The Public Sector Human Resource Puzzle: Strategic Management of a Strategic Resource

Eugene B. McGregor, Jr., Indiana University

■ *In post-industrial societies, human resources assume a fundamental importance that changes the traditional personnel administration agenda from operations management to management of a strategic resource. The role of human capital in post-industrial public organizations is assessed together with the impact on public sector human resource management. Government personnel managers face a particular challenge associated with the strategic management of the public workforce and the management of a strategic resource.*

Something has happened to public sector human resource management (HRM). The role of human resources in modern production systems has changed the significance of the HRM field and the criteria by which successful practice is to be judged. A few prescient analysts (Drucker, 1968; Schultz, 1971; Boulding, 1966; Chorafas, 1968; Machlup, 1962; Simon, 1964; Denison, 1967) grasped early the significance of human resources in information-based societies and economies. Awareness of the strategic role of human resources in post-industrial societies and organizations has penetrated management literature and practice (Meyer, 1978; *Business Week,* 1979; Messner, 1986; U. S. Department of Labor; Douglas *et al.,* 1985; Fombrun *et al.,* 1984; Odiorne, 1984). In essence, both the resource itself and the practices which manage that resource have become pivotal to the success of many public sector enterprises.

The Significance of Human Resources

The strategic importance of human resources has resulted from massive changes in goods and services production systems. In earlier industrial systems, people were operationally or tactically significant with respect to final products. For example, people are operational resources in cases where they serve merely as common labor from which physical products or other routine services are derived (Cleveland, 1985, pp. 20-21). Early manufacturing and office operations were based on an industrial form of organization where specialized bundles of tasks, duties, and responsibilities defined positions into which people were placed to produce final products. Such organizations were appropriate subjects for industrial engineers, such as Frederick W. Taylor, whose observations about work methods and organizational efficiency (Taylor, 1947) were implicitly based on the widespread existence of simple repetitive routines and products (*Scientific American,* 1982).

People are *tactically* significant resources in advanced industrial situations where complex deployment decisions must be made to organize the production of complex manufactured goods and services. In the tactical case, human labor is more highly trained, more varied, less easily interchangeable, and subject to more complex organizational arrangements than in early industrial systems. Thus, variables such as human learning (Belkaoui, 1986), morale and human relations (Rothlisberger and Dickson, 1939), job design (Herzberg, 1966), supervisory style (McGregor, 1959; Likert, 1964), and organization design (Galbraith, 1973) define many human resource deployment options. The literature on contingency management (Fiedler, 1967; Lawrence and Lorsch, 1967; Hellriegel and Slocum, 1974) demonstrates how diverse are the designs that relate people and positions in productive organizations.

In post-industrial systems, the relationship between people and productivity changes once again. Productivity no longer refers to the manufacture of things (Cleveland, 1985). When final products are brute physical things or routine services (e.g., guards at the gate, custodial health care, line operations processing of criminal justice cases), the workforce is only an operationally or tactically significant resource. However, when the final products are "smart" products and complex, knowledge intensive services, human beings become *the* critical input (Reich, 1983, chap. XI; Brickner, 1981).

This finding is a discontinuity (Drucker, 1969) with earlier practice. It means, for instance, that productivity is increasingly based on the knowledge, skills, and abilities of the trained human intellect. In post-industrial systems, occupation refers less to one's position in an industrial (e.g., task specialized, standardized, high volume line operation) production process. Instead, occupation is increasingly fused to classes of work based on the knowledge and skill requirements of "knowledge jobs" (Drucker, 1969, chapters 12 and 13). Thus, theoretical knowledge replaces experimental learning and apprenticeship as the basis for productivity (Drucker, 1969). Research-based industries supplant natural resource and craft-based industries (Lambright, 1981, p. 314) to the extent that a knowledge of such things as symbolic logic, plasma physics, fiber optics, molecular and submolecular (Drexler, 1986) structures, and social science serves as the source of future productivity. Knowledge and the learned capacity to accumulate and manipulate new knowledge become the coin of the post-industrial realm.

The Human Capital Problem

The stock of human capacity to produce goods and services from that knowledge is termed "human capital" (Thurow, 1970, p. 15). The significance of human capital in explaining differential rates of national economic development has long been noted (Schultz, 1971; Dennison, 1962) but not well understood. The most recent evidence of rising human capital significance in the United States is found in the decline of traditional industries -- such as textiles, shoes, paper, machine tools, paper making, leather goods, graphic arts, and wood products -- where productivity depends upon some combination of natural resource endowments and trained skill possessed by those with lifelong experience manipulating the tools of a particular craft. It is also implied in the rise of research-based industries -- such as petrochemicals, electronics, information processing, pharmaceuticals, and aircraft and satellite industries -- where products are derived from organized research, new product invention, and industrial process improvement (Lawrence, 1985).

Human capital (HC) is difficult to understand because it takes many forms and is invisible. The human capacity to produce is locked inside people and differs from physical commodities in several respects. First, HC is a stock of productive capacity for which marginal investments in the stock of HC imply marginal increases in productivity (Schultz, 1971, p. 4). Investments can take many forms, however (Schultz, 1971, pp. 8-9). The list would include education, on-the-job training, manpower migration, health, and research and development activity. Little is known about the marginal returns to such investments, but anecdotal evidence suggests that enormous investments are being made in seeming anticipation of return. For example, private corporate training and development divisions run educational programs that, by one estimate, total $40 billion annually (Carnevale, 1983). Some corporations are notable for the magnitude of their HC investments, for instance (Odiorne, 1986):

- IBM in 1985 made an after-tax profit of $6 billion and spent $2 billion on training;
- The Bell "system" reported 1985 after-tax profits of $6 billion and spent $2.8 billion on training;

A full accounting would also note the investment in corporate learning centers as seen, for example, in the $79 million Xerox center in Leesburg, Virginia, and the $60 million Kodak center in Rochester, New York (Odiorne, 1986).

Second, HC is defined not by the number of available workers, but by what the workers are capable of doing (Schultz, 1971, p. 35). Worker "capability" is a multifaceted and extremely slippery concept. Theoretical formulations (Becker, 1975; Schultz, 1961; Thurow, 1970) suggest that human capital can be divided into general and specific categories. Thus, *general* human capital consists of the knowledges, skills, and abilities (KSAs) that are common to many jobs and employers. Second, *specific* human capital consists of KSAs that are uniquely preferred and valued by a single employer. In general, the task of human capital management is to manage the portfolio of KSAs against the changing requirements of jobs designed to fulfill the missions of agencies. Thus, managers need to be evaluated not only on the extent to which they meet nominal productivity goals, but also on "their stewardship regarding the enhancement of the human capital assigned to them" (Fossum *et al.*, 1986, p. 372).

A third characteristic of HC is that, unlike nonhuman capital (e.g., land, buildings, and financial assets), human capital is *embodied in people*. This means, in turn, that it is not a commodity for which property rights are exchanged for payment (Lamberton, 1971; Becker, 1964). It is more correct to say that knowledge and skill are assets distributed under a variety of mechanisms in which the receipt or purchase of an asset in no way reduces the asset for the donor or the seller (Schultz, 1971, p. 48). Knowledge and skill may be destroyed and allowed to deteriorate, but the losses and gains of HC often do not depend on property rights; they depend on stocks and flows of information and knowledge. Even the sale of proprietary knowledge (e.g., trade secrets and patents) involves the reproduction of knowledge and information rather than a transfer of title (Boulding, 1971, p. 23).

Several conclusions can be derived from the HC characteristics discussed above. For example, insofar as information and knowledge define human capital, pricing is difficult (Boulding, 1971, p. 23). This is because, notwithstanding fees paid for lectures, "hot tips," newsprint, and information services, a standard economic unit of knowledge is hard to define. Thus, there is no available "wit," "bit," or "chunk" to which prices can be attached, except for the mechanical aspects of intelligence marketed as computer hardware and software.

Second, it is difficult to give financial meaning to the stocks and flows of human capital, although the accounting profession is beginning to examine the subject (Flamholtz, 1986). However, the real value of human capital lies not simply in the numbers of information "bits" processed, but in the human capacities and insights facilitated by knowledge and information. Thus, human capital definitions must include the human capacity for *generating more knowledge and capacity* (Boulding, 1971, p. 24), which is accomplished through the research and development (R & D) process by which old knowledge is constantly being supplanted by new knowledge and new capacities. In this process, the new capital becomes the *exclusive property of the individual possessing it* (Boulding, 1971, p. 24).

This leads to a third tentative conclusion. Since human capital depends on information exchange, HC is not instantly transferrable. It cannot be conveyed from a seller to a buyer at the precise moment of transaction. It can be acquired only by vesting knowledge and skill in a person *over time* (Sharp, 1982). The conclusion is implied by the proposition that people cannot be separated from the HC they possess. Only reproduction or sharing of capital is possible (Schultz, 1971, pp. 48-49). Knowledge codified and stored in hard copy or magnetic disk, for example, remains a valueless asset until the human user acquires and stockpiles the value potential of a basically inert resource.

Time also explains how HC depreciates, for unlike nonhuman capital stocks, human capital does not become consumed or worn out with use. Thus, human capital depreciates in two ways: first, idleness and lack of practice time cause human capital to degenerate; second, human capital can become obsolete relative to other knowledge. In the first case, skills deteriorate through lack of practice; for instance, SWAT teams, musicians, surgical teams, and aerospace workers require constant practice to keep skills sharp. In the second case, obsolescence derives from a failure to keep up with the pace at which discovery and invention redefine knowledge boundaries and relevant knowledge, skills, and abilities (KSAs) (Fossum *et al.*, 1986, p. 363). What might be done about the continuous threat of workforce obsolescence is at the core of the current human resource management problem.

Government as Post-Industrial Workforce

The extent to which government service delivery is representative of post-industrial production systems has never been examined. To answer the question requires statistical reporting not now available for any level of government. Some clues can be gleaned from available sources. For example, the product mix of more than 13 million state and local employees is only crudely classified in Table 1. Yet, even cursory examination suggests that the vast majority of state and local employment is actually or potentially knowledge-based work. For example, over 65 percent of employment is involved in producing education, health, and welfare products. These are areas dominated by human service professionals. The remainder of state and local employment cannot be more precisely described because of data limitations about public products and the way final products are produced.

TABLE 1
State and Local Government Employment by Function: October 1986

	1986 (Number in thousands)	Percentage of Total
Total Employment (Full & Part Time)	13,913	100.0
Education Total	7,357	52.9
Higher Ed.	2,049	14.7
Instructional	704	5.1
Element & Second	5,090	36.6
Instructional	3,375	24.3
Other (incl. libr)	218	1.6
Social Serv./Income Maintenance (Welfare, Hosp)	1,925	13.8
Transportation	591	4.2
Public Safety (Incl Corrections)	1,406	10.1
Environ & Housing	790	5.7
Gov't Administration	938	6.7
Local Utilities	426	3.1
Other	481	3.5
TOTAL NONEDUCATION EMPLOYMENT	6,556 6,451	47.1 46.7

Source: *Public Employment in 1986* (Washington: U.S. Bureau of the Census, GE-86-1), p. 3

All governments have traditionally employed large numbers of knowledge workers, however. For example, as early as 1960, the civilian workforces of federal, state, and local government employed 16 percent of the national labor force. Approximately two-fifths of the government workforce (including teachers) was employed in administrative, professional, and technical (APT) occupations. This two-fifths accounted for more than two-fifths of all APT opportunities in the nation at a time when employment in APT occupations covered only one-fifth of the total labor force. The rich occupational mix has meant perforce that government could only employ a much smaller proportion of labor, trades and crafts, machine operatives, and farmers and miners than the rest of the nongovernmental economy (National Manpower Council, 1968).

Federal employment data are more accessible but only partially digestible. For example, federal employment data are not organized according to major product lines. Nor is the federal personnel classification system of "series" and "groups" amenable to an occupational ordering of employment data (McGregor, 1985). One clue about the knowledge-intensive nature of federal employment is found by recording the employment that produces knowledge products. This can be done by counting employment in R & D agencies where new knowledge and know-how are the products and in those agencies whose chief products include statistics, analyses, and information services.

The Appendix displays the distribution of federal full-time equivalent employment in bureaus and agencies whose main products are knowledge products. The table both underestimates and overestimates the extent to which knowledge products characterize federal work. The underestimation occurs because many line production agencies not included in the Appendix provide "smart" products and services. Thus, engineers in the civilian corps of the Army Corps of Engineers, lawyers and accountants in the Federal Bureau of Investigation, linguists and computer programmers in the National Security Agency, historians in the National Park Service, foresters in the Forestry Service, and so forth are not counted.

The overestimation occurs because not all officials employed in agencies shown in the Appendix work in knowledge-intensive *occupations* or positions. Some employees at even the most sophisticated R & D facilities must provide security, clean the buildings, cut the grass, and perform routine support tasks and duties. While it is true that many support functions can be contracted out, it is a safe bet that much employment in the more than 120,000 employees identified in the Appendix involves less than high-tech work. The observation is an *occupational* generalization about the skill mix of persons required to produce a limited range of final *products*. Only a personnel information system that accurately distinguishes among

classes of products, positions, and persons can establish the extent to which knowledge-intensive *products* also employ people in low tech *positions* and the extent to which low tech *products* employ high tech skills (a characteristic of *persons*) required to support the analysis, design, and maintenance of highly sophisticated production processes.

Notwithstanding limitations, what is clearly revealed in the Appendix is that knowledge production consumes a sizable share of federal civilian employment. By simple count, well over 11 percent of the federal workforce is so engaged. In some cases, such as the Departments of Commerce and Energy, the vast majority of the workforce produces *only* knowledge products. In all of the cases listed, the quality of the products derives directly from the human capital stored in a largely professional workforce.

Thus, the federal workforce is highly professionalized by comparison to the national distribution of occupations. For example, engineers and scientists are a larger *proportion* of the federal workforce than they were of the private non-manufacturing (i.e., service-based) sector. In 1980 the 100,000 federal engineers accounted for nearly four percent of total federal employment in 1980, while 257,000 engineers employed in the private service sector accounted for less than one-half of one percent of total national employment (Rosen, 1985, p. 27).

Strategic Management of a Strategic Resource

In briefest terms, the rise of human capital in public production systems merely establishes that public workforces are strategic assets rather than simple production inputs. In the case of knowledge-based outputs, people are the product itself. Human resources, therefore, belong on the balance sheet side of public enterprise, where assets and liabilities are compared, as well as on the current income and expenses accounts where people are treated as a cost (Flamholtz, 1985; Odiorne, 1984). That public and private enterprises have been slow to convert the human capital insight into acceptable standards of human resources accounting (Flamholtz, 1986; Odiorne, 1984, p. 8) does not destroy the power of the human capital insight.

A significant puzzle remains, however. The term "strategic" has multiple uses. One interpretation refers to the *strategic management* of an important resource. Another refers to the management of a *strategic* resource. A third interpretation refers to the *strategic management* of a *strategic* resource, or S^2 in the terminology here. Each interpretation of the term, "strategic," produces a very different meaning for public sector human resource management.

Strategic Management of the Public Workforce

The strategic management of public and private enterprise has a literature too vast to track here. What is interesting is that the appearance of a literature on strategic human resource management (Odiorne, 1984; Douglas, Klein, and Hunt, 1985; Fombrun, Tichy, and Devanna, 1984) roughly parallels the realization that management in turbulent environments requires a reexamination of the basic purposes and missions underlying modern organizations. Both public and private American managers have been confronting the vulnerabilities of global recession and economic turbulence, competitive threats to agency and firm existence, shifting client demands for services, and uncertainty about the premises of organizational existence (Fombrun *et al.*, 1984, chaps. 1-3; Douglas, 1985, chap. 4).

How does strategic human resource management (HRM) facilitate thinking about the public workforce? No single strategic model exists. On the contrary, there are several models. One approach, for example, leads to a strategic view of "the human resource cycle" (Devanna *et al.*, 1984, pp. 33-51). Thus, strategic HRM is exhorted to take a design-oriented view of corporate and agency selection, appraisal, reward, and development systems. The result is an attempt to integrate personnel operations with overall strategic planning and management.

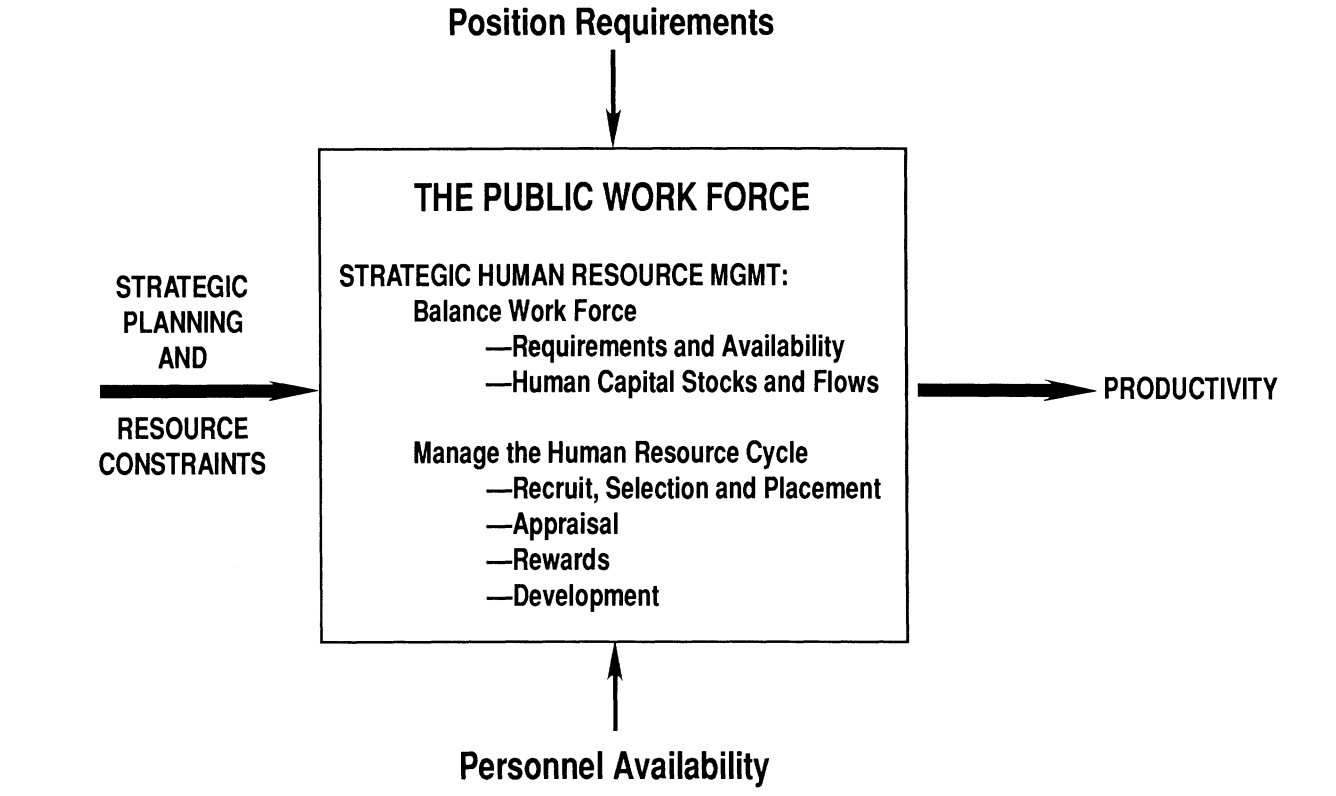
A second perspective treats strategic HRM as the management of a capital asset portfolio (Odiorne, 1984). In this analysis the strategic task is to make investment decisions that maximize the growth of human capital. Thus, high performing "stars" and "workhorses" must be identified and receive proper investments of training and development. By contrast, "problem employees" and "deadwood" must be weeded out, although the how and where of the weeding is left to the reader's imagination.

Yet a third approach (Douglas *et al.*, 1985) develops a "multiple role perspective" (MRP) as the point of departure. The MRP represents a multifaceted examination of human resources that is required when managers attempt to achieve a strategic fit between the external environment and internal deployments of corporate or agency resources (Douglas *et al.*, 1985, chap. 4). Thus, the ability to view human resources from the competing perspectives of chief executive, personnel director, employee, shop steward, first-line supervisor, and financial manager enables strategic managers to establish links between strategic, tactical, and operational levels of management (Douglas *et al.*, 1985, pp. 130-133).

What can a strategic management approach to the public workforce possibly mean? As Figure 1 shows, an indisputable conclusion is that strategic human resource management ties the management of people directly to strategic agency planning (Nkomo, 1988; Walker, 1980). This means managing the *availability* of people (i.e., the supply side) through the human resource management cycle -- selection, performance appraisal, compensation and rewards, and training and development -- in ways that meet the strategic operating *requirements* (i.e., the demand side) of agency programs, productivity goals, and resource constraints.

Several conclusions follow from this definition. First, the strategic HRM exercise goes far beyond the bounds of traditional personnel operations management. Indeed, the strategic view envisions the continuous experimentation and redesign of parts of operating personnel systems (i.e., the human resource cycle) in the interest of achieving productive balances of requirements and availability (Devanna, Fombrun, and Tichy, 1984). That this involves multiple roles associated with line management, resource

FIGURE 1
Strategic Human Resource Management



allocation (i.e., budgeting), position design and management, and personnel management is clear. Equally clear is that strategic HRM involves the guardianship of both stocks and flows of human capital. In short, strategic HRM strives to manage the interactions among goals, resource constraints, position allocations, workforce skills and competencies, and final products.

Management of a Strategic Resource

Strategic HRM is very different, however, from the management of a *strategic* resource. In the former case, the concern is with discerning the effects of environmental change (i.e., the strategic environment) on agency HRM policies and programs. In the latter case, however, people are *the* resource without which agency productivity becomes impossible.

When do people become a *strategic* resource? When human capital is truly strategic, public agency goals are fused to the products produced by human capital. The fusion of person, position, and product can occur in two ways: any time that the "product" is knowledge-based; and any time that production depends upon a "smart" production process. Public sector examples abound and are summarized in Table 2.

In the case where human capital cannot be separated from the output, people *are* the product. This obviously occurs in research and development cases where, respectively, new knowledge and invention exist as human understanding and know-how possessed either by the researcher or by the persons in whom the researcher has invested time to pass on knowledge and information. Another example of the fusion of final product and human capital is found in the many capacity-building programs achieved through workforce training and development. In effect, the product is a readiness condition in which people know how to deal with a public threat or problem; much of national security, emergency preparedness, and adaptation to economic recession depends on trained readiness. A third example of the congruence of human capital and final product is found in the knowledge-intensive human services; thus, the cases of public health, education, and social services are all instances of final products being defined by, respectively, a health professional's diagnostic skill, the teacher's subject matter competence, or the social worker's knowledge of community support networks.

A second way that people become strategic resources derives from the attempt to develop "smart" production processes. Thus, people are strategic in instances where the speed of organizational learning captures a significant advantage in meeting threats, capturing markets, and providing client services (Belkaoui, 1987; Comfort, 1986). People are strategic to production processes when they are used to develop mechanized production systems, such as are found in applications of artificial intelligence to public service provision (Karna, 1985; Hadden, 1986). Finally,

TABLE 2
Human Resources (HR) as Strategic Resources

Production Stage	Examples	Illustrations
HR as both input and output	Research (i.e., new knowledge)	NIH, NIMH, space and earth sciences labs
	Development (i.e., prototypes)	New satellites, new serums
	Training and development	Readiness, preparedness
	Knowledge-intensive services	Health, education, social services
HR as "smart" production process	Learning curve	Aircraft procurement
	Automated production	Permit issuance
	Intelligent job shop production	Human services

people can be strategic to operations processes when judgmental interruptions in production are required to accommodate the product to client need; examples are found in job shop service provision, where, for instance, case management services are tailored to meet individual client needs and requirements. Smart job shop production stands in contrast to line operations production where cases are processed only with regard to categorical formulas that can often be automated (Rosenthal, 1982).

The Case of the Double Strategic

There is also a third meaning of strategic HRM: strategic management of a strategic resource (S^2). The S^2 condition obtains whenever public managers attempt to manage strategically a workforce in which human capital is both a strategic input to production *and either* a strategic component in the production process, *or* an output, *or* both. When must public managers engage in S^2 management? Several examples illustrate the conditions under which S^2 management is required.

- When the "product" shifts from time-on-task to a knowledge-based service in areas such as health, education, and social service (Drucker, 1969) as when, for example, prisons, mental illness, and mental retardation facilities shift from custodial, chronic care services to acute care provision or "active treatments" required by courts and third party reimbursement systems.
- When knowledge-intensive scientific and technical excellence must be maintained as a means of controlling programs developed by a contractual workforce (Trento, 1987, p. 54);
- When the development of high-technology enterprises depends on managing the mobility of high skill human resources (Neihaus, 1985).
- When agency strategy depends on digital communications skills and computing (Keen, 1986) either using telecommunications for competitive advantage or implementing large-scale public programs in which dense streams of data are generated among public service arrangers, providers, payers, and clients.
- When the slope of a learning curve is essential to program success, as seen, for example, in the ability of public agencies to react to special circumstances, to design and routinize new production technologies, and to acquire products and services from private sector contractors (Belkaoui, 1986).

In short, S^2 management is required whenever the strategic goals of an agency are fused to the human capital required to produce desired results.

How to develop the S^2 agenda is very much a current issue that should engage public management researchers for years to come. At a minimum, three topics are worth consideration.

Topic #1 Flexible personnel policies are required when S^2 management occurs. The theoretical conclusion suggested above is that an extraordinary amount of personnel system experimentation will be required to find the designs compatible with the knowledge intensive systems of public service required by modern public policy.

The simple facts of life are that the post-industrial shift poses a direct challenge to current public personnel practice. For more than 75 years, position classification, rules of access, and the vesting of rank and pay in positions have sustained a guardianship of the merit system from political meddling. The empowerment of administrative staff professionals who applied specialized position management technologies and merit rules and regulations to a largely industrial workforce was well matched to the production requirements of a government whose products required long run, standardized production processes staffed by large numbers of people performing specialized, repetitive tasks (Colvard, 1987, p. 3).

How are civil service workforces to be managed when position-based industrial organization declines and is replaced, instead, with a semiautonomous performance of work by persons based on personal knowledge and skill (Benveniste, 1987)? Government information systems do not reveal the extent of occupational change, but case evidence suggests that even the vast clerical bureaucracies have been reorganizing work processes and automating clerical functions (Brock, 1984, pp. 165-181; Rosen, 1985). The operating reality is that government bureaucracies are no longer staffed by armies of "green eye shade" clerks and subalterns (Rosen, 1985, p. 24). Thus, it is a reasonable conclusion that government workforce managers have been continuously adapting the public workforce to the new post-industrial realities described above.

One indicator of the dimensions of civil service change may be found in the Title VI demonstration projects of the Civil Service Reform Act of 1978. The title has been little used, however, and thus public managers have only limited opportunities to learn about recent attempts to add flexibility to a position-based civil service system. To date, only three experiments have been authorized: the Naval Weapons Center (NWC) in China Lake, the Naval Ocean Systems Center (NOSC), and the McClellan Air Force Base. The two Navy experiments are the oldest, having begun in July 1980, and have been extended to September 1990 (cf. H. R. 4336; *Federal Register,* 1980, 1981, 1982). The McClellan experiment was begun July 1987 (*Federal Register,* 1987).

All three experiments aim at building workforce management flexibility into the civil service in four basic areas: simplifying position classification standards and descriptions; developing flexible compensation systems; streamlining performance appraisal systems; and designing performance-based reward systems. Flexibility is precisely the implication of an S^2 approach to workforce management in which different goals and different configurations of human capital are required for program success. Curiously, in this age of workforce discontinuity, more demonstration experiments have not been proposed under Title VI.

Topic #2 Public managers under constant productivity pressure will strive to develop smart production processes and apply microelectronic technologies to the business of public management. The effects of production technology shifts on public organizations are not well understood (Pennings and Buitendam, 1987).

It is too early to speculate about the effects of production technology changes on workforce decision making. Clearly, to the extent that production process improvements can leverage large productivity increases, the value of the human asset leaps dramatically. Improvements will be attempted in the areas of changing the slopes of learning curves, automating production systems, and developing intelligent and increasingly fast reactions to case management problems. In cases where human assets combined with technology generate quantum leaps in productivity based on high-tech production processes, the personnel services wage bill can leverage large increases in productivity. Indeed, pay levels for public personnel can be dramatically increased because the productivity value of a comparatively small and smart workforce is high relative to total current cost that invests large sums in highly automated production systems (Roosevelt, 1987). Accommodating such changes represents a great challenge to public S^2 management.

Topic #3 The capacity of individuals and organizations for learning and adaptation to rapidly changing public policy environments has become the strategic challenge of the post-industrial order (Belkaoui, 1987; Fossum *et al.,* 1986). How learning can be encouraged and obsolescence prevented has become a strategic concern.

Precisely how the many varieties of human capital can be created, at what rates, and for what types of people remains a mystery. Time is the key variable. Human capital accumulation depends on learning, and human learning requires time to practice, absorb, tinker, invent, discover, read, imagine, and converse about new products and better ways to do things. Public workers need time to ransack libraries and information services. In some cases, time will have to be packaged in terms of teams working together. In other cases, time will have to be augmented by equipment and travel grants. In still other cases, time is needed to acquire new skills.

Furthermore, time can be created both directly and indirectly. Direct management of time occurs when schedules, sabbaticals, and shifts are arranged to maximize the time available to maintain workforce knowledge and skills. Time is directly preserved through applications of labor saving equipment. Time can also be conserved in the way that organization structures, cultures, and work groups are designed and managed.

Less recognized is that time can be created indirectly. For example, arrangements of physical space, communications networks, transportation systems, and health maintenance are all ways to "create" time. This is done by reducing the unnecessary claims on time made, respectively, by office architecture, limited communications trunks, commuting distances, and disabling morbidity and mortality rates that impair or reduce the productive years of a working life. Conserving time for human capital investment remains one of the critical features of S^2 management.

This is not a "soft" research agenda. It involves an intense search for organizational and human resource management forms that can survive in a relentlessly challenging world (Hudson, 1987). The private sector is already consumed by the human resource requirements of the competitiveness challenge. It is inconceivable that public managers can remain immune to the public demand that public administration play its part in the design and operation of sturdy, adaptable, and smart systems for carrying out public work. The informed management of people as a strategic resource is at the center of today's post-industrial transformation.

* * *

Eugene B. McGregor, Jr., is Professor of Public and Environmental Affairs at Indiana University.

Note

This article is based on research supported by the National Institute of Mental Health and the State of Indiana Department of Mental Health. The views expressed are those of the author and not those of any sponsoring agency.

References

Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (New York: National Bureau of Economic Research, 1964).

Ahmed Belkaoui, *The Learning Curve: A Management Accounting Tool*

(Westport, CT: Quorum Books, 1986).
Guy Benveniste, *Professionalizing the Organization* (San Francisco: Jossey-Bass, 1987).
Kenneth E. Boulding, "The Economics of Knowledge and the Knowledge of Economics," *American Economic Review,* vol. 56 (1966), pp. 1-13.
William H. Brickner, "Innoventures: A Case for Public Policy Reforms," *Columbia Journal of World Business,* vol. 16 (Fall 1981), pp. 77-90.
Jonathon Brock, *Managing People in Public Agencies* (Boston: Little, Brown, and Company, 1984).
Business Week, "Low-Tech Education Threatens the High-Tech Future" (March 28, 1983), pp. 95 and 98.
Business Week, "The Shrinking of Middle Management," (April 25, 1983), pp. 54-80.
Business Week, "Personnel Widens Its Franchise," (February 26, 1979), pp. 116 and 121.
Anthony P. Carnevale, *Human Capital: A High Yield Corporate Investment* (Washington: American Society for Training and Development, National Issues Series, 1983).
D. N. Chorafas, *The Knowledge Revolution* (London: Allen & Unwin, 1968).
Harry Clark, *Planning Your Staffing Needs* (Washington: U. S. Civil Service Commission, 1977).
Harlan Cleveland, "The Twilight of Hierarchy: Speculations on the Global Information Society," *Public Administration Review* (January/February 1985), pp. 185-195.
James E. Colvard, "Federal Managers and the Civil Service Simplification Act," *The Federal Managers Quarterly* (January 1987), p. 21.
James E. Colvard, "The Office of Personnel Management Workforce Agenda," paper prepared for the National Conference on Public Administration, Boston, MA (March 30, 1987).
Louise K. Comfort, "Action Research: A Model for Organizational Learning," *Journal of Policy Analysis and Management,* vol. 5, no. 1 (Fall 1985), pp. 100-118.
Jean Couturier *et al., Government Labor Markets* (Evanston, IL: Northwestern University, 1979).
E. F. Denison, *Why Growth Rates Differ: Postwar Experience in Nine Western Countries* (Washington: The Brookings Institution, 1967).
John Douglas, Stuart Klein, and David Hunt, *The Strategic Managing of Human Resources* (New York: John Wiley & Sons, 1985).
Peter S. Drucker, *The Age of Discontinuity* (New York: Harper and Row, 1968).
Federal Times, "New Pay Bill Aims at Turnover" (April 27, 1987), p. 12.
Federal Register, "Proposed Demonstration Project: An Integrated Approach to Pay, Performance Appraisal, and Position Classification for More Effective Operation of Government Organizations," vol. 45, no. 77 (Friday, April 18, 1980), pp. 26505-26543.
Federal Register, Amendment of demonstration project, vol. 46, no. 144 (Tuesday, July 28, 1981), pp. 38660-38661.
Federal Register, Amendment of demonstration project, vol. 47, no. 186 (Friday, September 24, 1982), pp. 42306-42312.
Federal Register, Proposed Demonstration Project -- PACER SHARE: A Federal Productivity Enhancement Program, vol. 52, no. 137 (Friday, July 17, 1987), pp. 27132-27169.
Fred Fiedler, *A Theory of Leadership Effectiveness* (New York: McGraw-Hill Book Company, 1967).
Eric G. Flamholtz, *Human Resource Accounting,* 2d ed. revised and expanded (San Francisco: Jossey-Bass, 1985).
Charles Fombrun, Noel M. Tichy, and Mary Anne Devanna, *Strategic Human Resource Management* (New York: John Wiley, 1984).
John A. Fossum, Richard D. Arvey, Carol A. Paradise, Nancy E. Robbins, "Modeling the Skills Obsolescence Process: A Psychological/Economic Integration," *Academy of Management Review,* vol. 11 (April 1986), pp. 362-374.
J. R. Galbraith, *Designing Complex Organizations* (Reading, MA: Addison-Wesley, 1973).
Harold Geneen, *Managing* (New York: AVON Books, 1984).
Albert Gore, Jr., "China Lake," *The Federal Managers Quarterly* (January 1987), pp. 22-23.
Peter J. Grace, *War On Waste* (New York: Macmillan, 1984).
Susan G. Hadden, "Intelligent Advisory Systems for Managing and Disseminating Information," *Public Administration Review,* vol. 46 (November 1986), Special Issue, pp. 572-578.
Don Hellriegel and John W. Slocum, Jr., *Management: A Contingency Approach* (Reading MA: Addison-Wesley Publishing Company, 1974).
Fred Herzberg, *Work and the Nature of Man* (Cleveland, OH: World Publishing Company, 1966).
Hudson Institute, *Workforce 2000* (Indianapolis, IN: The Hudson Institute, 1987).
Kamal Karna, ed., *Expert Systems in Government Symposium* (Washington: IEEE Computer Society, 1985).
Peter G. W. Keen, *Competing in Time: Using Telecommunications for Competitive Advantage* (Cambridge, MA: Ballinger Publishing Company, 1986).
D. M. Lamberton, ed., *Economics of Information and Knowledge* (Penguin Books, 1971)
Robert Z. Lawrence, *Can America Compete?* (Washington: The Brookings Institution, 1985).
Paul R. Lawrence and Jay Lorsch, *Organization and Environment* (Cambridge, MA: Harvard Graduate School of Business Administration, 1967).
Charles H. Levine, "The Quiet Crisis of the Civil Service: The Federal Personnel System at the Crossroads," Occasional Paper No. 7 (Washington: National Academy of Public Administration, December 1986).
Rensis Likert, *New Patterns of Management* (New York: McGraw-Hill Book Company, 1961).
Frank Lynn, "An Investigation of the Rate of Development and Diffusion of Technology in Our Modern Industrial Society," Report of the National Commission on Technology, Automation and Economic Progress (Washington: U.S. Government Printing Office, 1966).
Fritz Machlup, *The Production and Distribution of Knowledge* (Princeton, NJ: Princeton University Press, 1962).
Douglas McGregor, *The Human Side of Enterprise* (New York: McGraw-Hill 1960).
Eugene B. McGregor, Jr., "The Grace Commission's Challenge to Public Personnel Administration," in Charles H. Levine, ed., *The Unfinished Agenda for Civil Service Reform: Implications of the Grace Commission Report* (Washington: The Brookings Institution, 1985), pp. 43-68.
Howard Messner, "The Environment Inside EPA," *The Bureaucrat* (Spring 1986), pp. 55-59.
Herbert E. Meyer, "Personnel Directors Are the New Corporate Heroes," *Fortune* (February 1978), pp. 84-88.
Summer Myers and Donald G. Marquis, *Successful Industrial Innovations* (Washington: National Science Foundation, NSF 69-71, 1969).
National Alliance of Business, *Employment Policies: Looking to the Year 2000* (NAB, February 1986).
National Manpower Council, *Government and Manpower* (New York: Columbia University Press, 1964).
Richard J. Neihaus, ed., *Human Resource Policy Analysis: Organizational Applications* (New York: Praeger Special Studies, 1985).
Stell M. Nkomo, "Strategic Planning for Human Resources -- Let's Get Started," *Long Range Planning,* vol. 21 (February 1988), pp. 66-72.
George S. Odiorne, *Strategic Management of Human Resources* (San Francisco: Jossey-Bass, 1984).
George S. Odiorne, "Strategic Management of Human Resources for the 80s and 90s: The Concept of HRD and Its Key Role in Public Mental Health Agencies," (Keynote Address at the Eighth National Assembly of State Mental Health Human Resource Development Programs, Portland, Maine, August 27-29, 1986).
Johannes M. Pennings and Arend Buitendam, *New Technology as Organizational Innovation: The Development and Diffusion of Microelectronics* (Cambridge, MA: Ballinger Publishing Co., 1987).
Tom J. Peters and R. H. Waterman,Jr., *In Search of Excellence: Lessons*

from America's Best-Run Companies (New York: Harper & Row, 1982).
James B. Quinn, *Strategies for Change: Logical Incrementalism* (Homewood, IL: Richard D. Irwin, 1980).
Simon Ramo, "SMR Forum: American's Technology Slip - A New Political Issue," *The Sloan Management Review,* vol. 21 (Summer 1980), pp. 77-85.
Robert B. Reich, "Why the U.S. Needs an Industrial Policy," *Harvard Business Review,* vol. 60 (January-February 1982), pp. 74-81.
Robert B. Reich, *The Next American Frontier* (New York: Penguin Books, 1983).
Howard Rosen, *Servants of the People: The Uncertain Future of the Federal Civil Service* (Salt Lake City, UT: Olympus Publishing Company, 1985).
F. J. Roethlisberger and William J. Dickson, *Management and the Worker* (Cambridge: Harvard University Press, 1939).
The Roosevelt Center, *The High Flex Society.* See especially Rogan Kersh, "The New Office and Factory," working paper (September 1987).
Stephen R. Rosenthal, *Managing Government Operations* (Glenview, IL: Scott, Foresman, 1982).
Theodore W. Schultz, *Investment in Human Capital: The Role of Education and Research* (New York: The Free Press, 1971).
Scientific American, issue on "The Mechanization of Work" (September 1982).
Second Public Management Research Conference, *The Changing Character of the Public Workforce: Conference Report* (Washington: U.S. Office of Personnel Management, March 1981, OPM document #134-59-7).
Herbert A. Simon, "Decision-Making As An Economic Resource," in L. H. Seltzer, ed., *New Horizons for Economic Progress* (Detroit, MI: Wayne State University Press, 1964).
Clifford Sharp, *The Economics of Time* (New York: John Wiley & Sons, 1981).
Bruce L. R. Smith, *The New Political Economy: The Public Use of the Private Sector* (New York: John Wiley, 1975).
Lyle M. Spencer, Jr., *Calculating Human Resource Costs and Benefits: Cutting Costs and Improving Productivity* (New York: John Wiley, 1986).
Lester Thurow, *Investment in Human Capital* (Belmont, CA: Wadsworth, 1970).
Noel M. Tichy, C. J. Fombrun, and M. A. Devanna, "Strategic Human Resource Management," *The Sloan Management Review,* vol. 23 (Winter 1982), pp. 47-61.
Joseph J. Trento, *Prescription for Disaster* (New York: Crown Publishers, 1987).
Eric L. Trist, "The Sociotechnical Perspective," in Andrew Van de Ven and William Joyce, eds., *Perspectives on Organization Design and Behavior* (New York: Wiley & Sons, 1981).
U. S. General Accounting Office, *General Management Review Issue Area Plan* (Washington: GAO, August 1986).
U. S. Department of Labor, "Human Resource Planning" and "Position Reference Packages" (Washington: Office of the Assistant Secretary for Administration and Management, Directorate of Personnel Management, undated).
U. S. Office of Personnel Management, *Management Reports I - IX: Evaluation of the Navy Personnel Management Demonstration Project* (Washington: OPM, Research and Demonstration Division, 1984 to 1986).
James Walker, *Human Resource Planning* (New York: McGraw-Hill, 1980).
Larry J. Wilson, "The Navy's Experiment with Pay, Performance, and Appraisal," *Defense Management Journal,* vol. 21 (Washington: U. S. Department of Defense, Third Quarter 1985), pp. 30-40.
Dale Zand, *Information, Organization, and Power* (New York: McGraw-Hill, 1981).

APPENDIX
Federal Full-Time Equivalent Civilian Employment in Selected Information and Knowledge Intensive Agencies, 1986 Actuals

	Employment No.	Information and Knowledge Agency Employ	Percentage of Dept./Agency	Percentage of Total Federal	Percentage of Civilian
TOTAL CIVILIAN EXECUTIVE BRANCH	2,853,715				
CIVILIAN AGENCY EMPLOYMENT	1,072,789			37.60%	100.00%
DEPARTMENTS					
Agriculture	102,997				
Agric Research Service		7,996			
Coop. State Research Service		130			
Nat'l Agric. Library		185			
Econ. Research Service		842			
World Agric. Outlook Board		27			
TOTAL		9,180	8.90%	0.30%	0.90%
Commerce	32,321				
Bureau of Census		2,809			
Econ. & Statistical Analysis		513			
Nat'l Oceanographic & Atmos. Administration		11,321			
Patent & Trademark Office		3,180			
National Bureau of Standards		1,749			
Nat'l Telecom. & Information Administration		213			
TOTAL		19,785	61.20%	0.70%	1.80%
Education	4,526				
[Mixed, too difficult to break out noninformation and knowledge agencies]		4,526	100.00%	0.20%	0.40%
Energy	16,193				
[Large components of R & D, data collection, planning]		16,193	100.00%	0.60%	1.50%

APPENDIX (CONTINUED)

	Employment No.	Information and Knowledge Agency Employ	Percentage of Dept./Agency	Percentage of Total Federal	Percentage of Civilian
Health and Human Services	128,105				
Center for Disease Control		3,859			
National Institutes of Health		8,615			
Alcohol, Drug Abuse and Mental Health Admin		1,546			
St. Elizabeths Hospital		2,212			
Public Health Service		1,716			
TOTAL		17,948	14.00%	0.60%	1.70%
Housing and Urban Development [Largely a grants and public enterprise-based dept]	11,720	0	0.00%	0.00%	0.00%
Interior	70,657				
Geological Survey		7,432			
Bureau of Mines(not including helium program)		2,055			
TOTAL		9,487	13.40%	0.30%	0.90%
Justice	63,307				
Legal Activites		3,680			
National Inst. of Corrections		44			
TOTAL		3,724	5.90%	0.10%	0.30%
Labor	17,931				
Bureau of Labor Statistics		2,108	11.80%	0.10%	0.20%
Transportation [Information and knowledge functions dispersed through grants-making, operating, and regulatory agencies]	60,375				
Treasury	130,845				
Financial Management Service		2,256	1.70%	0.10%	0.20%
INDEPENDENT AGENCIES	380,040				
NASA		21,660			
U. S. Information Agency		8,981			
General Services Administration Information Resources Mgmt Sr		482			
Advisory Commission on Intergovtal Relations		23			
National Science Foundation		1,124			
Smithsonian Institution		3,734			
TOTAL SELECTED AGENCIES		36,004	9.50%	1.30%	3.40%
TOTALS: ALL SELECTED DEPARTMENTS AND AGENCIES		121,211		4.20%	11.30%

Source: Appendix, *Budget of the United States 1988: Budget of the United States 1988*, pp. 5-14.