A Resource-Flow Model of the Human Resource Information System

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ABSTRACT

The human resource information system (HRIS) is the most recent in a progression of functionally oriented information systems, which reflect the trend toward end-user computing. The HRIS encompasses a wide range of computer-based applications, but comprehensive conceptual models for organizing and evaluating these applications are lacking. Here we propose a resource-flow model of the HRIS, based on systems theory, as a framework for organizing and assessing HRIS components. The model views applications in terms of activities that are performed as personnel flow through a firm. We use the findings of an international survey of human resource information system professionals to demonstrate the usefulness of the resource-flow approach. Our analysis reveals some important strengths and weaknesses in the current status of human resource information systems.

DEFINITION OF AN HRIS

As with many other acronyms in the computer field, there is not complete agreement as to the meaning of the HRIS, or human resource information system. In fact, the letters HRMS, for human resource management system, are often used [18, 32].

The term HRIS is used in two different ways. One usage regards it as an organizational unit within the human resources (HR) functional area, which specializes in human resource information. In this context, the HRIS includes not only the personnel assigned to the unit, but also the information resources, such as hardware and software, which have been distributed to HR.

The other usage regards the HRIS as all of the computer-based applications that process human resource information, regardless of where the information-processing resources are located. This view is the one taken in our analysis and enables the **human resource information system (HRIS)** to be defined as "a computerized tool for the collection, storage, maintenance, and retrieval of information about people and their jobs" [27, p. 156]. As such, the HRIS is an example of a functional information system, similar in organizational positioning to the marketing information system, the manufacturing resource planning system, and the accounting information system.

HISTORY OF THE HRIS

The HRIS got its start in the 1960s and 70s as firms converted their personnel records from hardcopy and punched card form to computer storage [16]. Mainframe computers, located in the firms' information systems (IS) unit, made it possible to produce personnel information much more quickly than had previously been the case.

The benefits of increased speed were short-lived, however, due to a succession of personnel reporting requirements imposed by the federal government. Legislation required that firms provide statistics concerning their hiring policies and practices. This legislation, which began with the Equal Pay Act of 1963 and the Civil Rights Act of 1964, was augmented by laws applicable to federal contractors and regulations specifying the need for affirmative action plans [17, p. 53]. As firms scurried about to meet the demands for government information, management realized that a computer-based system offered the only real solution. The HRIS, therefore, was forced upon many firms by requirements imposed by their environments, mainly the influence of the federal government.

The accumulating backlog of personnel applications caused by legislation occurred at the time of the microcomputer boom and the results were the same in HR as elsewhere in the firm. End-user computing became a reality as the HR

units installed not only the hardware, but also acquired the necessary software and the information specialists required to perform the processing [7]. In many firms, the information specialists were transferred from IS.

The responsibility for processing human resource data was no longer restricted to IS but was shared by that facility and HR. However, HR did not attempt to take over all of the processing but only implemented certain applications. The applications were typically those that could be performed with the mushrooming selection of prewritten HR software or within the developmental capabilities of the HR information specialists. Such a situation remains common today; many HR applications are performed in IS, but an increasing number of them are being implemented in HR.

HRIS APPLICATIONS

There are two primary points of origin for the computer-based applications performed by the HRIS.

The first consists of personnel data, originally maintained in a hardcopy form by the HR unit. This is the Employee Master file, and it contains all of the important data concerning each employee. It is not uncommon for each employee record to contain one hundred or more data elements [8, p. 299] This personnel data is often supplemented with payroll data. HR originally had responsibility for processing the firm's payroll, but that work has largely been shifted to the accounting department in most firms [22, 29].

The second origin point consists of applications made necessary to meet the government reporting requirements. In order to satisfy legislation, firms began developing computer-based systems to maintain data on job applicants, pay characteristics and changes, and compensation and benefits, as well as data describing job functions [17, p. 36].

The HRIS applications originating from both origin points were added without the benefit of any grand plan. The large number of applications, combined with the fact that they did not always fit together in a neat, logical package prompted several HR systems authorities, writing articles and books explaining the HRIS concept, to develop HRIS models. The models, existing in a graphic form supported by a narrative, were intended to provide a structure that would make it easier to understand the concept and facilitate development and management of such systems. Some of the earlier model descriptions also had the task of educating HR personnel in the basics of computer processing.

Such a modeling approach had been followed in the marketing area [3, 4, 15, 21], and was given much of the credit for the success of the marketing information system concept. A similar modeling approach seemed appropriate for HR.

VIEWS OF THE HRIS

As the HRIS concept has evolved, it has taken several different forms. For example, it has been viewed as input and output modules, as a system of input, maintenance, and output functions, as an integration of computing hardware,

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FIGURE 1

The Hyde-Shafritz HRIS Model
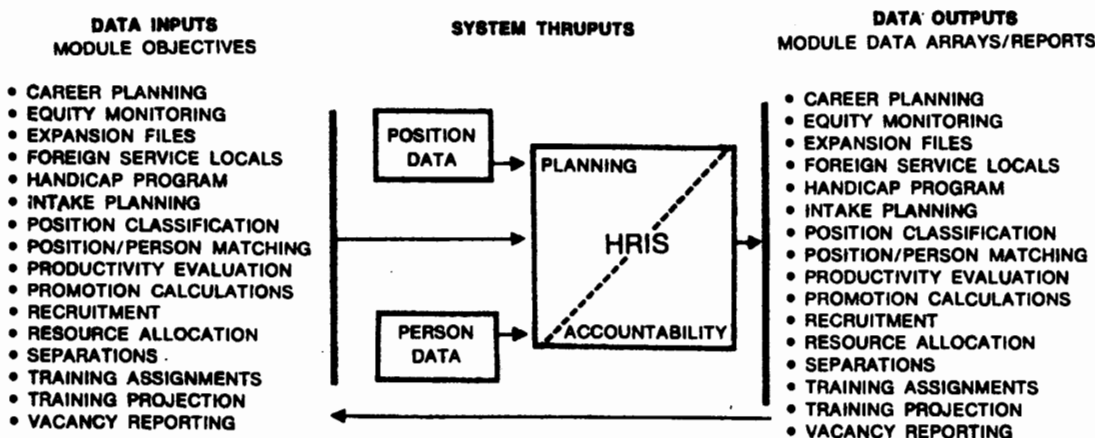
Source: Albert C. Hyde and Jay M. Shafritz, HRIS: Introduction to Tomorrow's System for Managing Human Resources. *Public Personnel Management*, 6 (March–April 1977), 76. Reprinted with permission.

TABLE 1

The Sixteen Hyde-Shafritz HRIS Modules

Career Planning. Charts career paths for all categories of employees based on current and future personnel needs.

Equity monitoring. Tracks the career progression for specified groups of employees to ensure that it is comparable for the overall workforce and consistent with legal mandates.

Expansion files. Maintains special data that meets needs of organizational subunits.

Foreign service locals. Maintains a database that describes foreign service nationals employed by the State Department.

Handicap programs. Identifies positions and work locations that are especially adaptable to handicapped employees.

Intake planning. Specifies the organization's future workforce requirements.

Position classification. Maintains position data and performs automatic monitoring in terms of job content and level of positions.

Position/person matching. Scores all employees as candidates for job openings and identifies the best positions for an employee, or the best employees for a position.

Productivity evaluation. Creates measures of performance for programs, offices, or positions.

Promotion calculations. Calculates the number of promotion opportunities for specific job categories.

Recruitment. Monitors qualifications of new employees, and analyzes retention and development trends.

Resource allocation. Provides a database that can be used for performing a budget analysis of human resource effort by both organizational and functional breakdowns.

Separations. Collects and analyzes data on separated employees.

Training assignments. Determines the training needed in order for certain employees to hold certain positions.

Training projections. Forecasts future training needs.

Vacancy reporting. Identifies and monitors present and potential job vacancies.

as a collection of application modules, and as automated components.

The Hyde-Shafritz Notion of Integrated Input and Output Modules

Albert C. Hyde and Jay M. Shafritz were among the first to attempt a conceptual framework for the HRIS. In a 1977 journal article, they identified sixteen database modules, which were integrated in that they had the capability of exchanging data [12]. Table 1 lists the modules and provides brief descriptions. These particular modules were identified during a study for the State Department, and the authors recognize that each firm could have a unique combination of such modules.

Rather than viewing their modules as internal components of the HRIS, Hyde and Shafritz viewed them as inputs and outputs. As shown in Figure 1, objectives for each of the modules, along with both position and person data are entered into the HRIS to enable management to perform the planning function. The HRIS produces reports organized along the lines of the modules, which facilitate accountability. A feedback loop enables the objectives to be modified to reflect actual performance. This is a typical closed-loop systems model, consisting of input, processing, output, and feedback loop.

The Simon Input/Data Maintenance/Output Model

In 1983, Sidney H. Simon presented a conference paper to human resources systems professionals that viewed the HRIS in terms of input, maintenance, and output functions [25]. Each function was illustrated with a graphic model.

The input function provides the capability for entering data into the HRIS. This function includes procedures that describe the details of data gathering: who provides data, when it is provided, and how it should be processed. Also included are data validation and error correction. The maintenance function is next performed, and includes the standard processes of keeping the human resource database current—adding new records, changing existing records, and deleting records. The output function uses the database contents to produce information, primarily in the form of periodic reports.

The Manzini-Gridley Hardware Network Model

Andrew O. Manzini and John D. Gridley, writing for the American Management Association in 1986, viewed the HRIS in terms of interfaces with a corporate human resources database [17]. Their model appears in Figure 2. The database contents are illustrated with shapes that resemble file drawers. According to this model, users interface with the system by means of on-line devices, such as PCs or terminals, and receive outputs in the form of hardcopy re-

FIGURE 2

The Manzini-Gridley HRIS Model
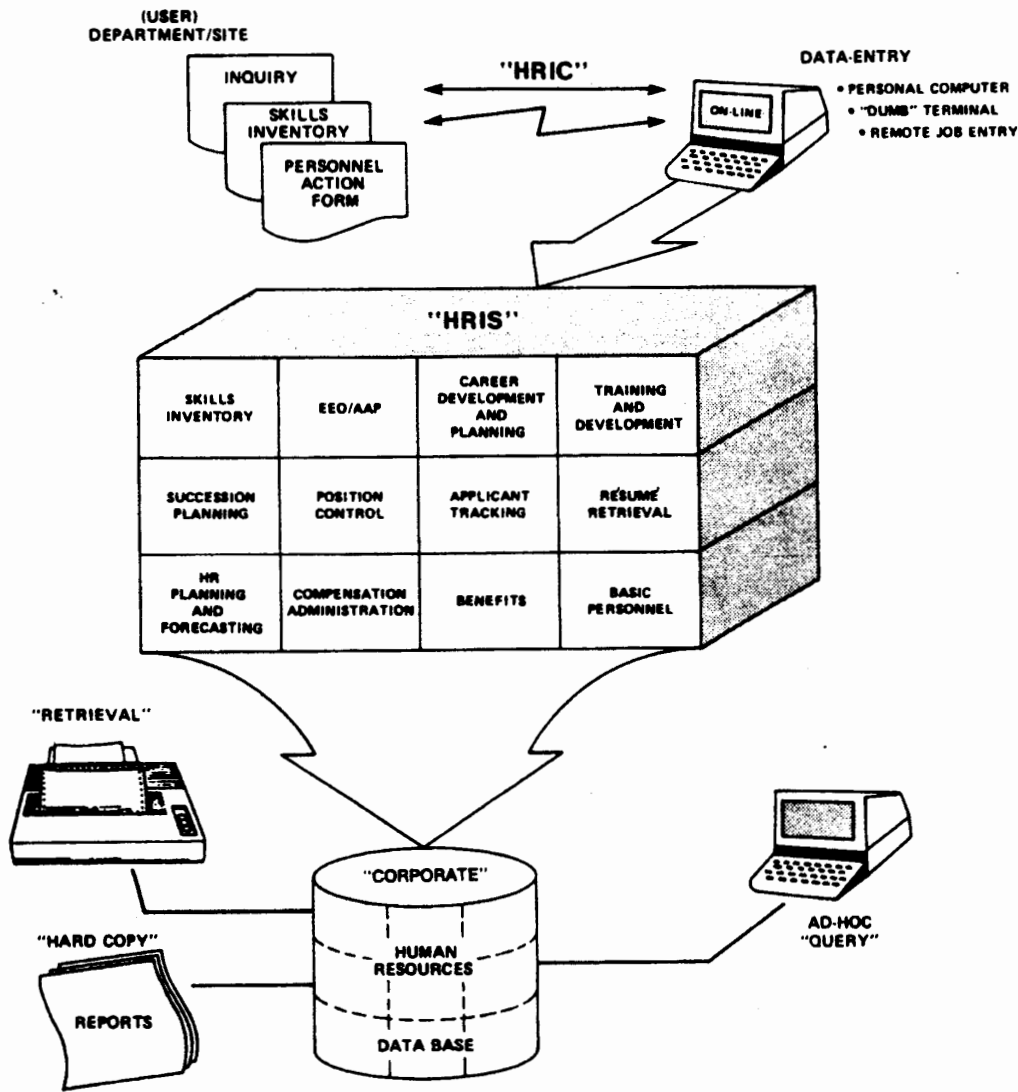
Source: Andrew O. Manzini and John D. Gridley, Integrating Human Resources and Strategic Business Planning. New York: American Management Association, 1986, 41. Reprinted with permission.

ports and responses to ad hoc queries. An administrative function called HRIC (for Human Resources Information Center) exists within HR for the purpose of assisting users, providing database security, and enforcing privacy controls.

The Fisher, Schoenfeldt, and Shaw Application Modules

In their 1990 human resources textbook, Cynthia D. Fisher, Lyle Schoenfeldt, and James B. Shaw identified nine major application areas of the HRIS [8, pp. 724-729]. These areas are listed and briefly described in Table 2.

The first two applications deal with the planning that provides the basis for all the firm's human resources activities. The third application (equal employment opportunity) consists of the reporting that occurs during the time that employees work for the firm. The remaining six applications are concerned with activities that occur during the employment cycle, beginning with recruitment and ending with organizational exit.

TABLE 2

The Nine Fisher, Schoenfeldt, and Shaw HRIS Application Areas

Planning. Assists management in planning future human resource needs by identifying deficiencies in the current workforce so that hiring and training programs can be planned.

Job analysis. Analyzes job data for the purpose of identifying common characteristics and job families. This information is used to develop and refine job titles, salary structure, and promotion paths.

Equal employment opportunity (EEO). Monitors workforce data in terms of age, race, and sex to identify adverse impacts on certain groups so that corrective action can be taken.

Recruitment. Scans both external and internal databases for the purpose of identifying candidates for particular job openings.

Selection. Conducts computer-aided interviews, and scores performance on personality and cognitive ability tests as a means of determining which applicants will be hired.

Training and development. Enables employees to use the computer to engage in interactive training that is tailored to particular needs.

Performance appraisal. Assists raters in focusing on the important job-related criteria when conducting employee performance evaluations.

Compensation and benefits. Computes employee earnings by using attendance data, computes merit pay for performance-based jobs, and maintains and monitors benefits for both current and retired employees.

Organizational exit. Analyzes factors that influence turnover.

TABLE 3

The Four HRSP Components

Personnel administration and workforce planning
* Position control
* Attendance
* Organization charting
* Planning
* Succession
* Skills/competency
* Training
* Workforce models
* Performance appraisal

Compensation and Affirmative Action / EEO
* Executive compensation
* Merit increases
* Union increases
* Bonus incentives
* Job analysis/evaluation
* Salary forecast
* EEO records
* EEO analysis

Benefits, employment, and recruiting
* Defined contribution
* Defined benefits
* Stock purchase
* Flexible benefits
* Claims processing
* Benefit statements
* Applicant tracking
* Internal search
* Relocation

Health and safety, payroll, and labor relations
* Health records
* Toxic substance
* Payroll
* Disciplinary
* Grievances

The HRSP Automated Components

The professional organization that is most closely linked with the HRIS concept is the Association of Human Resource Systems Professionals, or HRSP. HRSP conducts periodic surveys, hosts conferences, and disseminates publications aimed at keeping its members aware of trends in technology and methodology as applied to HR. Reports of its survey findings provide valuable benchmarks against which to evaluate HRIS management approaches and accomplishments [6].

In conjunction with HRSP, the authors conducted a survey of HRIS practices in member firms around the world. This 1990-91 survey subdivided the HRIS into four automated components: personnel administration and workforce planning; compensation and affirmative action/EEO; benefits, employment, and recruiting; and health and safety, payroll, and labor relations. Each component included several subsidiary application areas as shown in Table 3. In total, there were 31 application areas.

The HRSP classification was adequate for the survey, allowing respondents to indicate the status of each subsidiary application in their firms. The classification is noteworthy

because it consisted of only four components, an extremely concise packaging job considering the large number of applications. However, conciseness was achieved by combining components in a manner that did not always provide a good fit. For example, in the third component, employment and recruiting deal with activities that occur before employees join the firm, and benefits apply while the employees are on the job and after they retire. In a similar manner, the payroll application in the fourth component appears to be better suited for the second component that deals with compensation.

Although concise, the components do not clearly reflect the planning that takes place prior to the time the employees enter the firm, the activities that take place while the employees work for the firm, and the activities that take place after the employees retire. Since the primary task of the HRIS is to provide a conceptual representation of the firm's human resources as they flow through the firm, a resource-flow view seems to be especially appropriate.

RESOURCE FLOW THEORY

Viewing phenomena in terms of resource flows is an example of systems theory, and several respected theoreticians have taken such an approach. The first to achieve worldwide fame was Jay Forrester of MIT, who used resource flows as a basis for his theory of industrial dynamics. Forrester explained that his theory showed "how company success depends on the interaction between the flows of information, materials, money, manpower, and capital equipment" [9, p. 37].

Two University of Washington professors, Stanley H. Brewer and James E. Rosenzweig, used the term **rhocrematics** to describe the way materials flow through a firm [2]. The term was derived from the Greek "rhoe" meaning a flow such as a river, and "chrema" meaning materials. Rosenzweig also teamed with two other Washington professors to explain a general approach to systems design that involved the identification of material, energy, and information flow [13].

One of the most thorough explanations of the resource flow theory was provided by Richard J. Hopeman, of Syracuse University. In a 1969 text, he described the manufacturing process as a composite of material, machine, manpower, money, and information flows [11].

Management theorist Henry Mintzberg integrated the concept of flows into his theory of organization. He used flows of authority, material, information, and decision processes between line and staff units to illustrate organizational complexity [19].

Applying Resource-Flow Theory to the HRIS

A resource-flow view of the HRIS focuses on the flow of human resources through the firm. It recognizes that the firm's environment provides a pool of potential employees who are subjected to a screening process before joining the firm. While in the firm, the employees receive training and education, perform their tasks, and receive evaluations. The employees are compensated for their efforts with money and other benefits. Eventually, the employees terminate their employment and return to the environment. The employees who retire continue to receive benefits. The task of the HRIS is to gather data that tracks this human resource flow, store the data until it is needed, and use the data to produce information that enables persons both in the firm and its environment to monitor the flow.

The HRSP survey findings provide a rich database for use in studying the extent to which firms have implemented HRIS applications that can be used in a resource-flow manner. The resource-flow analysis is facilitated by reallocating the application areas and renaming the major components, as done in Table 4.

Workforce planning occurs prior to the flow of human resources through the firm, and provides the basis for that flow. The planning enables management to adjust its human resource activities so as to accomplish both short- and long-term objectives. **Recruiting** brings new employees into the firm, and **workforce management** consists of all activities that occur during the time of employment, including such tasks as training, performance appraisal, and relocation. Also during employment, employees receive **compensation** in such forms as hourly earnings, salary, and bonuses, and **benefits** in such forms as insurance and stock purchase plans. Many of the benefits continue through retirement. Information concerning the entire resource flow is made available in the form of **environmental reporting**, primarily to the government and labor unions.

THE COMPONENTS OF A RESOURCE-FLOW HRIS MODEL

The 31 HRSP applications in Table 4 represent not only output information, but also data storage, processing, and gathering. The view of the HRIS, as taken by Hyde-Shafritz, Simon, and Manzini-Gridley, that the HRIS incorporates input, processing, and output components is especially applicable to the design of computer-based systems and should be incorporated in a resource- flow model. This is done in the resource-flow model illustrated in Figure 3. The model consists of three subsystems devoted to data input, an HRIS database, and six subsystems devoted to transforming the data into information and making it available to users. The input data is obtained from both internal and environmental sources, and the users consist of individuals and organizations both inside and outside the firm.

TABLE 4

The HRSP Components Realigned to Reflect Resource Flow

Workforce planning
* Planning
* Job analysis/evaluation
* Workforce models
* Organization charting
* Salary forecast

Recruiting
* Applicant tracking
* Internal search

Workforce management
* Position control
* Skills/competency
* Training
* Performance appraisal
* Disciplinary
* Relocation
* Succession

Compensation
* Attendance
* Payroll
* Merit increases
* Bonus incentives
* Executive compensation

Benefits
* Defined contribution
* Defined benefits
* Stock purchase
* Flexible benefits
* Claims processing
* Benefit statements

Environmental Reporting
* Union increases
* Grievances
* Health records
* Toxic substance
* EEO records
* EEO analysis

Input Subsystems

Three input subsystems enter data into the database. They are data processing, human resources research, and human resources intelligence. Each of these subsystems can include all types of data entry processes such as those involving keyboard and mouse input, and optical scanning [31]. In certain cases, the input subsystems also include software that transforms input data into the required format for storage.

Data Processing Subsystem. This subsystem consists of those systems residing both in the accounting department and HR, which process data relating to human resources. The data consists of personnel data describing human resources transactions that occur during the resource flow, and also payroll data. The data processing subsystem gathers the data both from internal and environmental sources.

Human Resources Research Subsystem. This subsystem has the responsibility for conducting special studies to provide data on the firm's human resource-related activities. For example, such data identifies employees who are good candidates for positions coming available because of transfer or termination, and describes job content and the knowledge and skills that are required [1, 30]. In essence, the human resources research subsystem is the introspective view taken by HR of its own operations. As with the data processing subsystem, input data can come from both inside and outside the firm.

Human Resources Intelligence Subsystem. This subsystem has the responsibility for keeping current on environmental activities that are especially important to human resource activities. Data and information are gathered describing activities of the government, labor unions, suppliers, the local and financial communities, and even competitors. Employment firms function as suppliers, funneling applicants to the firm. Applicants can also come from the local community and from competitors. The financial community provides data and information concerning the economic climate, which influences the human resource plans. Much of the intelligence data can be obtained from commercial databases [14, 33].

The HRIS Database

All of the data and information provided by the input subsystems is held in computer storage. The storage units can reside in IS, HR, or other locations. The data relates primarily to the firm's employees, but also can describe the environmental elements with which HR interfaces. Database management system (DBMS) software performs the maintenance processes.

Output Subsystems

The output subsystems consist of various types of soft-

FIGURE 3

A Resource-Flow HRIS Model
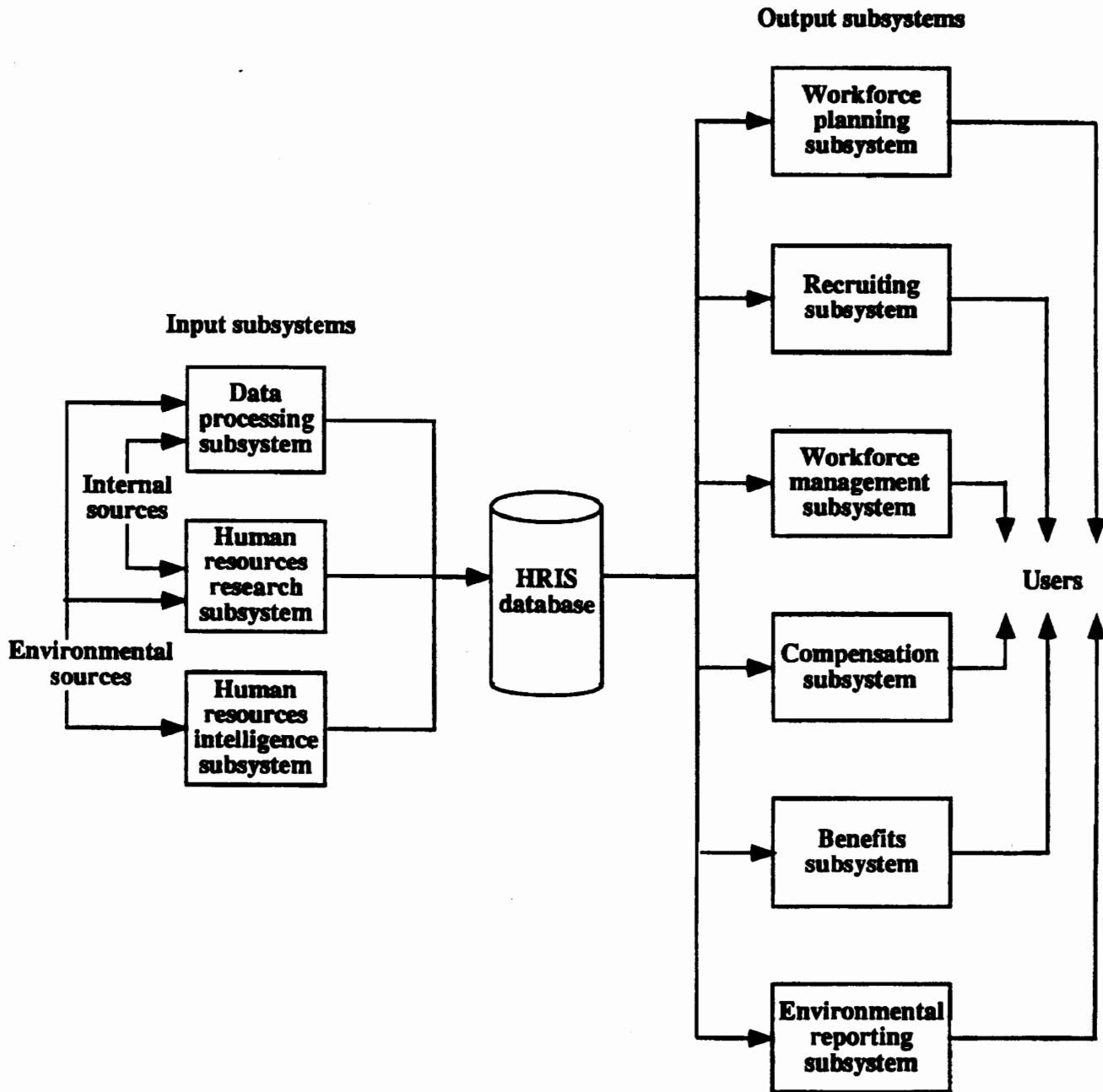
ware that transform data in the database into information outputs. The software can include report writers, mathematical models, office automation packages such as E-mail and desktop publishing, and applications of artificial intelligence such as expert systems [20].

According to the model, the output subsystems represent the six groups of HRSP applications identified in Table 4. For example, all of the software that supports management as they engage in workforce planning is included in the workforce planning subsystem.

The model illustrated in Figure 3 builds heavily on the work of both the HRIS model builders and the systems theoreticians. The model captures the concept of a system of inputs, processes, and outputs, and provides a structure that can accommodate the wide variety of HRIS applications, viewed primarily as they apply to the resource flow. As such, the model provides an effective vehicle for learning about the HRIS and identifying its strengths and weaknesses. This type of evaluation can be accomplished by applying the HRSP survey data to each of the model components.

APPLYING THE HRSP SURVEY DATA TO THE MODEL

The 1990-91 HRSP survey data was provided by 513 member firms that represent a wide diversity in terms of geographic location, size, and revenue.[1] Since the data was provided by HR professionals who are most knowledgeable about the HRIS activities of their firms, the quality of the data is assumed to be very high.

The Firms

The professionals were asked to characterize their firms in relation to their **human resource readiness**, the quantity and quality of human resources that are available to meet unanticipated needs. Most of the professionals gave their firms good marks, describing them as having a Moderate (273 firms, 53.2%), Rather high (123, 24%), or Extremely high (13, 2.5%) readiness. Relatively few firms were characterized as having Little (83, 16.2%) or Extremely low (7, 1.4%) readiness.[2] Therefore, the responses are generally from those firms with good HR operations.

In 377 (73.5%) firms, the HRIS unit is located within HR, in 43 (8.4%) it is in IS, in 9 (1.8%) it is in the payroll

department, and in 25 (4.9%) it is elsewhere. The annual operating budgets of the HRIS units range from none to over $10 million, and the number of full-time HRIS employees in a single firm range from zero to 260, with an average of 11.9.

Hardware and Software Resources

The hardware located within HR consists primarily of microcomputers (an average of 37.89 per firm), but it also includes terminals (34.08), workstations (13.79), minicomputers (3.69), and mainframes (2.37). The multiunit averages for the minis and mainframes indicate the large scale of many of the operations. All in all, the firms' HRIS operations appear to be well-stocked in terms of hardware.

The firms use a combination of prewritten and custom software, with most (60.2%) being the prewritten variety. More of the custom software is developed jointly by HR and IS (33%) than by IS (28%) or HR (24%) working alone. In some cases (15%) the custom software is obtained from external sources.

Input Subsystems

The most common mode of data entry is by nonmanagers in HR (446 firms, 86.9%). Nonmanagers outside of HR (185, 36.1%) also participate, as do managers outside of HR (40, 7.8%), and managers within HR (158, 30.8%). In only 124 firms (24.2%) is data provided by environmental organizations such as outsourcers.

The HRIS Database

When asked if their firms have an HRIS database stored in the computer, 461 firms (89.9%) responded "Yes." The most popular DBMSs are IMS (112 firms), FOCUS (108), DB2 (87), and dBASE (86).

The database can reside in more than one computer, and in most instances it is the firm's central computer (342 firms). Other locations are HR (174), another unit within the firm (52), and outside the firm (32).

In most cases the database contents include only data relating to employees. This is the situation in 423 (82.5%) of the firms. Only forty-one firms (8%) report database contents on such other subjects as government regulations, labor unions, employment agencies, and economic conditions.

The HRIS database, therefore, has a clearly internal focus, with the data flow that links the HRIS with the firm's environment being essentially one-way.

Output Subsystems

The HRSP respondents were asked to provide information concerning the applications performed in their firms. For each application, the respondents indicated whether it was in use or being developed. In addition, each application

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[1]The report can be obtained from the Association of Human Resource Systems Professionals, P. O. Box 801646, Dallas, TX 75380-1646, or from the authors.

[2]Percentages do not always add to 100, caused primarily by nonresponse.

TABLE 5

Number of Firms Using Workforce Planning Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Planning	68	61	72	45
Job analysis/evaluation	176	66	105	124
Workforce models	66	29	55	33
Organization charting	238	58	59	237
Salary forecast	237	47	172	104
Totals	**785**	**261**	**463**	**543**

Percent applications in use: 75
Percent part of core HRIS: 46

was identified as being a part of the core HRIS or a standalone system.

During recent years, the trend has been toward integrated software, which consists of multiple programs that operate as a unit [5, 16]. The integrated packages are termed the **Core HRIS**, and can take the form of either custom or prewritten software.

Workforce Planning Subsystem. Table 5 reveals the status of workforce planning in the HRSP firms. The most popular applications are organization charting, salary forecasting, and job analysis/evaluation. Planning and workforce modeling are another story; not only are relatively few in use, but developmental activity is low.

Of the firms that reported computer activity in these workforce planning areas, 75% of the applications have been implemented.[3] More of the applications take the form of standalone systems than core HRIS components. Only 46% are in the core.

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[3] The in-use figure does *not* take into account those firms that failed to respond to the question. If the missing observations were assumed to represent lack of implementation activity and were included in the in-use calculation, the percentage would be much lower.

TABLE 6

Number of Firms Using Recruiting Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Applicant tracking	235	98	143	164
Internal search	111	56	115	44
Totals	**346**	**154**	**258**	**208**

Percent applications in use: 69
Percent part of core HRIS: 55

TABLE 7

Number of Firms Using Workforce Management Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Position control	177	108	230	40
Skills competency	115	107	172	37
Training	216	102	187	113
Performance appraisal	244	60	242	48
Disciplinary	63	39	66	28
Relocation	121	33	46	101
Succession	110	102	63	121
Totals	**1046**	**551**	**1006**	**488**

Percent applications in use: 65
Percent part of core HRIS: 67

TABLE 8

Number of Firms Using Compensation Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Attendance	191	69	173	74
Payroll	389	21	289	97
Merit increases	404	36	338	79
Bonus incentives	230	31	144	101
Executive compensation	273	39	166	134
Totals	**1487**	**196**	**1110**	**485**

Percent applications in use: 88
Percent part of core HRIS: 70

TABLE 9

Number of Firms Using Benefits Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Defined contribution	275	38	192	87
Defined benefits	270	47	204	80
Stock purchase	149	16	80	68
Flexible benefits	195	55	162	65
Claims processing	88	11	34	56
Benefit statements	234	57	171	94
Totals	**1211**	**224**	**843**	**450**

Percent applications in use: 84
Percent part of core HRIS: 65

TABLE 10

Number of Firms Using Environmental Reporting Applications

Application Name	In Use	Being Developed	Part of Core HRIS	Stand-alone
Union increases	165	13	157	21
Grievances	66	31	49	44
Health records	102	41	65	67
Toxic substance	80	32	30	76
EEO records	402	43	373	58
EEO analysis	352	47	277	103
Totals	**1167**	**207**	**951**	**369**

Percent applications in use: 85
Percent part of core HRIS: 72

Recruiting Subsystem. Although considerable attention has been given to HRIS support for recruiting [10, 33], the HRSP data indicates that such support is relatively rare. Table 6 shows that more attention is paid to applicant tracking than to internal search, and that these applications have been put in use at only a 69% level. In terms of both the number of applications and the percent in use, the recruiting component of the HRIS is fairly modest. Also, a rather low proportion (55%) of the programs are part of the core HRIS.

Although this subsystem represents an important segment of HR activity, much work remains to be done, as indicated by the 35% of the applications that are in the process of development.

Compensation Subsystem. This is the area of greatest saturation, with the applications in use at the 88% level. All five applications listed in Table 8 enjoy heavy use, with merit increases being the most popular of the entire HRIS. Although HR has given up the payroll application in most firms, much of the payroll data remains a part of the HRIS, and maintaining that data represents the third most popular HRIS application.

Perhaps one reason for the popularity of compensation applications is the fact that they are essentially the transaction processing variety, and are easier to implement than applications oriented more toward decision support. Since compensation is a "bread and butter" HRIS application, a large portion of the software (70%) is included in the core HRIS.

Benefits Subsystem. Running a close second to compensation in overall popularity are the benefits applications. According to Table 9, they enjoy a high saturation in use (84%) and are often included in the core HRIS (65%). Flexible benefits, those that can be tailored to an individual employee's needs, are currently very popular [28], accounting for the high number in use. Benefit statements are prepared for both current and retired employees to reflect the benefits that are paid, and the defined contribution and benefits plans are special retirement plans that are complex and difficult to administer, and require computer processing.

Environmental Reporting Subsystem. This is the portion of the HRIS that satisfies the information reporting responsibility of the firm to its external constituencies, primarily the government and labor unions. Table 10 shows the exceptionally high level of usage, primarily in the form of Equal Employment Opportunity (EEO) applications.

EEO recordkeeping is the second most popular application in the HRIS, with EEO analysis in fourth place. On the other hand, the relatively low number of installed grievance and toxic substance applications reflect their selective nature. Not all firms employ union workers and handle toxic materials.

The environmental reporting applications are implemented to the second highest degree (85%). The applications of this subsystem are also the most likely to be housed in the core HRIS (72%).

The HRSP survey data provides a good idea of the degree to which HR applications have enjoyed widespread use. The data also provides a good idea of how those applications are implemented, either standalone or part of the core HRIS. However, in order to get a handle on the *areas* of HR activity where the HRIS has been employed effectively, it is necessary to house the applications in some type of logical framework. This is where the resource-flow model makes a contribution. By analyzing the applications in terms of the output modules, it becomes clear which areas of the HR flow have been supported well, and which have not. As such, the model provides an effective blueprint for future HRIS planning.

CONCLUSION

Until recently firms paid more attention to their money flows (the finance function) and material flows (the manufacturing and marketing functions) than to their human resource flows. Few people in the firm, including top management and members of IS, paid much attention to HR as a potential application area for most of the computer era. When the microcomputer came along, pent-up demand resulted in a virtual explosion in end-user computing applications in HR. Today, there is an abundance of application development going on in the HR area of the firm. The migration of human resource applications from IS to HR, which began approximately twenty years ago, is continuing to take place.

The inroads made by the HRIS in the firm's information systems are borne out by the attitudes of the top management of the HRSP survey firms. In almost half of the firms (242, 47.2%) top management is perceived by the HRIS professionals as valuing the HRIS "on a par" with other similar systems. In 25 firms (4.9%) the HRIS is valued "higher," and in 4 firms (.8%) it is the "most highly" valued. These are encouraging figures, but in 9 firms (1.8%) the HRIS is thought to have "little value," and in 31 firms (6%) top management is believed to be unaware of the HRIS. On the whole, considering the late start of the HRIS in comparison to other functional information systems, the status that it has achieved is very respectable.

Another indication of a good environment within the firm for the HRIS is the large number of firms that engage in formal, long-range information planning. When asked whether their firms have such plans, 245 firms (47.2%) replied "Yes." Of these, 157 (64.9%) explicitly include long-range HRIS plans.

Although many firms have done a good job in IS plan-

ning, the same cannot be said for HR. In 186 firms (36.3%), HR has developed long-range HRIS plans, but a larger number, 199 (38.8%), have not. The 65 respondents (12.7%) who did not know whether HRIS plans exist could probably also be added to the "No" category. These figures indicate that HR has some catching up to do in terms of strategic information planning.

As HR units go about the process of planning their future HRIS activities, the resource flow model can provide a good framework for organizing and assessing the major HRIS components. The model identifies the components that should be present and their relationships within a systems view. The model also provides a basis for monitoring progress in HRIS applications development and overall maturity within the HRIS discipline. For our sample of HRIS professionals, the model reveals that many firms have neglected applications for workforce management and recruiting. The HRIS has provided strong support in the compensation and benefits areas, but other activities that occur during employment demand greater attention. For example, little attention has been directed at activities relating to organizational exit, or termination.

Recently, the feeling among HR and HRIS managers has been that the key to future HRIS success is its ability to support the firm's strategic objectives [23]. This has proven to be a difficult challenge for several reasons, but one could well be the modest track record of many HR units in information planning, as reported by the HRSP firms. Rather than attempting to support the strategic objectives directly—a task not unlike hitting a moving target—an indirect approach might prove better. If HRIS resources were aimed at building strong planning systems, up-to-date HRIS databases, and responsive information output systems, then the HRIS would support management in each of its workforce-related activities. This direct management support would contribute to the firm's strategic objectives, whatever they might be.

As the HRIS does a better job of providing management with information about people and their jobs, it will solidify its position in the firm as a valued information system. The resource flow model, as presented in this paper, serves as a useful framework for conceptualizing HRIS processes and tracking their progress over time.

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ACKNOWLEDGMENT