tasks</td>
<td>Interaction/integration</td>
<td>Team structure</td>
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<td>Task</td>
<td>with other functions</td>
<td>Empowerment</td>
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<td>Learning</td>
<td>Quicker interactions</td>
<td>Quick access to information</td>
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<td>Decision Making</td>
<td>Less formality</td>
<td>Telecommunication</td>
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As Table 1 demonstrates, we emphasize three noteworthy facets of technology. One facet is shortened completion time. Technological advancements frequently yield shortened cycle times and reduce the amount of time needed to complete tasks. Time reduction does not usually, however, occur in a vacuum. Quicker completion times can affect both the content and process of work. Indeed, the very nature of tasks is often changed due to technology. For example, computerization of an operation can lead to some tasks becoming obsolete and eliminated while other tasks, even though they may have the same name, are fundamentally different. A project with a tool manufacturer provides an illustration of technology’s influence on the nature of tasks (Cardy, 1993).

Computerization of the manufacturing process resulted in the elimination of some tasks since they would henceforward be automated. However, other tasks, such as shop floor control, were changed since they involved much more interaction with the computer system. The increased speed with which tools could be manufactured was a positive change, but it brought with it additional changes in the nature of the tasks.

Beyond the nature of tasks, the sheer pace of work can be influenced by shortened completion times as well. The impact of technology may not, for example, be even across all tasks. Some tasks may therefore have to be compressed or somehow completed more quickly in order to keep pace with the shortened cycle time. Further, simply the potential of shortened completion time that a technology offers can lead to performance expectations that increase the pace of work. In other words, if it is possible to do a task in a short amount of time, then it becomes an expectation that it had better be done quickly. Anything less is an annoyance. Consider, for example, our expectations regarding typing or conducting a literature review. Given technology, quick completion is now simply expected.

Shortened completion times can also influence the process of work. A significant reduction in the cycle time needed to, for example, produce a product, typically brings with it changes in how the work is carried out. Perhaps most fundamentally, the work process changes to include interaction or even integration among functions that might otherwise have been separate. The change in auto production from a functional “silo” approach to an integrated team is an example of a change in work process that occurred under the pressure of shortened cycle times. Shorter completion times can also influence the work process by promoting interactions that are quicker and less formal. For instance, shorter completion times may require quicker interactions among workers, such as requests for input, suggestions, feedback, and so on. Decreasing completion times can lead to adoption of a team structure, since shortened time frames can force collaboration. The team structure can yield greater efficiency and can
replace a traditional emphasis on individual performance. Further, time pressure can lead to a priority being placed on performance accomplishments that can produce less regard for position in the organization and greater regard for expertise.

Another important facet of technology is speed of change. Technological advancements are more a stream of events than unitary phenomena. Technology improves and changes and can do so at a surprising rate. The speed of change can easily become a critical factor in the domain of high technology where firms wrestle with the rate at which they must confront change and obsolescence. In terms of the content of work, rapid change can be expected to lead to uncertain in the life of tasks. In the face of change, it is unknown how long a particular task will remain relevant. Along with the changes in tasks comes change in skills needed to perform in the no longer stable environment. Rapid change means constant training for employees to update and replace obsolete skills.

The speed of change that technology induces can also have important influences on the process of work. Perhaps most importantly, a high rate of change can lead to an emphasis on process skills, since specific content of work may be in flux, but the process can remain stable. For example, team work, information sharing, and providing input and feedback may be process skills that are stable and important even though the work content is changing. Further, the rate of change that technology fosters often necessitates a shift toward an empowered workforce in which decision-making is pushed down into the lowest ranks of the organization. Empowerment is needed for rapid adaptation to changed conditions. In addition, successful adaptation to rapid change may require that employees have quick access to information.

Communication capability is another aspect of technology that we have selected as a critical facet. While technological advancements do not always include a communication component, in recent times technology has dramatically influenced communication capability. Increased communication capability can alter the content of work. Ease of communication that technology provides can permit greater input and involvement by a wider range of people. Further, increased communication capability can make possible decentralization in decision making. With enhanced communication capability, management can be easily kept informed and provide input, thus reducing a need to exercise their formal decision making authority. These types of changes due to increased communication capability can bring new dimensions to employees’ work. For example, the more widespread the information sharing that a new level of communication capability brings may mean that more people are in a position to offer creative and collaborative solutions to a firm’s problems and challenges.

This may allow them to derive increased job satisfaction because enhanced opportunity for individual empowerment is altered due to increased communication. Telecommuting, meetings via telephone, and fax all can quickly be brought into organizational members.

IMPLICATIONS FOR HRM

Consideration of the examples of change described leads to the conclusion that, due to the complexity of what it used to be. Technology has become not only a tool and process of work. It is our work. As part of the function in organizations, HRM must project itself into the new environment and adapt to the new world of work. HRM risks the relevance and value of its functions when it does not examine implications of technological change on management of people. In focusing on selection, training, and performance management, it is evident that improved practice and for relevant trends may already be occurring, improvement in HRM need to more broadly utilize technological potential. Complacency in the face of increased technological innovation is of concern. In the future, the value of the function (e.g. Cardy, 1985) presents us with the challenge of innovation within an otherwise stable environment. The impact of technology on itself that extensive management development and educational programs will be needed to keep HRM staff members up-to-date on new technology and value and effectiveness.

JOB ANALYSIS

Job analysis is a staple of effective human resources management. It is a defensible approach to the field. The development of job analysis conditions dates back at least to the 1950s (e.g. Lawler, 1955). However, it is evident that scientific analysis should specify what the job is to be done and the exact time and space a rationale underlying job analysis is
This may allow them to derive increased organizational commitment or greater job satisfaction because enhanced communication capability provides the opportunity for individual empowerment. The process of work can be radically altered due to increased communication capability that technology affords. Telecommuting, meetings via teleconferencing, even the more mundane e-mail, phone, and fax all can quickly become new methods for getting things done. In general, technology produces greater capability for virtual connections among organizational members.

IMPLICATIONS FOR HRM RESEARCH AND PRACTICE

Consideration of the examples of technological influences presented in Table 1 leads to the conclusion that, due to technology, organizational life is no longer what it used to be. Technology has fundamentally influenced both the content and process of work. It is our contention that to remain a value added function in organizations, HRM must recognize the changed organizational environment and adapt to the new reality. To persist with traditional approaches to HRM risks the relevance and very survival of the profession. The following sections examine implications of the influence of technology on the effective management of people. In focusing on the principal HRM areas of job analysis, selection, and performance management our intent is to identify directions for improved practice and for relevant research. Some of the changes that we suggest may already be occurring, but only in an isolated fashion. Professionals in HRM need to more broadly recognize and embrace the influences of technology. Complacency in the field of HRM will lead to questioning of the value of the function (e.g. Cardy, Gove & DeMatteo, 2000), and small pockets of innovation within an otherwise business-as-usual approach will not be sufficient. The impact of technology is so broad sweeping and integral to work itself that extensive management changes are necessary in order to maintain value and effectiveness.

JOB ANALYSIS

Job analysis is a staple of effective HRM. It is fundamental to a rational and defensible approach to the field. The systematic description of work tasks and conditions dates back at least to the work of Frederick Taylor (1911) who stated that scientific analysis should specify "not only what is to be done, but how it is to be done and the exact time allowed for doing it" (p. 39). The essential rationale underlying job analysis is that the management of people should be
based on the job. For example, people should be hired based on how well they match the requirements of the job, not based on job irrelevant characteristics such as attractiveness, gender, age, and so on. Further, performance management and compensation should be driven by performance on objective aspects of the job, not by job irrelevant characteristics.

Job analysis research has focused on developing and refining methods that accurately capture the bundles of tasks called jobs (Harvey, 1991). Studies have, for example, examined the validity and utility of various job analysis methods and the effect of job analyst characteristics (Butler & Harvey, 1988; DeNisi, Cornelius & Blencoe, 1987; Harvey, Hakel, Friedman & Cornelius, 1988; Landy & Vassev, 1991; Mulins & Kimbrough, 1988; Sanchez & Fraser, 1992). This research and the very practice of job analysis rests on the simple assumption that the work activities of individual employees are mostly fixed and repetitive and can be fairly objectively measured.

Increasingly, the assumption of a fixed set of tasks for individuals is becoming a difficult fit with organizational reality. Less hierarchical control and greater empowerment provide workers the authority to alter operating procedures in order to maximize productivity, sales, and/or customer satisfaction. Various customer and production demands may impose unique challenges that are best met through unique solutions. Trying to force a standardized description of tasks may have a negative impact on performance. However, the empowered and team-based structure that technology engenders creates situations that are not mesh well with a traditional approach to job analysis. Further, other influences of technology on work content and process also lead to the conclusion that fixed individual tasks are no longer a safe assumption. Characteristics such as task uncertainty due to the speed of change, changing and broadened tasks due to shortened completion times, and virtual connections brought about by increased communication capability indicate that tasks may be better thought of as more fluid and emergent than fixed. Technology is making the old assumption of fixed individual tasks a thing of the past.

The reality in many organizations today is that narrow job descriptions are being replaced by dynamic relationships that define individual contribution. For example, team members are often provided cross-training so that the team has "depth on the bench" and individuals can serve in a variety of roles. A team may physically meet and function as a long-standing group, or team members may be virtually connected. A team may focus on short-term projects and membership may be internal to the organization or cut across organizations and even include customers or suppliers. Whatever the nature of the team, it is often the team itself, rather than a manager, that decides who will do what at any given time. This dynamic team-level control is particularly adaptive when considering the uncertainty and change that technology at any point in time would depend on the person's relative strengths and weaknesses among other things. Further, individuals simultaneously and their contributions rather than being defined by a set of fixed tasks.

The above discussion leads to the necessity in organizations that a change should not be taken lightly. Job analysis HRM since it is the basis for a broad job analysis has far reaching implications, performance standards, performance criteria, and possible alternatives to the traditional approach. From the outset we would like to clarify our position with job analysis altogether. We believe that there needs to be change in order to be relevant. In the following sections we identify and contrast to the task-based approach to job analysis which is exclusive, and they could be considered organization.

Broad Approach

Given rapid change, uncertainty, and personal needs, an approach to accommodate this need is to broaden the narrow job description. A broad approach of general duties but would not provide an adequate basis for the requirements of the job. However, such a broad approach would allow room for personal needs. Although broad duties are possible that insufficient direction to contribute to uncertainty and other practices: just the thing that isn't needed. In some respects, the workplace. These competing, systematic testing and empirical explorations.
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uncertainty and change that technology imposes. The contribution someone makes at any point in time would depend on factors such as the particular project, the person’s relative strengths and weaknesses, the team they are on, and the relative strengths and weaknesses of other members of the team (Stewart & Carson, 1997) among other things. Further, individuals may serve on multiple project teams simultaneously and their contributions may be dynamic and interdependent rather than being defined by a set of fixed and repetitive tasks.

The above discussion leads to the conclusion that the impact of technology in organizations necessitates a change in job analysis. A change in job analysis should not be taken lightly. Job analysis is often described as the bedrock of HRM since it is the basis for almost all HRM functions. Thus, alteration in job analysis has far reaching effects that include, for example, selection standards, performance criteria, and bases for compensation. We next review possible alternatives to the traditional task-based approach to job analysis. At the outset we would like to clarify that we are not recommending doing away with job analysis altogether. We do believe, however, that job analysis needs to change in order to be relevant and contribute to today’s organizations. In the following sections we identify and briefly describe potential alternatives to the task-based approach to job analysis. These alternatives are not mutually exclusive, and they could be combined to effectively meet the needs of an organization.

**Broad Descriptions**

Given rapid change, uncertainty, and dynamic determination of duties, one approach to accommodate this variance would be to broaden the typically narrow job description. A broad description could include a generic analysis of general duties but would not specify particular tasks and behaviors. This broad approach would allow room for employee discretion and for change in tasks. However, such a broad approach may be so generic that it does not provide an adequate basis for developing solid HRM programs, such as selection, training, performance management, and compensation (Cardy & Stewart, 1998). Although broad descriptions could provide needed latitude for adaptation and change, breadth may also lack direction. Furthermore, it is possible that insufficient direction and excessive breadth could further contribute to uncertainty and ambiguity, or even conflict over reward practices: just the thing that isn’t needed in the face of technological impact on the workplace. These competing approaches to job analysis certainly deserve systematic testing and empirical follow-up. One way this might occur is by exploring the following Research Issue:
Research Issue 1a: As the breadth of job descriptions increase, the effectiveness of HRM programs (e.g. selection, training, performance management, compensation) decrease.

Research Issue 1b: As the breadth of job descriptions increase, employee feelings of role conflict and ambiguity increase.

WORKER CHARACTERISTICS

If tasks are in flux due to technology, a stable underlying base may exist in person characteristics important for success in the organization. Tasks may be changing and any description of them may be outdated by the time the analysis is completed. However, person characteristics needed to succeed in an organization’s environment may be more enduring. For example, even though specific tasks may change, being innovative, a team player, being supportive, reliable, and taking initiative have been found to be important characteristics for success in dynamic organizational environments (Cardy, 1993). Interestingly, these characteristics all relate to the process of work, not to work content. This process emphasis makes sense in a situation in which the content is continually in flux.

There may be person characteristics that are quite stable in their centrality to effective performance, even though technology makes the work environment highly dynamic. A focus on person characteristics can uncover the stable characteristics that are the needed outcome of a job analysis. However, there are issues that must be addressed concerning this approach. Is identification of person characteristics sufficiently detailed as a basis for HRM functions? Perhaps the worker characteristic approach to job analysis could provide useful detail if an approach such as critical incident technique (Flanagan, 1954) is used to behaviorally describe each personal characteristic.

Explicating personal characteristics with behavioral descriptions can yield a job analysis with rich detail, even in a dynamic organizational environment. It would be helpful for research to examine the potential for a behavioral approach to defining worker characteristics. Research Issue Two addresses one aspect of this issue:

Research Issue 2: A personal characteristics approach to job analysis will yield process gains in terms of greater teamwork, flexibility, and innovation.

Value-Based Job Analysis

Another alternative job analysis approach is to focus on the values in the organization. With the values-based approach, an organization’s core values are used to define desirable job behavior. This can be used to develop a job analysis (Schaumann-Reese, 2001). A values-based approach found that use of the values associated with selection, training, and performance management and decreased turnover.

The values-based approach may be more worthwhile approach for dynamic organizations that are virtual have gone through rapid growth or have rapidly gained on a need to proliferate in order to establish their culture and work ethic. An organization may have difficulty in sustaining agreement over priorities, goals and values, and they can reduce these problems and increase potential for helping develop and manage people.

The value-based approach to management underlies an organization. This may be particularly driven solely by a pending financial crisis. Values-based approach is the unique characteristic of an organization. In such a case, new values can provide a rich source of information. It may prove divisive and must be addressed in regard to his prominent core values can be addressed in regard to his prominent core values. It can suggest some avenues for exploring the potential for a behavioral approach to job analysis:

Research Issue 3a: Given a dynamic environment, job analysis will increase the self-awareness of workers relative to a traditional approach.

Research Issue 3b: All else being equal, workers with a higher level of values-based job analysis.

SELECTED REFERENCES

Employee selection is a critical HRM process, it makes a substantial impact on bottom line profitability. In the case of smaller operations, can be the difference between success or bankruptcy. In order to maximize the effectiveness of the selection process, organizations must develop and implement strategies that are consistent with their overall goals and objectives.
Technology: Implications for HRM

...to define desirable job behavior. For example, a values-based approach was used to develop a job analysis for a rehabilitation agency (Henry, Keys & Schaumann-Reese, 2001). A values-based approach identifies organizational values and the behaviors associated with them. The case study by Henry et al. (2001) found that use of the values-based approach as basis for recruitment, selection, training, and performance evaluation led to performance improvements and decreased turnover.

The values-based approach may prove to be a particularly useful and worthwhile approach for dynamic organizational environments. Organizations that are virtual have gone through rapid change due to technological advancement, or have rapidly grown on a technological wave and can have difficulty in establishing their culture and values (Cardy, 2001). For example, a virtual organization may have difficulty in getting people to work effectively together, not just because of physical distance among its members, but because of a lack of agreement over priorities, goals, and how to proceed. A shared sense of values can reduce these problems and the values-based job analysis has the potential for helping develop and maintain this common sense of purpose.

The value-based approach of necessity assumes that a stable set of values underlies an organization. This may not be true of all organizations, particularly those driven solely by a profit motive. Another possible limitation of the values-based approach is the uncovering of competing values systems within an organization. In such a case, making the competing values explicit through job analysis may prove divisive and dysfunctional. These and other issues must be addressed in regard to his promising approach. The following Research Issues suggest some avenues for exploring the effectiveness of a value-based approach to job analysis:

**Research Issue 3a:** Given a dynamic organizational environment, value-based job analysis will increase the sense of a shared framework or culture among workers relative to a traditional job analysis.

**Research Issue 3b:** All else equal, value-based job analysis will be associated with a lower level of conflict in organizations than traditional job analysis.

### Selection

Employee selection is a critical HRM function. Hiring the best employees can make a substantial impact on bottom-line performance of the firm and, in the case of smaller operations, can make the difference between survival and bankruptcy. In order to maximize performance, selection systems have been...
tightly tied to the job. Specifically, assessment of job applicants is focused on the tasks and person characteristics identified in the job analysis. The closer the selection activities are based on and measure job-relevant skills and characteristics, the better or more valid it is assumed that the selection test will be. Individuals who exhibit the greatest performance or skills on the selection assessments are hired for a job. However, as presented previously, technology is changing the nature of work. These changes have implications for job analysis and, in turn, for employee selection.

Technology and the Selection Process

Technology has the potential for altering the process of selection. For example, computerized testing techniques have been available for some time. Computerized testing can provide much quicker assessments and streamlining of the selection process through creation of databases that can generate weighted scores across various assessments. Further, technology has the potential for significantly reducing the cost of selection. For example, assessment centers can be costly and time-consuming activities, but numerous studies have shown them to be valid (Bray, Campbell & Grant, 1979). The cost of this technique can be reduced by computerizing assessment center exercises and scoring, and by administering the process using technologies identical to those employed for distance learning.

Perhaps the most revolutionary process change affecting employee selection has been the greater presence of Web technology and online recruiting. Organizations have the option of disseminating hiring information and applications over the Web and thus potentially reaching a much wider audience than via using traditional means. Meanwhile, various sites such as Monster.com, HotJobs and others have become key ingredients in the job search process, both from the standpoint of employers and potential employees (Greenberg, 2000). In HR departments that implement selection technology to the fullest extent, there are genuine process gains to be made by integrating online searching with résumé tracking and database management. For example, HR departments using this technology have a greater potential to find qualified candidates, interview, evaluate, and hire them in a timely manner. HR may add value to a firm by filling positions quickly and appropriately, avoiding the productivity losses that occur when key positions are left open.

Selection technologies are revolutionizing this aspect of HR practice, but research is not keeping pace. More remains to be done from a research standpoint in terms of discovering what types of applicants are attracted to the online application process, and how they later perform in the organizations that hire them, versus individuals recruited through traditional means. Furthermore, while a great deal in industry and large organizations use Internet recruiting, little is known about how these practices. It is possible that Internet-based selection is less susceptible to applicant demographic characteristics (such as gender and economic outlook might influence test performance) in significant ways. The following Research Issue 4: Enhancing gains, such as faster and more efficient technology enhanced selection.

Technology: Implications for HRM

As Table 1 summarizes, work is changing. For example, content implications for HRM, tasks are changeable and worker requirements are variable. Focusing on these aspects leads to the conclusion that, therefore, be focused on breadth of skills and narrow skills that may soon be obsolete. To learn other skills may be impossible; a broad utility player may prove better. In addition, to the extent that the ability to work in the work environment, general knowledge, selection assessment. The specific abilities may be based on the particular job. However, a high level of cognitive ability (g) appears to generalize across all jobs (see e.g. Hunter, 1986), measured by summing the verbal and quantitative test. The degree of possession, regardless of the type of job. In general, individuals faster and can adapt quickly to change.

Workers with higher levels of general ability and most easily adapt any task from one task or role to another. Workers with general ability should be expected to have more diverse transitions. Workers with lower levels of general ability by focusing on a fixed role and greater general ability provides the
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ment of job applicants is focused on the job analysis. The closer the measure job-relevant skills and assumed that the selection test will perform or skills on the selection is presented previously, technologies have implications for job analysis.

Selection Process

The process of selection. For example, been available for some time. Much quicker assessments and streamlining of databases that can generate results. Further, technology has the potential of selection. For example, assessing activities, but numerous studies have been done. The cost of this is necessary assessment center exercises and using technologies identical to those that are not affecting employee selection technology and online recruiting activities, allowing hiring information and approaching a much wider audience than is possible online. For example, HR departments using online systems to pre-screen candidates, interview, and hire. HR may add value to a firm by avoiding the productivity losses that might occur if new hires are wrong.

This aspect of HR practice, but is not always done from a research perspective. Applicants are attracted to the organization that hire them, versus individuals recruited and selected in more traditional ways. Furthermore, while a great deal is known about the extent to which organizations use Internet recruiting, little is understood about the long-term success of these practices. It is possible that contingency factors such as industry type, applicant demographic characteristics, organizational culture, or the general economic outlook might influence Internet recruiting effectiveness in significant ways. The following Research Issue suggests a direction for research on this topic.

Research Issue 4: Enhancing selection with technology results in process gains, such as faster and more effective selection, relative to traditional, non-technology enhanced selection.

Technology and Selection Content

As Table 1 summarizes, work is changing in terms of both content and process. For example, content implications of shortened completion times include that tasks are changeable and worker responsibilities can be broader than otherwise. Focusing on these aspects leads to the conclusion that selection should, therefore, be focused on breadth of skills. For example, rather than focusing on narrow skills that may soon be obsolete, the breadth of skills and/or the capacity to learn other skills may be important ability assessments. In other words, a broad utility player may prove a more valuable hire than a specialist. In addition, to the extent that the ability to adapt and learn new skills is critical in the work environment, general ability would be expected to be an important selection assessment. The specific abilities important to a job, of course, depend on the particular job. However a reliable HRM finding is that general cognitive ability (g) appears to generalize and be important for job performance across all jobs (see e.g. Hunter, 1986). General cognitive ability is typically measured by summing the verbal and quantitative scores on a standard ability test. The degree of “g” possessed by workers is related to job performance, regardless of the type of job. In other words, people who can learn more and faster and can adapt quickly to changing conditions tend to be better performers.

Workers with higher levels of g should be quickest to learn additional skills and should most easily adapt and make necessary transitions when changing from one task or role to another. In contrast, workers with low levels of g should be expected to have more difficulty learning, adapting, and making transitions. Workers with lower levels of g may best add to organizational performance by focusing on a fixed task. An explanation for this effect is that greater general ability provides the capacity to successfully adapt to changing...
conditions. This is just the type of characteristic that would be expected to be a crucial ability in today's technology-driven workplace. It appears that g may be an important characteristic to assess in selection.

Before g is viewed as a panacea, limitations need to be recognized. For instance, general ability cannot be measured without error. Thus, any measure of g is imperfect. Further, the correlation between g and performance is certainly less than perfect and, while found to be statistically significant, may be less than one might expect. Additionally, ability does not imply motivation. Simply stated, being capable of learning and adapting doesn't necessarily mean there is willingness to learn and adapt. A fair summation concerning g in a technologically driven workplace is that it should be a positive but not necessarily sufficient characteristic for effective performance.

Similar to the rationale for general cognitive ability, the impact of technology on the workplace also suggests the desirability of a high level of emotional intelligence. Emotional intelligence is most often defined as an ability to recognize and manage emotion in oneself and in others (Goleman, 1995). The ability to handle stress brought about by shortened completion times and speed of change—the changing of tasks, uncertainty, the pace of work—should be greater among people with higher levels of emotional intelligence. Attributes that contribute to emotional intelligence include self-awareness, impulse control, persistence, confidence, empathy, and social skills (Goleman, 1998). While the concept of emotional intelligence can be viewed as a popular culture fad, there is evidence that it can have important influences on performance (see e.g., Stuller, 1997). For example, Salopek and Goleman (1998) reported that a training program designed to instill emotional intelligence competencies in stressful environments was responsible for an 18% increase in sales following training. Instruments are available for measuring emotional intelligence, and the incremental impact of this individual difference characteristic on performance in today's technologically driven work environments needs to be examined.

As with the above discussion of limitations concerning g, emotional intelligence is also not a stand-alone answer to workplace changes brought about by technology. At an operational level, the construct is measured with error. Further, smoothing of processes with higher emotional intelligence can only go so far if content capability isn't also present.

The speed of change introduced by technology leads to work content changes such as uncertain task life and constant training. In addition to breadth and adaptability mentioned above, tolerance for ambiguity and willingness to learn are two qualities that may be critical in fast-paced environments.

Increased communication capability offered by technology increases the importance of communication skills as an employee selection criterion. Further, greater communication capability takes a broader view of decision making for example, incorporating a variety of strategic factors may come into play. Rather than being focused on narrow skill selection capability can broaden the selection.

The impact of technology on employee characteristics. Work flattening, empowerment, and cross-functional, interpersonal skills. The ability to use written form, are crucial to successful technology-assisted work environments. The work process requires people to read. Today's work process calls for people to write for themselves. The following investigation selection investigations that may be occurring in work driven workplace:

Research Issue 5: Greater breadth reflected in selection measures will yield improved performance and outcomes.

PERFORMANCE

Workplace technology has changed the practice of performance management. In terms of process, more immediate feedback can be delivered of performance feedback through technology. Online, paperless, and more frequent performance appraisals packages have been developed. Appraisals and feedback and track worker productivity. In fact, digital performance reports raise the level of performance and ethical in the management of employee monitoring is the practice. Finally, the popularity of telecommuting increases productivity. We believe these changes will be a roadmap for managers in
greater communication capability may often mean that employees are able to take a broader view of decision factors and alternative perspectives. For example, incorporating a variety of opinions, operational constraints and strategic factors may come into play with increased communication capability. Rather than being focused on narrow technical issues, increased communication capability can broaden the scope of relevant issues for workers.

The impact of technology on the process of work also suggests needed employee characteristics. Work process features such as team structures, empowerment, and cross-functional integration underscore the importance of interpersonal skills. The ability to listen and to express, both in verbal and written form, are crucial to successfully conducting the work process in a technologically assisted work environment. In addition to interpersonal skills, the work process requires people who can work well with little structure. Today’s work process calls for people who can set goals and structure work for themselves. The following Research Issue is suggestive of the type of selection investigations that may be fruitful in regard to the technologically driven workplace:

Research Issue 5: Greater breadth and more mature interaction capability, as reflected in selection measures such as g and emotional intelligence, will yield improved performance effectiveness in terms of both process and outcomes.

PERFORMANCE MANAGEMENT

Workplace technology has changed both the process and content of performance management. In terms of process, managers now have the option of turning delivery of performance feedback into yet another opportunity to implement technology. Online, paperless, and off-the-shelf (or “shrink wrapped”) performance appraisal packages have the potential to revolutionize performance appraisal practice. Meanwhile, doing work itself can provide the actual content of performance management by allowing employers to electronically monitor and track worker productivity. Indeed, the growing ability to generate computerized performance reports raises timely questions about what is humane, benevolent, and ethical in the many work settings where electronic performance monitoring is the practice. Finally, the existence of virtual teams and the growing popularity of telecommuting introduce additional challenges for performance management. We believe these challenges provide HR researchers with an opportunity to generate prescriptions for practice that are both theory-based and will be a roadmap for managers in the high technology environment both now...
and in the future. In this case, research can address both process and content issues. The next sections reflect our assessment of these topics.

**Technology and the Performance Management Process**

Today’s manager has the option of using computer software to generate both performance appraisals and the narrative that accompanies them (Meyer, 2000). For example, managers can complete an on-line evaluation form on a firm’s intranet, forward it to the employee for comments, and then submit the form to a compensation professional for processing. Along the way, someone completing an evaluation may also, depending on the software package, have the luxury of merely pointing and clicking to generate appropriate text for the appraisal. Clearly, this kind of technology is appealing to managers who would rather be solving problems on the line than writing prose for the purpose of their employees’ career development. The appeal of appraisal technology is undeniable, particularly when it is possible to upgrade to more positive or downgrade to more negative narrative comments with only a mouse click.

A particular benefit of technology in the performance management process is the sheer magnitude of the databases available for generating prewritten text. One may conclude that an employee need not be short-changed in the appraisal process merely because his/her manager has mediocre literary skills. Thus, one positive outcome of appraisal technology may be that employees will receive more complete, richly developed and detailed feedback that will enable them to improve their performance. Research is needed to help answer whether this is the case, and whether individuals indeed perceive a difference between “canned” reports and human-generated ones. Obviously, if the distinction between custom and computer-generated feedback matters to some kinds of workers, or in some circumstances, then research should help define when and for whom this technology is most useful and when it might actually be detrimental.

There are other positive features inherent in appraisal technology. Aside from the potential for more descriptive narrative, many appraisal packages include a legal/language review that can evaluate the appraisal document for words that could lead to charges of discrimination or harassment. Some also allow for training needs to be pinpointed, creating valuable documentation in case of contested personnel actions (Slattery, 1991). Appraisal software packages can also determine whether protected classes of employees are being evaluated more harshly or more leniently than others. Ultimately, however, we caution that the bells, whistles, and attractive features of technology-enhanced appraisal programs will only be useful to the degree that their users are willing to follow through with individual feedback and opportunity to take action to remedy any deficiencies.

**Research Issue 6:** Appraisal effectiveness, and perceived usefulness of feedback, and commitment of the rater, the employee, and the appraisal.

**Technology and Performance Management**

Estimates vary regarding how much employee work is evaluated through computers. Recently, researchers have reported that up to greater than 26 million (Stahl, 1992) employees perform activities like listening in on the number of work units or keystrokes per hour and length of times a terminal is active, and employees do not always realize the possibilities for evaluating and controlling their performance. It seems clear that CPM may be a benefit to employers who substitute appraisal and increased productivity with growing acknowledgement that it can be done.

The objectivity inherent in reporting is the degree that an organization provides employees with data where individuals may benefit, while not assuming that all else is being held equal. There is no evidence that CPM bears these “system” issues into account unless workplace situational constraints are appropriately weighted. Likewise, CPM systems can track quantity and work quality or the number of units worked. This is analogous to discussions of worker performance. CPM ignores the contribution of worker collegiality, characteristics of the work environment, and employee satisfaction, but are nonetheless worth examining.

Another problem that can arise from the ever-watchful and ever-supervised workplace is...
address both process and content of these topics.

Management Process

Computer software to generate both accompanies them (Meyer, 2000), dine evaluation form on a firm's enments, and then submit the form ssoing. Along the way, someone ng on the software package, have o generate appropriate text for the appealing to managers who would writing prose for the purpose of appeal of appraisal technology is: to upgrade to more positive or ents with only a mouse click.

Performance management process for generating prewritten text. x be shortchanged in the appraisal mediocre literary skills. Thus, one ay be that employees will receive feedback that will enable them ded to help answer whether this d perceive a difference between es. Obviously, if the distinction edback matters to some kinds of arch should help define when and and when it might actually be appraisal technology. Aside from many appraisal packages include a appraisal document for words that harassment. Some also allow for durable documentation in case of Appraisal software packages can employees are being evaluated more uly, however, we caution that the 7 technology-enhanced appraisal at their users are willing to follow

Technology: Implications for HRM

through with individual feedback sessions, high-quality coaching, and commitment to take action to remedy any evidence of adverse impact. The following Research Issue captures an important facet of automated appraisal:

Research Issue 6: Appraisal effectiveness, such as satisfaction with appraisal and perceived usefulness of feedback, is more a function of the capability and commitment of the rater, than of the degree of technological support for appraisal.

Technology and Performance Management Content

Estimates vary regarding how many workers in the U.S. have some or all of their work evaluated through computerized performance monitoring (CPM). Recently, researchers have reported totals ranging from 6 million (Hawk, 1994) up to greater than 26 million (Staunton & Barnes-Farrell, 1996). These systems perform activities like listening in on sales or customer service calls, counting the number of work units or keystrokes completed per time period, the number and length of times a terminal is idle, and an individual's error rates. The possibilities for evaluating and controlling performance that CPM provides are obvious, and researchers, managers, and government entities have only begun to consider the human relations and ethical aspects of CPM systems. While CPM may be a benefit to employees because of increased objectivity of performance appraisal and increased potential for feedback (Earley, 1988), there is growing acknowledgement that it may also be questionable on ethical grounds.

The objectivity inherent in reporting performance data is only useful to the degree that an organization provides an equal playing field for workers. In cases where individuals may benefit from better training and materials, more advantageous office environments, or more collegial co-workers, one might assume that all else being held equal, their productivity would also be greater. There is no evidence that CPM systems as they are presently configured take these "system" issues into account. Indeed, reliance on CPM data may be unfair unless workplace situational constraints are measured and somehow appropriately weighted. Likewise, CPM systems often do not discriminate between work quantity and work quality or the process by which employees achieve results.

This is analogous to discussions of a result orientation vs. a process orientation. CPM ignores the contributions of positive interpersonal relations and worker collegiality, characteristics that may be completely distinct from productivity, but are nonetheless worth acknowledging.

Another problem that can arise with CPM adoption is that workers may feel over-watched and over-supervised, and that their privacy is invaded. Some
researchers have suggested that this may result in a dehumanizing and unsatisfying work environment that can lead to increased stress and health problems in those being monitored (Howard, 1985). Evidence for these outcomes appears to be equivocal, however, and this area is one that deserves more research attention. Perhaps one solution to the potential drawbacks of CPM as a performance management technique is a commitment to providing an opportunity to discuss monitoring output with managers and providing workers a chance to explain their results. Hawk (1994) and others have suggested that this may be one way to ensure that these techniques also promote an overall sense of procedural justice and fairness in the performance appraisal process. The following Research Issue may be an initial step in clarifying some of these issues:

Research Issue 7: Computerized performance monitoring will be associated with high performance only in situations where firms consider the impact of workplace situational constraints.

Performance Management in Virtual and Telecommuting Environments

Performance management presents special challenges when individuals work in non-traditional virtual team environments and/or telecommute. For example, distance workers who do not engage in face-to-face interactions with managers on a daily basis run an increased risk of not receiving feedback that could help them elevate work performance (Miller & Cardy, 2000; Shamir & Salomon, 1985). Absence or reduction in mentoring activities may also inhibit professional development and achievement (Cooper, Kurland & Bailey, 1999). Furthermore, managers may focus on outcome orientation at the expense of process concerns when evaluating workers in these settings, since process observations are more difficult to come by or non-existent. Lack of attention to process issues is especially problematic when jobs include a strong customer interaction component. Cooper et al. (1999) found that supervisors who were unable to observe telecommuters in action were less able to coach, counsel, and develop them for long-term organizational success.

In a recent review, Cascio (2000) suggested that a critical factor in the performance management of distance workers is an understanding of their responsibilities and objectives, and the chain of command. The next important step is development of specific, challenging and measurable goals so distance workers can stay focused on what is important. In his view, the ultimate objective of goals, measures, and assessment is to reduce uncertainty and allow telecommuters and virtual workers to know where they stand at all times.

Technology: Implications for HRM

If an individual’s status as a virtual or telecommuter changes the interpersonal network and productivity, then it might seem reasonable that performance management would change to include more frequent telephone contact or on-site observation of feedback that managers deliver. A performance management review with ongoing and direct feedback provides a dynamic and timely perspective on progress toward goals, acceptance of feedback, and an alignment with the appraisal process in the organization.

Although the above approach may seem the rational approach, if managers are suspicious and committed, it may be dysfunctional. Supervisors might increase their monitoring in an attempt to generate increased productivity and team performance and can produce negative reactions on the part of workers. In some cases, monitoring are the means used in a performance management system. In the empowered setting of the 21st century, managers are challenged with how to identify, with any great degree of certainty, what needs to perform. To pursue this tradition in performance management could easily be seen by telecommuters as a threat to their job security. To pursue traditional performance management techniques in the 21st century without making performance expectation clear and explicit may result in negative consequences for workers. Of course, if a worker demonstrates strong commitment to the organization, a focus on activity control may be appropriate.

The above discussion leads to the next Research Issue:

Research Issue 8: A performance management system for telecommuting environments, relative to a focus on activity control control.

CONCLUSION

Twenty-first century technology is dynamic and productive while at the same time using the leaders to monitor the performance of workers in these environments.
ult in a dehumanizing and unsaturated stress and health problems. Hence for these outcomes appears that deserves more. research attention. The challenge here is to explain why one way. In an overall sense of procedural appraisals for the following issues:

**Telecommuting Environments**

Challenges when individuals work in close proximity to their telecommute. For example, face-to-face interactions with managers, while receiving feedback that could help to improve, are often non-existent in telecommuting environments. The orientation at the expense of face-to-face interactions is more likely to occur in telecommuting environments, since this type of interaction is not always available. Lack of feedback may make it difficult for managers to determine whether the tasks are being completed. In some cases, supervisors may not be able to identify, with any great specificity, all of the tasks that a worker needs to perform. To pursue this traditional approach to performance management could be seen as a constraint, focusing on checklist items, and can actually degrade performance (see e.g., Cardy, 1997). What may be more effective in a virtual or telecommuting environment is a focus on outcomes. Explicit goals and timetables can make performance expectations clear, but not train the worker on how the goals are accomplished. This approach is consistent with an empowerment approach to workers and conveys trust in workers' abilities to manage the work process. Of course, if a worker demonstrates that she/he cannot achieve the goals, then a focus on activity control may be appropriate.

The above discussion leads to the following Research Issue.

**Research Issue 8:** A performance management focus on process control will result in lower performance and commitment in a virtual and telecommuting environments, relative to a focus on results.

**CONCLUSION**

Twenty-first century technology makes it possible to be increasingly productive while at the same time using fewer and fewer workers to accomplish the...
same tasks. Technology can have enormous influence not only on the content but also the process of work, as we have discussed here. This review has addressed some implications of technology for HRM, however we urge readers to remember the message underlying these ideas is one of strengthening and maintaining human resources as the unique competitive advantage firms possess. Technologies that are today both widely available and easily copied will not by themselves impart the unique advantage that an organization’s human resources can provide. However, we believe an adept combination of advanced technology and a talent for managing people within its context is a robust prescription for organizational success.

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