

Dottorato di Sistemi Informativi Aziendali
XXII Ciclo

Libera Università degli Studi Sociali
“Guido Carli”
Roma

**Human Resource Information
Systems and the performance of the
Human Resource Function**

Tesi di dottorato

Dott. Maria Chiara Benfatto

Table of Contents

Preface.....	4
Chapter I.....	6
1.1 Introduction to HRIS	6
1.2 Historical overview – From transactional HR to Strategic HR	10
1.3 Benefits and Drawbacks	14
1.3.1 Security and controls	19
1.4 Empirical studies in HRIS	20
Chapter II	24
2.1 Elements of current technology in HRM.....	24
2.1.1 HR IS, the complexity of the IT challenge	24
2.1.2 Structure of HRM processes in the ICT age	27
2.2 Trends in the HR technology.....	39
2.2.1 The IT legacy in HR	39
2.2.2 Evolution of the HR Application Market.....	41
2.3 Impact of the HR integrated model	48
2.3.1 Emerging roles	48
2.3.2 The demand for integration.....	50
2.4 HR specialist systems in the back-office	52
2.4.1 HR Administration.....	52
2.4.2 Reward	53
2.4.3 Organization Management.....	65
2.4.4 Learning and development.....	66
2.4.5 Resourcing	68
2.4.6 Assessment and evaluation	70
2.4.7 Flexible work tools	72
2.5 Self-Service and Shared Service Systems	73
2.6 The integrated management of HRIS	75
2.6.1 Single Supplier Approach	76
2.6.2 Best-of-breed approach.....	77
2.6.3 Single supplier versus best-of-breed – Some conclusions	78
Chapter III.....	80
3.1 Research Model.....	80
3.1.1 Model for HRIS success	82
3.1.2 Model for HRIS effectiveness	88
3.1.3 Information-Based Model.....	95
3.2 Rational and Design	102
Chapter IV.....	108
4.1 Discussion and further research.....	108
4.1 Conclusion.....	109
References.....	115

*Alla mia famiglia in Italia,
och till min familj i Sverige*

Preface

The objectives of this thesis are: to present a comprehensive literature review of human resource information systems (HRIS) and to explore the impact of information systems on HR performance. Extensive research has been done to address the benefits in the introduction of HRIS. Little investigation, instead, is available to measure the effects of HRIS on HR performance.

This study is important in that it defines HRIS, examines the current status of HRIS empirical research, and proposes an architectural model to explain the integration of different human resource processes into a single management system. In the proposed framework, integration is presented not only as the ability of the HR function to respond to cost cutting plans, but also as its capability to evolve into a service centre where time is spent on firm's competitiveness issues.

Our research question, in particular, is as follows: how do we measure HRIS effectiveness and what factors determine HRIS overall success? Researchers and consulting firms have developed models to assess HRIS either through attitude, belief and behaviour variable (Haines and Petit model) or through progression and cost effectiveness of implemented HRIS (Watson Wyatt model). However what their outcomes suggest is that the first model lacks a "hard" performance basis whereas the second one does not confirm any direct correlation between higher HRIS progression and better HR performance. This also implies that implementation effectiveness may be a necessary but not sufficient condition for HRIS effectiveness. While these models offer a point of departure for researchers, clearly more work is needed in developing a causal model of HRIS success.

By matching the two previous models and integrating them with Ostermann's concept of environment maturity and HR value generation and other relevant studies on the measurement of HR performance, we propose a conceptual model for investigating what HRIS practice produces the best results in an organization. In the last part of this work, a prediction on how HRIS will continue to develop

in the future and its likely impact on the human resources function form another chapter of this thesis. We conclude with suggestions for further research.

Chapter I

1.1 Introduction to HRIS

In the present context of globalization, employing organizations and their environments have become increasingly complex. Managers in these organizations face growing difficulties in coping with workforces that may be spread across various countries, cultures, and political systems. Given such trends, manual HR systems management is completely inadequate (Beckers & Bsat, 2002). On the other hand information technology has considerable potential as a tool that managers can use, both generally, and in human resource functions in particular, to increase the capabilities of the organization (Tansley & Watson, 2000). Those managing the human resource functions have not ignored such potential, and a widespread use of human resource information systems (HRIS) has occurred (Cedar, 2009-2010).

	World-wide Average	Agriculture, Mining, Construction	Financial Services	Healthcare	Higher Education	High-tech Manufacturing	Consumer/Other Manufacturing	Other Services	Public Administration	Retail/Wholesale	Transport/Communication/Public Utility
Administrative	92%	88%	92%	94%	87%	95%	93%	87%	91%	92%	93%
Service Delivery	46%	41%	60%	43%	38%	45%	29%	55%	41%	49%	55%
Workforce management	43%	31%	40%	48%	30%	33%	41%	52%	27%	48%	46%
Strategic HCM (Talent management)	42%	29%	43%	44%	41%	42%	42%	45%	33%	46%	44%
Business Intelligence	34%	32%	33%	30%	38%	29%	21%	28%	31%	26%	37%

Table 1. HRIS adoption by Industry in 2009 (source: Cedar, 2009)

HR executives are looking to technology and the information it provides to help them drive decisions that will lead to success of the organization as a whole (Wilcox, 1997). Snell, Stueber, and Lepak (2002) observe that HR can meet the challenge of simultaneously becoming more strategic, flexible, cost-efficient,

and customer-oriented by leveraging information technology. They point out that IT has the potential to lower administrative costs, increase productivity, speed response times, improve decision-making, and enhance customer service all at the same time. The need for cost reduction, higher quality services, and cultural change are the three main forces that have driven firms to seek IT-driven HR solutions (Yeung & Brockbank, 1995).

The rapid development of the ICT during the last two decades has boosted the implementation and application of electronic human resource management (e-HRM) (Strohmeier, 2007). Surveys of HR consultants suggest that both the number of organizations adopting HRIS and the depth of applications within the organizations are continually increasing (CedarCrestone, 2005). Many experts forecasted that the PC would become the central tool for all HR professionals (Kovach & Cathcart, 1999). These predictions find today empirical confirmation in several surveys carried on by academic research and consulting companies (Cedar, 2009).

Given these preliminary evaluations, how can we define a HRIS? According to Broderick and Boudreau (1992) a HRIS is the composite of databases, computer applications, hardware and software necessary to collect/record, store, manage, deliver, present, and manipulate data for human resources. Similarly Tannenbaum (1990) defines a HRIS as a system that is used to “acquire, store, manipulate, analyze, retrieve, and distribute information about an organization’s human resources” (p. 27). Kovach and Cathcart (1999) used a similar definition of HRIS as any system for “collecting, storing, maintaining, retrieving and validating data needed by an organization about its human resources” (p. 275). Strohmeier (2007), instead, uses the expression e-HRM when describing the activity of planning, implementing and applying information technology for both networking and supporting at least two individual or collective actors in their shared performing of HR activities.

Other authors point out that, as is the case with any complex organizational information system, a HRIS is not limited to the computer hardware and software

applications that comprise the technical part of the system. According to this view, Hendrickson defined a HRIS as a socio-technical (integrated) system (see figure 1) whose purpose is to gather, store, and analyze information regarding an organization's human resources department comprising of computer hardware and applications as well as the people, policies, procedures and data required to manage the human resources function (2003).

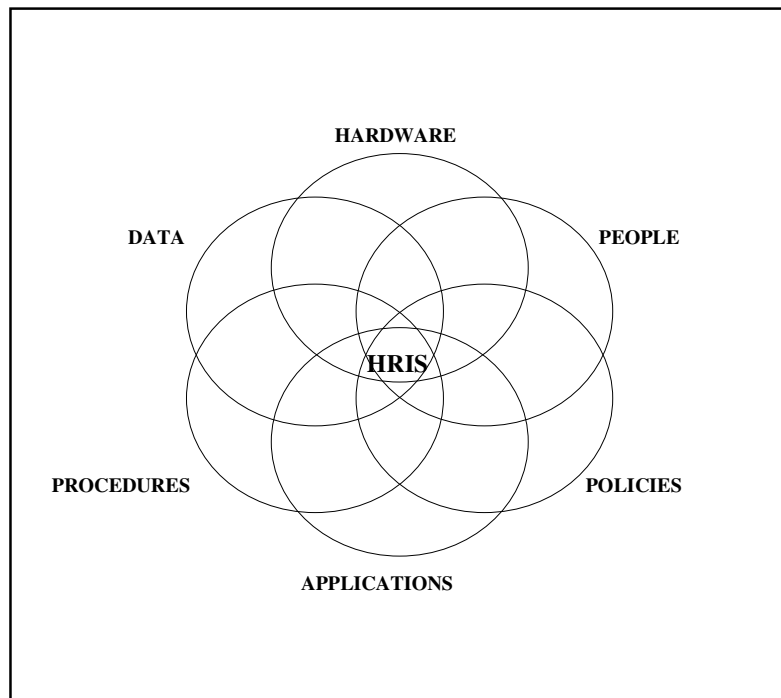


Figure 1. Components of a Human Resource Information System

A common assumption for all these researchers is that a HRIS can have a wide range of uses. It can range in complexity from simple spreadsheets, enabling complex calculations to be performed easily, to comprehensive HRIS solutions. Similarly a HRIS has been addressed as a tool that organizations use to solve and manage a variety of issues and processes connected to the management of people. On the one hand, technology may be used for different purposes within particular HR functions - for recruitment and selection, performance evaluation, compensation and benefits, training and development, health and safety, employee relations and legal issues, retention and work-life balance (Enshur,

Nielson, & Grant-Vallone, 2002). On the other hand, a company that uses a complex mix of HRIS solutions enables the HR function to manage its human resources as well as employees' information flow in an integrated approach across the entire employment cycle of each individual, thus shifting the attention from a process-centered HR function to a customer(employee)-centered HR management.

Martinsons (1994) distinguished between “unsophisticated” use of technology in HR, such as payroll and benefits administration, and “sophisticated” use such as recruitment and selection, training and development and performance appraisal. Other authors, instead, highlight the devolution occurring in certain organizations where, thanks to advanced HRIS, HR services are extended directly to managers and employees via the Internet or Intranet, through self-service systems.

Another benefit of HRIS is that it enables the creation of an IT-based work place (Othman & Teh, 2003). Advances in IT hold the promise of meeting many of the challenges of the HRM area in the future such as attracting, retaining and motivating employees, meeting the demands for a more strategic HR function and managing the “human element” of technological change (Ashbaugh & Miranda, 2002). Over the past 10 years, the use of technology in human resources has increased dramatically and is now a vital aspect of many personnel-related decisions such as collecting job information, recruitment, employee selection, training, and performance management (Chapman & Webster, 2003). Human Resource Management (HRM) could support technological innovation to achieve high performance while technology innovation could serve as an approach to enable HR function to focus more on value-added activities in order to realize the full potential of technology and organizational strategy (Shrivastava et al., 2003).

The biggest benefit to organizations of using IT in HRM is the freeing of HR staff from intermediary roles so that they can concentrate on strategic planning in human resource organization and development (Pinsonneault & Kraemer, 1993).

Similarly Broderick & Boudreau (1992) observe that IT can automate routine tasks such as payroll processing, benefits administration and transactional activities so that HR professionals are free to focus on more strategic matters, such as boosting productivity. Increased use of human resource information systems (HRIS) allows professionals to achieve improved performance and thus facilitate participation in internal consultancy activities (Bussler & Davis, 2001).

In latest research, Hussain, Wallace, and Cornelius (2007) observed that for senior HR professionals, strategic use of HRIS is increasingly the norm, irrespective of company size and this had led to the HR profession providing a value-add for the company. According to them strategic use of HRIS enhances the perceived standing of HR professionals within their organizations, a view however, not shared by their senior non-HR executives colleagues. In fact, the current problem that HRIS success faces is that despite the fact that HRIS has already started to revolutionize the HR function, the implications for the HR function are not yet fully visible. The main challenges are the alignment of processes in the HR function according to the future e-business challenge (Svoboda & Schröder, 2001) and a stronger awareness of the explicit and implicit benefits of having a working HRIS.

1.2 Historical overview – From transactional HR to Strategic HR

HRIS has grown in popularity since the 1960s (Cascio, 2005) in parallel with the grow of a new awareness of the personnel function from being a compiling office to a company strategic partner (see table 1).

Stages of the development of HRM	Time Period	Relevant tasks	Role	Focus of restructuring within the stage
HR Partial/File Administration (“File maintenance”)	Until mid of 1960s	Fulfilment of management information needs	Personnel Office	Focus on restructuring of HR database
HR Full-Administration “Government accountability”	From mid of 1960s until mid of 1980s	Compliance with legal & tax rules, fulfilment of administrative and legally mandated tasks	Personnel Administration	Focus on optimal legal handling of a full range of administrative tasks, development of HR departmental structure
HR Professionalization (“Organizational accountability”)	In the 1980s and 1990s	Accountability for success (in single business units), effective use of HR tools (recruitment, development, etc.) for business success	Personnel Management	Focus on increasing professionalization of the HR departments, development of services and tools, optimising the cooperation with other HR partners
HR Strategic Integration (“Strategic Business Partner”)	From the late 1990s, ongoing development	Demand for added value to the business. Contributions with strategic impact, participative developed organizational strategy (strategic partnership)	Business Partner and role sets	Focus on outsourcing, enabling of line managers to do HRM, inclusion of new fields (e.g. knowledge management, cultural development, creation of a new model of cooperation between HR partners)

Table 1. Stages of the Human Resource Management view

The ongoing development process, which started with the massive restructuring of organizations in the 1990s, sees today two parallel phenomena: on the one hand a large-scale outsourcing of transactional HR activities (payroll, benefits administration, some types of training); on the other hand the re-integration of those activities into a single, internal information/service system that, thanks to intranet platforms, enables employees to manage themselves in a variety of “self service” HR activities.

The difference between today and 1990s approach consists in an enriched interest in the social part of the socio-technical view of HRIS. According to Cascio (2005), if transactional activities are being eliminated, then the survival of in-

house HR talent depends on a demonstrated ability to add value to the business. In order to do that, a number of key competencies are necessary. These include proficiency in areas such as the following:

- An organization's business model. How the company competes for business in the product or service markets in which it operates. This also includes understanding the constraints that managers face, as well as the needs of internal and external customers. A HR professional can acquire this competency by working with managers and employees responsible for operations and also by serving on a management team with other executives to gain experience and exposure;
- Basic business literacy (corporate finance, marketing, accounting, information technology, and general management);
- Functional areas within HR (legal requirements, recruitment, staffing, training and development, performance management, compensation and benefits, labour and employee relations, occupational safety and health);
- Listening skills, as well as the courage to raise difficult issues with senior executives based on what has been learnt by listening;
- Skills as a strategic business partner (creating an overall talent or people mindset; creating an HR strategy that aligns people, processes, and systems; developing human capital metrics that are aligned with the strategy of the company; acquiring the ability to assess talent especially during challenging organizational changes; ensuring that ethical standards are actually practiced).

Strategic business partnership is an important role for HR professionals to play, for it demonstrably adds value to any organization, but in and of itself it is insufficient. The role of a HR Business Partner encompasses strategic business partnerships, but also requires HR professionals to understand and identify the key drivers of individual, team, and organizational success that are consistent, or aligned with, the strategy of an organization. Those drivers become the basis for human capital metrics to assess work-unit or organizational performance. The

mere existence of metrics is not enough, however. The challenge is to link the human capital metrics to customer behaviour and important financial outcomes of the business, and to build a coherent information management system around the entire process (see figure 1).

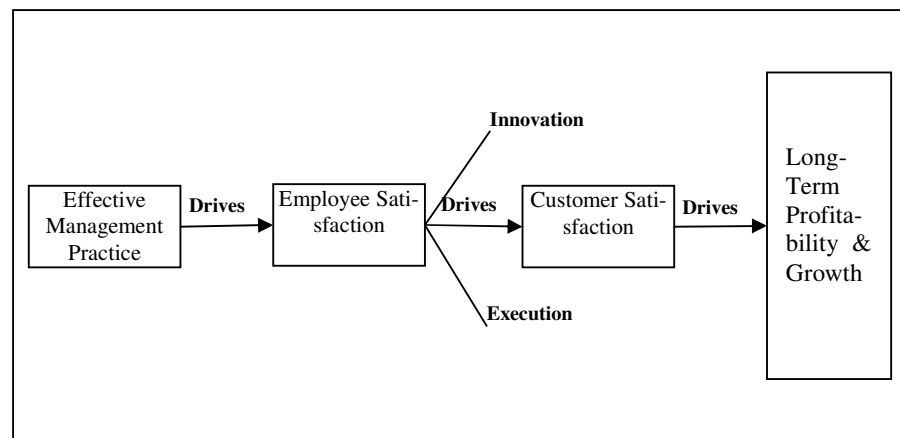


Figure 1. The chain of relationships that links management practices to long-term profitability and growth

Some authors have suggested that the introduction of HRIS brings about such an opportunity for the HR departments to evolve from cost centers into profit centers (Bussler & Davis, 2001; Cascio, 2005; Groe, Pyle & Jamrong, 1996; Hannon, Jelf & Brandes, 1996; Yeung, Brockband & Ulrich, 1994).

Research has shown that most organizations still appear to actuate technology merely to automate routine administrative tasks (Ball, 2001; Groe, Pyle & Jamrong, 1996; Kinnie & Arthurs, 1996; Yeung & Brockband, 1995) however, research evidence also suggests that larger organizations and those with an established HR department are more likely to use their system strategically (Burbach & Dundon, 2005; Kavanagh, Gueutal & Tannenbaum, 1990; Kinnie & Arthurs, 1996).

A survey conducted in 1998 (Ball, 2001) shows that 60 percent of Fortune 500 companies use the HRIS to support daily human resource management (HRM) operations.

Others have advocated that IT has the ability to revolutionize the HR function and to transform it into a strategic business unit (Broderick & Boudreau, 1992; Kovach *et al.*, 2002; Lepak & Snell, 1998).

Evaluating the usage of the information/knowledge generated by HRIS for the benefit of the organization requires system-level thinking and consideration of multiple stakeholders' needs and claims (Groe, Pyle & Jamrong, 1996; James, 1997). A number of authors advocate that capital investments in IT alone cannot guarantee its strategic application (Davenport, 1994; Miller & Cardy, 2000; Porter & Millar, 1985). According to Ostermann *et al.* (2009) the main reasons for that are:

- HR practitioners' lack IT skills;
- Senior management's lack of commitment to capitalize on system capabilities;
- Lack of employee involvement in the HRIS implementation process as a barrier to full HRIS utilization and satisfaction with the existing HRIS.

1.3 Benefits and Drawbacks

As an HRIS can be used in such a wide variety of ways and can represent a large investment decision for companies of all sizes, a convincing case must be made to persuade decision makers that the benefits outweigh the costs. Ngai and Wat (2004) observed that organizations need to be convinced of the benefits of HRIS for their company before they implement such a system. Therefore, an analysis of the potential benefits of technology in HRM has been one of the main issues both for HR practitioners and academics in this area. An examination of the literature suggests that the impact of technology in HRM falls into two main areas—the impact on the efficiency of the delivery of HR processes and the impact on the role of the HR function itself.

In terms of the efficiency of the HR processes, a typical argument is that a HRIS helps organizations reduce process costs. Enshur *et al.* (2002), in particu-

lar, discuss in some detail the impact of technology on the processes of acquiring, rewarding, developing, protecting and retaining human resources and conclude that the shift from traditional HR to e-HR can lead to “substantial reductions in cost and time for many HR activities” (p. 238).

Snell, Stuber, and Lepak (2002) have also noted that IT may potentially enable HR to lower administrative costs, increase productivity and reduce response times. Likewise, Lengnick-Hall and Moritz (2003) suggested that HRIS, not only reduces process and administrative costs, but can speed up transaction processing, reduce information errors and improve the tracking and control of human resource actions. Lengnick-Hall et al. (2003) also note that many of these effects are likely to be realized early in the implementation of a HR information system, and so providing compelling evidence of the benefits of such a system to stakeholders.

Other common benefits of HRIS frequently cited in studies include improved accuracy, the provision of timely and quick access to information, and the savings of personnel costs (Tetz, 1973; Wille and Hammond, 1981). Lengnick-Hall and Moritz (2003) discuss that fewer human resource professionals are needed because HRIS eliminates the “HR middleman”. Furthermore, HRIS speeds up transaction processing, reduces information errors, and improves the tracking and control of human resource actions. Thus, on the one hand HRIS improves service delivery (Lengnick-Hall and Moritz, 2003). On the other hand, it proves very important in the timeliness of HRIS in terms of operating, controlling, and planning activities in HR (Lederer, 1984).

Similarly Kovach *et al.* (2002) list several administrative and strategic advantages to using HRIS. In addition, Beckers and Bsath (2002) point out at least four reasons why companies should use HRIS. These are that HRIS can:

- Increase competitiveness by improving HR operations;
- Produce a greater number and variety of HR-related reports;
- Shift the focus of HR from the processing of transactions to strategic HRM;

- Reengineer the entire HR function of companies.

Broderick and Boudreau (1992) examine how HRIS can contribute to cost reductions, quality/customer satisfaction, and innovation. Sadri and Chatterjee (2003) noted that HRIS can fasten HR decision making but also strengthen an organization's character. Most organizations that adopt HRIS rely on available, accessible and tangible measures to make a business case for the investment. Some metrics that are used to justify HRIS include: the average cost of an HR transaction, number of inquiries to the service centre, cycle times, headcount changes, employee satisfaction, and financial metrics, such as the return on investment or payback period (Anonymous, April, 2002). In their 2002 HRIS survey, Watson Wyatt found that the top four metrics used in formal business cases supporting HRIS were: productivity improvements within the HR organization, cost reduction, return on investment, and enhanced employee communication.

Many of these cost reductions and efficiency gains are likely to be realized early in the implementation of a HRIS, so they provide compelling evidence when it is needed to get a project up and running. In fact, the payback period, or the time it takes to recoup the investment, can be as short as one to three years (Lego, 2001). However, while it may be possible to identify many of the relevant costs (e.g. software and hardware), it is more difficult to quantify the intangible benefits to be derived from a HRIS.

Beyond cost reductions and productivity improvements, HRIS also has the potential to fundamentally affect revenue channels. However, establishing direct and objective measures of these benefits is more difficult to achieve. For example, HRIS may improve employee productivity, employee morale, decision making, and information sharing; it may enhance innovation; and it may speed up time-to-market for products. In addition, HRIS can fundamentally change the way individuals relate to one another and to their organizations through various communication media. This may improve the flow of information and expertise through the organization enhancing firm's strategic capabilities. While a logical

case can be made that these consequences of HRIS affect an organization's bottom line, an empirical case is more challenging to develop.

On the other hand, there are costs associated with implementing a HR information system. For example, "wiring the work force" (ensuring that everyone has access to the HRIS), requires providing personal computers and internet connections for all the employees. Moreover, to capitalize on all the possibilities of HRIS, workers need to have personal computers and internet connections at home as well as at work (including work "on the road"). Some companies facilitate this outcome by providing employees computer discount programs to encourage home usage. In addition to "wiring the work force", there are inevitably transition costs associated with moving from a more traditional information system to a HRIS, including slowdowns, mistakes, and other consequences of changing from old to new – from legacy systems to integrated suites. Hardware costs for servers and software costs for application programs entail sizeable initial expenses and continuing costs over time as better technology becomes available (Lengnick-Hall and Moritz, 2003).

According to Bussler and Davis (2001), security is another factor to consider for HR and IT professionals, as with any software system. Human Resources by its very nature deals with very confidential data and companies need to be conscientious in managing that data. Although vendors offer high security and are aware of its priority, HR professionals should never let their guard down.

Another bigger factor may be resistance to change, employees like the feeling of safety in the old paper system (Ostermann et al., 2009). Thus, change management is another issue for HR and it might be the most serious one. Most organizations greatly underestimate the cultural impact of technology on their employees. HR needs to spend as much time with employees on "change" as they do on the training and implementation software. They will have to assess the level of the employees' skills and acceptance of technology, whether the PC or a kiosk system. HR can set up training and mentoring programs within staff groups to help stressed employees. Better yet, employees should be involved in the de-

velopment of the HR system (Bussler and Davis, 2001-2002, Ostermann et al., 2009).

While many companies are adopting HRISs and acknowledging their benefits, other are taking a “wait and see” attitude before embarking on such an expensive and time-consuming change. Some firms prefer to adopt a soft approach, by introducing less complex forms such as “publishing information”, before attempting to transform their HR departments. And for those who have already adopted HRIS, many have yet to realize its full benefits. For example, a survey by Towers Perrin found that 80% of respondents said employee self-service can lower HR costs, but only 5% said they fully achieved this objective, another 35% said they have only partially achieved that objective, and only 3% said it was accelerating HR’s transformation into to a strategic partner.

According to Towers Perrin's recent HR Service Delivery Survey of over 330 global organizations:

- 21% of organizations plan to increase their HR technology spending this year.
- 43% will maintain their current level of investment.
- 36% do intend to decrease their budget.

While some organizations reported a modest cutting of planned technology investments, it is clear that companies no longer view HR technology as a discretionary cost to be held during tough times. Instead, the prevalent view seems to be that HR is a needed partner, able to help the business identify cost savings and position the organization for future success. Despite some caution about spending, companies see a proven value in HR technology and are willing to make the investments needed to sustain organizational effectiveness, workforce planning and long-term growth (2009). This is why learning from the experiences of pioneering companies in the world of HRIS can be valuable.

1.3.1 Security and controls

Given the confidential nature of HR data, it is evident that effective security is a major requirement of HR SSC technology, which must support the organization's compliance with data protection principles.

The first one is that only relevant data should be captured. By controlling the capture of data within legitimate HR processes, the technology can be used to ensure that only relevant data are captured. Branches can be applied within the processing logic to further refine this. For example, if an employee is not entitled to a particular benefit, meaning that certain data items should not be recorded in their case, HR systems can be configured to prevent such input.

Secondly, data should be accurately maintained. Various facilities exist to help keep data up to date and accurate: validation rules can be applied to input screens to prevent inaccurate data entry; self-service can be used by employees and managers to inspect and where appropriate change data; audit reports are available to provide a record of what has been changed; reports can be run for data verification purpose.

A third rule is that data should be retained for no longer than necessary. By means of processes or reports, HR systems are able to highlight data which are about to become too old to be retained, so that a decision can be made as to whether they should be deleted or archived off the database.

A fourth rule implies that data are used for legitimate purposes. Again, by controlling the capture of data within specified HR processes, the technology can be used to ensure that data are only used for legitimate purposes.

Another features required to help achieve compliance with the data protection principles is that access to data is controlled. Various features are available to ensure that system access is confined to authorized users, and that the nature of their access is appropriate: telephony and CRM systems prevent unauthorized callers gaining access to personal HR data; this can be extended to ensure that authorized callers only get access to data to which they are entitled. For example,

the agent could confirm that the manager on the phone is responsible for the employee who is the subject of their call; HR systems offer secure ID and password logon facilities.

If multiple systems are in use, they should comply with generic access standards so that appropriate access across all systems is granted to users via a single sign-on; stringent technical security provisions can be applied, for example, encryption of passwords, secure web data transfer protocols (HTTPS) and so on; powerful security management facilities should be available for use by system administrators, for example, password resets, setting up and changing user groups and so on; access within systems should be confined to appropriate transactions (for example, being able to update all new starter details except payroll) and data (for example, managers are only given access to their own staff's data); finally a periodical report could show which user carried out each data update.

The last principle is that data must be disposed of safely. HR systems should offer effective data archiving facilities so that, after an agreed period (and perhaps prompted by the system as mentioned above), data can be archived into secure off-line storage or deleted with absolute certainty.

1.4 Empirical studies in HRIS

A number of studies related to HRIS can be found in various HR Journals. Many of them are conceptual or non-empirical studies. Based on a comprehensive search of the literature, Table 1 summarizes, in a structured format, previous empirical studies that use either a qualitative or quantitative approach. The earliest empirical study we found was conducted by Mathys and LaVan (1982). They conducted a survey to examine stages in the development of HRIS. Nearly 40 percent of the surveyed organizations did not have a computerized HRIS. Other survey results similarly revealed a relatively low implementation of HRIS (Murdick and Schuster, 1983). Later DeSanctis (1986) also surveyed the status of HRIS and assessed its operation and relationships to the management informa-

tion system (MIS) function. Martinsons (1994) compared the degree and sophistication in the use of IT for HRM between Canada and Hong Kong. In a recent study, Ball (2001) conducted a survey of the use of HRIS in smaller organizations. Her study and the one of Martinsons (1994) show that smaller organizations are less likely to use HRIS.

It is noted that the majority of studies have focused on the status of the use of HRIS and on the HR applications/features that have been integrated as part of HRIS (see tables 1 and 2).

Table 1 – Summary on empirical studies on HRIS

Author(s)	Location/Target	Sample Size	Method	Purpose(s)	Findings
Ngai and Wat (2004)	Hong Kong	147	Mail survey	Examines the status and extent to which industries in Hong Kong have adopted HRIS Investigates the perceptions of HR professionals of benefits and barriers to implementing HRIS in Hong Kong	83% of the respondents indicate that their organizations have a separate HR unit, and the majority of the sample organizations has less than 5 members of staff employed in the HR unit. The major benefit of HRIS is quick response and the quick access it provides to information; the greatest barrier to implementation is insufficient financial support
Ball (2001)	UK companies	115	Mail survey	Reviews the issues surrounding the use of HRIS Profiles system usage in terms of information stored on personnel, training and recruitment, and information processing system used	Smaller organizations are less likely to use HRIS Training and recruitment are used less frequently in HRIS HRIS are used for administrative ends rather than analytical ones
Ng <i>et al.</i> (2001)	Australian construction companies	3	Case study (interview)	Aims to improve the understanding of HRIS in construction companies, which are potential users of the HRIS, and the purpose of the information and the type of data they seek from the system Establishes a conceptual framework to facilitate the integration of HRIS into construction companies	23 HR activities are identified and grouped into 7 major functions: (1) project management and control; (2) strategic planning, review and analysis; (3) employee profile; (4) employee performance; (5) human resource development; (6) payroll and accounting; (7) information systems outside the company
Tansley and Watson (2000)	US-owned transnational company	1	Case study (interview with 10 HR and IT representatives)	Examines whether the individuals involved in developing the HRIS are "enabled and constrained in their efforts by an organizational context that is consistently re-created by the actions of those individuals within that context"	Strategic exchange processes are important in influencing the outcomes of the successful implementation of HRIS
Haines and Pett (1997)	Members of the Canadian Association of Human Resource Systems Professionals	152	Mail survey	Identifies the conditions for a successful HRIS	The presence of an HRIS department or unit increases user satisfaction and system usage The larger the size of the IS unit, the lower the usage levels User satisfaction is higher when HRIS supports more HRM applications System conditions such as training, documentation, the presence of online applications, the number of HRM applications, the ease of use, and the perceived usefulness of the system, are the most important factors for a successful HRIS

Table 2 – Summary on empirical studies on HRIS

Author(s)	Location/Target	Sample Size	Method	Purpose(s)	Findings
Hannon <i>et al.</i> (1996)	US-based multinational corporations	11	Telephone survey	Determines how US-based multinational corporations improve the flow of information to, from, and within the HR function	All the respondents have either begun or plan to design, develop, and implement a global HRIS to increase the effectiveness and efficiency of the system Some HR processes in HRIS include payroll, succession planning, pension planning, employee benefits, etc. Lack of consistency across the company's locations is the major obstacle in assessing and operating the global HRIS. Other obstacles include data transfer, data security, and integrity, and technical requirements The three most important factors of a global HRIS are providing trainings for employees working with the HRIS, ensuring the relevance and accuracy of reports, and keeping up with changes in technology The support of HR and IS executives is key to the successful implementation of HRIS
Kinnie and Arthurs (1996)	Europe	231 (mail survey) 4 (case study)	Mail survey; semi-structured interviews for case study	Examines the uses and personnel applications of IT	73% make use of HRIS The use of an HRIS is significantly associated with the presence of a personnel director within the organization The use of IT by personnel specialists remains largely unfulfilled
McLeod and DeSanctis (1995)	Members of the Association of HRS professionals	513	Survey	Studies the current status of the HRIS	The HRIS of 73.5% of the companies is located within the HR department HR applications, such as workforce planning, recruiting, workforce management, and compensation applications are widely used either in a standalone manner or as part of the core HRIS
Martinsons (1994)	Canada, Hong Kong	118 (Canada) 361 (Hong Kong)	Mail survey	Benchmark the use of IT for HRM activities in Canada and Hong Kong Identifies future priorities for HRIS enhancement Accounts for differences and profiles exemplary HRIS practices in these two places	The use of IT for HRM is more extensive and of greater sophistication in a more developed economy (Canada) The application rate for using IT for HRM is greater in a faster-developing economy (Hong Kong) Larger organizations make more use of IT for HRM than smaller ones
Murdick and Schuster (1983)	Companies from Moody's Industrials Manual	150	Survey	Determines the extent to which HRIS is employed in the personnel function	Many personnel departments lag behind in terms of both planning for and implementing HRIS
Matlrys and La Van (1982)	Fortune 500 companies	105	Mail survey	Studies the current stage of development of the HRIS	40% of organizations do not have an HRIS The use for career planning & development was ranked lowest, while payroll and accounting was ranked highest

Chapter II

2.1 Elements of current technology in HRM

2.1.1 HR IS, the complexity of the IT challenge

The development of human resources is bound inextricably to the technology that serves it. The HR function has faced a succession of demands for changes to the way in which it delivers transactional services ranging from the development of more effective, integrated end-to-end processes to the development of knowledge-based centres of excellence.

In the end, however, the ability of the HR function to deliver step changes in performance is dependent on its capability to manage administrative tasks, which in turn demands a firm grasp and control of HR processes and data. For instance even the frequent request for simple headcount figures raises issues in the production and interpretation of data, thus making difficult to grasp the complexity of fast-moving HR information, even after they may have invested considerable sums of money in systems to try to raise the capabilities of the HR function.

The clue to the problem lies in the phrase itself: an employee headcount is rarely a 'simple figure'. For example, producing an accurate headcount often demands a clear definition of parameters:

- Does the figure include staff on maternity leave or career breaks?
- Does it count individual people or full-time equivalents (FTEs)?
- Does it include contractors, temporary and agency staff (regardless of how much of a permanent fixture they may be)?
- Given the fact that resourcing is a highly dynamic process, what day of the month is this figure taken from?

Once these questions are considered, it becomes apparent that seemingly simple data such as headcount in fact define a process for tracking an employee population. Further complications may arise when the headcount data are compared to similar figures produced by other systems. HR staff have often to succeed in reconciling their headcount figures with those of payroll or pensions, who may be using subtle variations on the parameters selected by HR. Similarly, finance operations may confound the issue further by viewing the organization differently from HR. Clearly when cost centres don't line up in an obvious way with organization structures, then aligning headcount with staff costs becomes a complicated task. These issues make many organizations wonder where the promised efficiency savings come from.

The situation is no simpler around the management of integrated HR processes. For example, the benefits of an integrated HR and payroll operation, whilst well documented, are still frequently unrealised. A lack of integration around legacy systems frequently shows up in HR as separate HR and payroll systems.

Consequently the organization and delivery of HR and payroll services is defined not by what works best for the customer/employee, but by where the boundaries of the software lie.

Interfaces between systems too often define the divisions between departments, for example where HR data on employee movements are passed summarily across to payroll, causing the process to wade through and requiring manual intervention, recalculation and double entry of data.

Such data and process management problems and resultant inferior service quality have been a recurring historical problem in HR that has, arguably, been a contributing factor in the inability of the function to participate fully in the strategic agenda.

Against this background of struggling to make technology deliver, HR is now facing a new challenge in terms of the way its services are organized and delivered. The separation of administrative/operational activity into shared service

centres, together with the development of the role of the HR business partner to deliver strategic advice and support directly to the business, have set new standards of process and data management for HR to achieve.

However, there is unlikely to be much tolerance for HR failing to deliver benefits from the new HR model and blaming the historic problems on poor technology. Many organizations are pushing the operational effectiveness agenda hard, motivated by clear success stories around shared services in different organizations. In some sectors, such as government, the objectives have been formalized – for example demanding fixed levels of operational improvement in a given timescale (Cedar, 2009).

The move to more effective HR operations and technology is not simply inspirational; it is a clear demand from the business. This demand is given added edge as, for many organizations, the development of HR shared services is simply one option, with the other being to source such services from commercial external providers.

An increasing number of organizations approach the transformation of HR operations with an open mind as to whether the solution should be ‘built’ or ‘bought’ (Raymond, 1985). The implications for HR are clear: delivery of HR services needs to make a change in performance to keep pace with demand from stakeholders and shareholders, or be considered a prime target for outsourcing. Against this background, reliance on legacy technologies with their inherent problems and high cost is simply not going to cut it.

The HR technology architectures that support our proposal of a new HR model illustrate how organizations can best leverage technology to serve the process of HR change.

We will look at the implications of this HR model in terms of new users’ roles and their needs. In particular, the model will help illustrate how the HR infrastructure can evolve to accommodate the needs of HR business partners, centres of excellence and HR shared service centres. This model will serve for us to ex-

plain the integration of different HR processes into a single management system that supports the HRIS transformation process.

Before introducing the model, it is of primary importance to take an in-depth glance at the new HR processes structure resulting from the interrelation between ICT technology and work/information flow.

2.1.2 Structure of HRM processes in the ICT age

HRIS emerged from the confluence of several important changes in society and business. First the nearly universal availability of personal computers was necessary to provide managers and employees with the hardware needed to conduct human resource transactions on line. PCs provided an important part of the infrastructure on which HRIS could build. Second, widespread computer literacy was necessary for employees and managers to take advantage of the opportunities that advances in technology offered. It is not enough to have requisite technology. People must know how to use it. Third, the Internet provided the means for linking personal computers and computer literate employees and managers in real time. Connecting people and data removed many of the physical barriers that previously hindered interactions and slowed business processes. Fourth, enterprise resource planning software and its various derivatives made it possible to link people working in the same business operation together. ERP provided the model – and sometimes the software – for linking often disparate databases into a seamless whole for a real time transaction processing and decision making. Fifth, human resource professionals along with information technology specialists created software and systems that moved HR information and decision making from file drawers to computers (Lengnick-Hall and Moritz, 2003).

According to Lengnick-Hall and Moritz (2003), HRIS has developed through three major forms. The simplest and easiest to implement is publishing information. More involved forms of HRIS included automated transactions. Finally, the

most complex forms of HRIS transform the way HR is conducted in the organization.

The first form of HRIS is simply publishing information. This involves one-way communication from the company to the employees or managers. This form of HRIS typically uses intranets as the primary information delivery medium. Earliest information publishing efforts involved generic content (e.g. company policies and procedures; benefits; directories of services; current events, etc). This was often followed by the introduction of personalized content (e.g. job openings tailored to individuals).

Simply publishing information on the web provides several benefits to the organization. Expensive printing costs can be virtually eliminated. Changes in published information can be made immediately and users can be easily and quickly notified of those changes. Users (managers and employees) can get current, relevant information whenever they need it and from wherever they have access to computers with linkages to the internet. Of course, issues of web design, information quantity and quality, and information control could limit the utilities of these efforts, but the best designed and the best implemented systems produce noticeable benefits.

The second, higher-level form of HRIS involves the automation of transactions, workflow, and even supply-chain integration. This form of HRIS typically uses intranets along with extranets, and frequently combines several different application programs. In this form of HRIS, paperwork is replaced by electronic input. Managers and employees can access databases, update information, search for needed information, and make decisions. For example, employees can access a back-end database that provides employee-specific data for enquiries such as: paid time-off accruals and balances, current benefit coverage, personal demographic data, work schedules, and retirement plan balances. Procedures that required much time, paperwork passing among staff, and multiple approvals, can now be accomplished by end users without face-to-face administrative support. Workflow applications enable users to complete an entire process with built-in

checks to assure compliance with organizational policies. Furthermore, functional processes (e.g. finance, accounting, purchasing, etc.) which may maintain separate databases and applications, are integrated into user-friendly presentations for end users. The higher level of automation occurs with supply chain integration, which allows organizations to coordinate human resource processes (e.g. assuring quality by using similar performance appraisal processes) among suppliers and distributors, improving efficiency and effectiveness along the entire value chain.

The third, and highest-level form of HRIS involves transformation of the human resources function. From information to automation to transformation, HRIS begins to move beyond its more traditional focus. In the transformation form, HRIS liberates the human resources function from its operational focus and redirects it toward a strategic one. Walker (2001) identifies three types of work for human resources in this transformation form: strategic partnering with the line businesses; creating centres of expertise; and service centre administration. Getting non strategic tasks done faster, cheaper and with less reliance on HR staff, creates the opportunity to focus on new ways to add value to the organization. HR can play a more active role in fostering the organization's intellectual capital (know-how, skills and capabilities), developing the organization's social capital (the connections between people that leverage productivity and innovation) and facilitating the flow of knowledge (knowledge management) in order to create new products and services, improve efficiencies in serving customers, and develop capabilities that lead to new sources of value creation.

Another classification of HRM information systems is based on the advancement of the tools it uses, in comparison with traditional HR. This distinction has been expressed in three generations of HRIS (Evans *et al.*, 2002), namely:

- 1st Generation of HRIS: It involves initial attempts to exploit HRIS. Those are predominantly transactional, using Intranet or electronic means to speed up service delivery or to reduce costs. Examples of this are payroll processing

and providing of training information so that people can satisfy their skill development needs on a real time basis.

- 2nd Generation of HRIS: It involves qualitative changes and improvements in the way HRM services are offered. For example, when 360o feedback is performed online, new possibilities for multiple appraisals open up. Another example is e-recruitment and the potential for Intranet-assisted open job markets. Such tools allow one to undertake things that were not feasible previously, such as benchmarking the functional competencies of the firm.
- 3rd Generation of HRIS: It means using technology to do things that could not be done before. An example would be the possibility to measure, on a regular basis, the energy that people put into their work.

The above categorizations can be presented using two dimensions: generation of HRIS, signifying the extent of change/improvement it brings upon HRM in general, and the level of automation it allows to transactions. Table 1 presents the above categorization of e-HRM.

		Three Generations of HRIS		
		1st Generation of HRIS: speeding up	2nd Generation of HRIS: qualitative changes & improvements	3rd Generation of HRIS: things that could not be done before
Function of HRIS	Publishing of information	HRIS major function is the publishing of information and the speeding up of this process compared to traditional HR	HRIS major function is the publishing of information & bringing upon qualitative changes in the way information is published (content of information communicated)	HRIS major function is the publishing of information and allowing HRM to do things in the communication of info that were not possible before (public reached)
	Automation of transactions	HRIS major function is the automation of transactions which are sped up, compared to prior traditional HR (time effective)	HRIS major function is the automation of transactions to which it has brought upon qualitative changes (fewer mistakes and better handling of data)	HRIS major function is the automation of transactions. It allows doing things that could not be done before (e.g. allows employees to choose from several benefit schemes)
	Transformation of HRM	HRIS allows HRM to take up a more strategic role, through the substantial savings in time it achieves	HRIS allows HRM to take up a more strategic role, through better quality	HRIS allows HRM to use tools it did not have before, in order to support the strategic function

Table 1. Suggested typology of HRIS (elaboration of Evans et al., 2002)

From the literature we can summarize several factors facilitating the adoption of HRIS. First, comes the organizational culture. The effect of organizational culture on the successful adoption of HRIS has been discussed in relation to the emphasis that companies put on intense, face-to-face services (Legnick-Hall & Moritz, 2003). Another related issue is the effect of culture on the change management that the transition to ICT tools entails, as performance-oriented cultures are more likely to accept change, and consequently to adopt electronic tools (Jackson & Harris, 2003).

Employee's IT skills and their familiarization with the electronic tools benefit HRIS adoption. This can be affected by past experience, since past usage determines perceived ease of use of an information system (Shrivastava & Shaw, 2003). Moreover, the crucial role of communication to employees as a facilitator in HRIS implementation is underlined in many studies (Ruta, 2005). This is why the HRM function needs to invest in IT training and communicate the benefits of employees' participation and involvement in HRIS services (Panayotopoulou, *et al.*, 2007).

Collaboration of HRM and IT has also been identified as a crucial success factor in HRIS adoption and use. This collaboration can ensure successful integration of technology into HRM processes, aiming at responding to the need for quality HRM services (Panayotopoulou *et al.*, 2007).

Finally, the industry/sector, in which the company operates, plays an important role in HRIS adoption. For example, companies in high-technology sectors, such as telecommunications, use more elaborate HR information systems. Previous research has shown that image is a reason for earlier adoption of HRIS in technology intensive sectors (Galanaki, 2002). Companies in IT want to show early adoption of IT tools from fear of staying behind, as this does not match their image. Also, having already introduced technology for customers (e.g., e-banking) positively affects internal customers' attitude toward technology.

As HRIS enables HR departments to supply their services to their internal customers with a capability and degree of interaction not previously possible (Alleyne *et al.*, 2007), it is important to consider their views on the system's success. One of the most widely used measures of the success of information systems in general is considered to be user computing satisfaction. Huang *et al.* (2004) argue that the employees' needs and preferences are important considerations in designing and managing a business-to-employee system. Moreover, both the internal marketing and IT literature on satisfaction regard customer involvement as an important part of the satisfaction outcome (Alleyne *et al.*, 2007).

While some organizations may take an evolutionary approach to implementing HRISs (moving from publishing information to automating transactions to transformation), others may opt for a more radical change and move directly to transforming the HR function. Since HRIS is both time-consuming and expensive for most organizations, the first step is to convince decision makers that the benefits are greater than the costs and that thanks to the mediation of HRIS HR could have a direct role in employee performance in support of business results..

According to Townsend and Bennett (2003), for most organizations there was little significant development of the HR or as, it was then more commonly known, the 'Personnel' function prior to the 1960s, and the focus sat mainly with the administration of core activities such as payroll or timesheets.

Rapid changes in the industrial relations landscape in the 1960s and 1970s put HR in a new role of police officer to the labour relations process. It was not until the early 1980s that new approaches to the function gave rise to the concept of human resource management (HRM), which drew on two themes in the 1980s, both of which carry relevance today.

The first was an early attempt to link HR activity with business outcomes through the work of Fombrum, Tichy and Devanna (1984), who developed a model of the HR cycle to show how key HR policies and activities could be linked to the delivery of business strategy. Although relatively unsophisticated

by today's standards, the approach demonstrated that HR could have a direct influence on employee performance in support of organizational strategy.

The second view to emerge was the Harvard model, led by the work of Michael Beer (1984), which shifted the focus towards the consideration of the employee as a 'human resource', where the focus was shifted away from HR processes and systems and towards a model that sought to manage through developing high commitment amongst employees. This approach attempted to align employee commitment at an individual level with the goals and strategies of the organization.

The implication of both approaches was that HR had the means to improve organizational performance, which, in turn, extended the range of activities that HR might legitimately become involved in and the information they demanded to manage such processes effectively. From the systems and data perspective the emphasis moved, for the first time, away from payroll processing and manpower modelling towards consideration of the employee performance cycle and how that supported the delivery of organizational objectives. This period gradually saw the emergence of a lifecycle of activity against which HR could start to identify demands for data and system functionality to support new ways of working (see Figure 1).

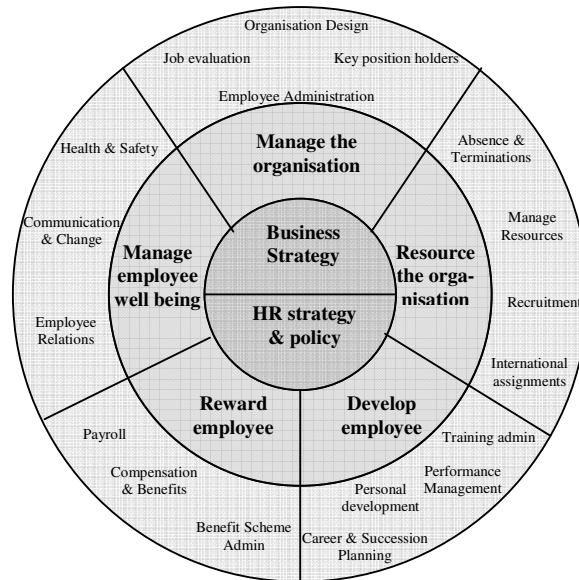


Figure 1. Performance cycle and demands on HR system (personal elaboration of Fombrum et al., 1984)

The development of HR ‘levers’ to manage employee behaviours in support of organizational objectives highlighted a need for much improved management information and supporting processes in several areas.

Managing the organization: The human resource management vision first demands knowledge of what the organization needs to fulfil its objectives. This gives rise to an increased focus on the organizational structure and the demands of specific roles within it; job evaluation gives more information about the job content of specific roles, whilst competency profiles can set out the precise behavioural demands of a successful employee in the role. From a systems perspective, this demands a significant new set of information to be held in an organizational record, distinct from that of the employee. This in turn can be used to drive several processes in HR as well as inform related processes outside HR (for example, the sharing of organizational hierarchy data can be used to inform both financial planning and procurement processes).

Resourcing the organization: The rise of HRM also gives focus to the resourcing process. Whilst, historically, HR holds responsibility for the mechanics of recruitment, the discipline of resourcing demands knowledge of how the requirements of the organization are made up and where those demands can best

be sourced. Thus organizations start to focus on their own resource pools and, from a systems perspective, see the emergence of requirements to match employee capability to demands in the organization; specifically to focus on the 'gaps' between an employee's personal competency profile and the demands of a specific role. At the same time, the recruitment function starts to develop administrative systems that can support the manually intensive mechanics of the process, such as producing correspondence, processing CVs and assessing the effectiveness of different providers in the process, as well as the ever growing statutory demands around the monitoring and recording of workforce composition statistics.

Developing the employee: The process of highlighting where employees performance currently lay in relation to their roles and addressing any gaps then becomes a primary occupation for HR. Performance appraisal, performance management and training and development activity to bring employees to the levels of competence required for their roles becomes the principal levers for aligning employee performance with the objectives of the business. This in turn creates new demands on systems to hold data on the employee development process. As well as maintaining a competency profile, systems are needed to cope with the process of measuring employee performance. The appraisal process grows more formalized and time critical as it becomes imperative to complete the appraisal cycle to meet other development goals in the HR calendar. At the same time, as with recruitment, managing administration of the process becomes burdensome unless systems can be developed to support the distribution of forms and correspondence and to collate and analyze results.

Rewarding the employee: Whilst not exclusively so, the performance lifecycle is frequently tied to reward management as the link between performance aligns with business objectives and the contents of the employee's pay packet. Operations & Maintenance related payments have been common since the beginning of the century and hence provided little technical challenge to payroll systems. However, the need to extend this approach to a new generation of cleri-

cal/managerial activities highlights the need for HR systems that operate in a fully integrated manner to support the performance cycle.

This means that all of the processes identified above needed to operate in a seamless manner, with data from one part of the process fully available to the next stage of the process without the need for re-inserting data or guiding data through a weak set of technical interfaces. As a minimum, systems are required to provide a clear, auditable trail showing the basis on which employees are rewarded, which in turn demanded a single view of the HR process and data and a level of integration between the component parts of the HR system that has seldom been seen before.

As we have analysed the shift from traditional HR to integrated HR through the means of technology, drawing from recent literature and empirical studies, we can sum it up in overarching trends.

The first trend is that the time and money spent on certain HR processes have decreased significantly thanks to technology and the internet. Specifically, we can notice cost reductions in relation to the functions of recruitment, compensation and benefits, performance evaluation, training & development, and career management. However, technology has created new challenges for functions such health and safety, and legal issues such privacy in employee relations.

The second major trend is that various HR functions previously administered by HR (e.g. training and development, benefits, personnel records) are now administered by employees themselves, with the aid of technological tools. This shift has freed up HR employees to focus on more strategic, value-added activities. Less administrative paperwork for HR personnel is definitely perceived as one of the major benefits.

A third trend is the increased involvement by employees in HR practices, and the increased knowledge that they have about HR issues. One effect of this distributed knowledge is that HR professionals must consistently keep up to speed with new developments in their own HR processes. Where information regarding benefit options and salaries were once private domain of the HR department, the

internet has now made more of that information available to employees throughout organisations.

The fourth trend that has resulted from the influence of technology on HR processes is the increased need for HR information to be integrated with the information systems and other key systems of the organisation. Using the internet and e-mail for recruiting has seemingly triggered this focus on information sharing and coordination concerning the company's most precious asset – its own people.

Finally the clear objective highlighted in many researches is that HR needs to be (and in many cases is now becoming) a strategic business partner in their organisations. Hr professionals and line managers should consider working together in assessing how transitioning from traditional HR to HRIS practice can add value to the business of the organisation. Table 1 presents a comparison of traditional versus HRIS practice that can be used as a starting point for HR professionals and their business partners to assess how their organisation can effectively implement HRIS (Enshur, 2002).

Key HR Processes	Traditional HR	HRIS
Acquiring Human Resources		
<i>Recruitment & Selection</i>	Paper resume & paper postings Positions filled in months Limited by geographical barriers	Electronic resume & internet posting Positions filled in weeks or days Unlimited access to global applicants
<i>Selection</i>	Costs directed at attraction Manual review of resume FTF process	Costs directed at selection Electronic review of resume (scanning) Some distance interviewing
Rewarding Human Resources		
<i>Performance evaluation</i>	Supervisor evaluation Face-to-face appraisal	360 degree evaluation Appraisal software (online & hard-copy)
<i>Compensation & Benefits</i>	Time spent on paperwork (benefit changes) Emphasis on salaries & bonuses Naïve employees Emphasis on internal equity Changes made by HR	Time spent on assessing market salaries Emphasis on ownership & quality of life Knowledgeable employees Emphasis on external equity Changes made by employee on line
Developing Human		
<i>Training & Development</i>	Standardized classroom training Development process is HR driven	Flexible online training Development process s employee driven
<i>Career Management</i>	HR lays out career paths Reactive decision Personal networking (local area only)	Employees manage their career with HR Proactive planning with technology Electronic & personal networking
Protecting Human Re-		
<i>Health & Safety</i>	Building & equipment safety Physical fatigue Mostly reactive programs Limited to job-related stressors	Ergonomic considerations Mental fatigue & wellness Proactive programs to reduce stress Personal & job-related stressors
<i>Employee Relations/Legal</i>	Focus on employee-management relations Stronger Union presence Equal employment opportunity Sexual harassment/Discrimination Task performance monitoring	Focus on employee-employee relations Weaker Union presence Intellectual property & data security Inappropriate use of technology Use of technology monitoring (big brother)
Retaining Human Re-		
<i>Retention strategies</i>	Not a major focal point	The critical HR activity currently Online employee opinion survey Cultivating an effective company culture Repetitive tasks done by technology
<i>Work/family balance</i>	Not a major focal point	Development & monitoring of programs Providing childcare & eldercare Erosion of work/home boundaries

Table 1. Comparison of traditional HR to HRIS

2.2 Trends in the HR technology

How well is the HR function served by technology after 40 years of parallel evolution? Most organizations are caught in a continual process of ‘technology tag’: new developments in HR demand new approaches to HR computing, which in turn consume large amounts of time and budget whilst generally failing to deliver their promise. While this is happening, the organization inevitably develops further, leading to demands for newer technology, and thus the cycle repeats. The result is that many HR organizations live with a multilayered set of technologies that chart the development of HR operations over many years but which add little value to the overall function.

2.2.1 The IT legacy in HR

Examples of poor HR architectures are nowadays still frequent: personnel records are frequently held in multiple locations and systems (perhaps the legacy of past mergers and acquisitions) which fail to provide a complete picture of the workforce; mainframe payrolls sit alongside PC-based reward systems and are unable to share common data; web-based recruitment tools invite applications on an international scale, which cannot be shared or distributed within the organization.

Clearly this is not true in all organizations. Many enterprises on widely differing scales have successfully developed HR tools that serve the purpose of the HR organization without becoming a constraint on the ability to change. The development of complete and integrated HR data and effective management information in turn creates the climate for developing new service led models for HR delivery.

Kavanagh et al. (1990) stated that HRIS functions interactively with human resources management systems such as human resource planning, staffing, training and career development, performance management, and compensation man-

agement. They further explained HRIS in a three level continuum, namely electronic data processing (EDP), management information system (MIS), and decision support system (DSS). For easy reference, a comparison of these three levels of HRIS is presented in Table 1. Combinations of these systems can occur within a single firm (Kavanagh et al, 1990).

Dimension	EDP	MIS	DSS
Target Users	Basic level operators	Middle managers	Top managers and executives
Focus	Data, files, storage, transaction processing, and reports	Information retrieval, Plan and analyze data against expected values, Integration	“What if” analysis through use of models, generation of decision alternatives
Characteristics	Basic personnel information	Inquiry capability, report-generation capability	Interactive for users
Examples	Payroll	Turnover reports, age and gender distribution, Equal Employment Opportunity (EEO) compliance report	Human resource planning, compensation simulation

Table 1. Comparisons of the Three Levels of HRIS

Most HRISs are organized by modules which help users to deal with HR data more effectively (Kavanagh et al., 1990). Users can generate calculations or reports that enhance administrative procedures and decisions in one or more functional areas. Therefore, a modular approach is adopted here to map the major contents of HRIS and their relationship with HRM systems. A list of HRIS modules may help new users in system implementation and experienced users to refine and advance existing systems. A matrix of 15 cells is presented in Table 2, which describes three levels of HRIS (EDP, MIS, DSS) and five human resource management functions (human resource planning, staffing, training and career development, performance management, and compensation management). The most commonly used modules are placed into appropriate cells for easy reference. Table 2 is not an exhaustive list of HRIS modules, rather it is a matrix to provide a general description of HRIS that may be applicable to any organisation in the implementation of information systems for HRM. It should also be noted

that some modules may not be confined to a certain function. A function such as performance appraisal can be a performance index as well as an indicator for human resource planning or training. The depth of application also varies with the business environment. For example, applicant tracking can be an automated applicant administration system at the data processing level, it can also be performed at the decision support level as a recruiting strategy. Modules are placed into the cells where they are most likely to be used. The major purpose of the matrix is to provide a general frame of reference which companies can look to in the initial stages of development. The matrix can be modified to suit individual company needs.

Function\Level	EDP	MIS	DSS
Human resource planning	Skills inventory	Turnover analysis, Organizational charting	Succession planning, Work force dynamics analysis
Staffing	Basic employee information, Applicant tracking	Recruitment analysis, Selection analysis, Position analysis, Manpower structure analysis	Staffing simulation
Training and career development	Employee training data, Training courses, Career profile	Training needs analysis, Training cost-benefit analysis, Promotion analysis	Career management simulation, Training evaluation and decisions
Performance management	Performance data	Performance appraisal analysis, Attitude survey, Attendance management analysis, Productivity analysis	Performance management simulation
Compensation management	Payroll, Health insurance, Routine reports (e.g. income tax)	Personnel cost analysis, Compensation structure analysis	Compensation management simulation

Table 2. HRIS Modules by Level and by Function

2.2.2 Evolution of the HR Application Market

To understand the nature of current problems with HR technology, it is necessary first to understand something of how HR technology solutions have evolved. Many of the problems routinely encountered in HR systems have their roots in

design and development problems that relate to older technologies and which no longer need be a constraint on the organization.

Throughout this chapter we have referenced the major stages in the historical development of HR technologies, which should be read in parallel with the points made here.

2.2.2.1 The Payroll-driven solution

The beginnings of HR technology arose with the need to process large numbers of employee payslips which, prior to the 1960s, was predominantly a manual or clerical exercise. The advent of large mainframe applications to process payroll calculations and generate paper payslips on a large scale was, for most organizations, the first major application of technology to an HR-related problem.

Such systems rapidly proved their value in reducing clerical activity and the number of staff required to support the process within both finance and HR. At the same time it was recognized that such payroll systems often held a useful repository of employee information, including data about jobs, pay, cost, absence levels and personal data. This stimulated demand for better information and quickly led to the development of HR-related applications that held additional management information on individual employees that could, for the first time, be used to produce meaningful information on which to base strategic decisions in the function.

At this point the 'market' for HR systems was split fairly evenly between organizations that built their own systems, often employing large IT sections to do this for them, and a small embryonic group of HR system vendors.

This rapid development led to quality solutions, many of which are now still in use in some organizations in some form. However, as HR information needs developed, mainframe technologies quickly proved to be a constraint.

Whilst mainframe systems are, by their nature, very adept at sharing data across a wide network and maintaining a secure and robust environment, at the

outset of the business computing era mainframe systems tended to be highly inflexible and heavily dependent on skilled technical resources who could build required applications. At this point the relationship between HR and IT was often characterized by end users attempting to explain to IT experts what was required. With such a focus on the technical difficulties of delivery, it was not surprising that the developed solutions were gigantic, expensive to build and maintain, difficult to use and, generally, did not deliver what was needed.

2.2.2.2 Human Resource Management systems – Evolution of the dedicated HR systems market

The development of the personal computer and related trends in computing such as client-server architectures determined a whole new set of computing possibilities for HR. The flexibility and local processing capability offered by PCs meant that HR users could maintain their own HR records and information and could quickly generate the types of specialized management information that would previously have required dedicated technical resources. Whilst PC systems were easy to acquire and operate, they had a significant downside in that they tended to lack any real integration with the payroll system or indeed any other business applications. Therefore whilst PC systems offered significant advantages, their stand-alone nature led to a mass of new problems in terms of keeping HR systems in step with other data.

Client-server architectures offered the potential to share this information across a wider network and to distribute data processing, data storage and presentation to the end user across different technical platforms according to the requirements of the task. At the same time, more advanced database and reporting tools, particularly the advent of fourth generation languages such as Oracle, provided far more flexibility to structure and analyze data in a way that was less dependent on the restrictive hierarchical data structures found in mainframe systems.

These changes in the options for technology delivery provided the catalyst the industry required to develop a new generation of HR specific systems and tools. Software vendors rapidly evolved applications to manage the complexities of HR processes such as historical record keeping, time and labour recording, organizational management, performance management, recruitment administration and a whole host of other functional areas. With the development of new functions, businesses started to recognize the possibilities and quickly wanted to tailor the new systems to meet unique or specialized requirements in their own organizations; thus the requirement for flexible business solutions was created.

New systems were generally delivered with a set of configuration tools that would allow the organization to make subtle (and sometimes not so subtle) changes to the core system to meet their local requirements. This in turn demanded a specialist set of skills to manage the implementation of the new system. Vendor marketing messages focused on how technology solutions would provide the basis for a revolution in the way HR was managed in the organization, and a race began between the main vendors to develop functionality that would differentiate their system from their competitors.

However, whilst the new systems and architectures offered considerable advantages they also opened up a wide range of complexity around HR solutions that brought a whole new set of problems. Because the applications market for HR was evolving so rapidly, many 'leading edge' products were rapidly eclipsed by developments from rival vendors. For the organization wishing to buy an HR solution, this often meant a comprehensive and long evaluation process to determine which system best fit their needs.

In addition, many of the new systems were IT platform specific (for example running only on IBM, HP or Dec hardware), which meant that the evaluation process often boiled down to a debate between IT and HR about technical platform versus functional needs.

Once the preferred system was selected, organizations often found their problems were only beginning. The flexibility of new systems was a new-found free-

dom for HR users used to being told what was not possible. The ability to adapt systems was frequently interpreted as ‘we can tailor the system to do whatever we want’, which in turn led the systems delivery project down a route of complex and costly development projects that only succeeded in delivering a system that did what the old system did.

What was often lacking from such projects was any clear understanding of what opportunities the new system presented for optimizing existing process or how embedded process inherent in the system provided a basis for understanding and developing best practice processes. In addition, few business users were aware that tailoring an IT system was often a far more costly proposition than changing the process to fit the system.

From an IT perspective, the new technologies were often long on promise and short on delivery. PC systems proliferated as users discovered the advantage of personal computing power. However, in a pre-web environment, PCs were notoriously poor at sharing data, and systems integration became a major issue.

In a networked environment, the management of client-server solutions was frequently highly complex and surrounded by proprietary tools and systems that required a wide range of skills to implement. IT departments often resorted to imposing mainframe-like restrictions on the development of new systems in a deliberate attempt to limit the technologies they would need to support.

As HR solutions developed, therefore, the complexities on both the business and IT sides of the project frequently caused problems during delivery. Many high-profile delivery projects during this period flourished and successful systems delivery was often a missed affair.

2.2.2.3 ERP/Web-based applications

The development of integrated HR solutions was given further impetus by the emergence in the 1990s of enterprise resource planning (ERP) applications, such as Oracle, SAP and PeopleSoft. Initially the term was coined to describe a com-

plete set of business applications that would cover all aspects of an organization's core processes, although later it generally came to mean applications that specifically focused on back office operations including HR, finance and procurement.

The development of an integrated approach to the back office meant the potential to eliminate the complexities of integrating cross-functional processes such as the management of organization structures (where HR and finance information seldom agreed) and paved the way for fully integrated solutions that might cover multiple back office processes and geographies.

At the same time, the introduction of web-based technologies meant that the historical problems relating to the sharing of data and processes over a network could now be managed by means of a universal set of technology tools. This in turn meant that anyone in the organization with access to a PC and an Internet connection could now use self-service tools that enabled line managers and employees to access and update records and processes that, so far, had been the preserve of the HR function alone. It was the development of such fully integrated toolsets that made the organization of transactional activity into service centres and the reduction in administrative headcount a real possibility.

Through the course of the 1990s, three giants emerged in the vendor market as the main suppliers of such applications: SAP, Oracle and PeopleSoft; all three remain in a dominant position in the HR systems market, although PeopleSoft is now in the ownership of Oracle.

It was quickly apparent that the problems that had been experienced to date in delivering large-scale solutions needed to be addressed and the focus turned towards the techniques and methods used to implement these systems if such solutions were to be seen as credible and reliable. This period announced the growing market in organizations specializing in systems integration and offering a wide variety of structured methodologies and preconfigured solutions. However, the fact remains that implementation remains the most problematic aspect of system.

2.2.2.4 Tools on top – The best-of-breed argument

During the period of explosive growth in HR systems in the 1980s and 1990s, a new systems market emerged providing technology to meet specialist functional requirements. This market included a range of systems that were specifically designed to meet the needs of specialists in the HR field such as recruiters or trainers.

The rationale for such systems arose from the realization that an HR system that tried to cover all processes would inevitably lead to some compromise in the functionality offered. Specialist systems, it was argued, could bring a unique focus on providing 'best-of-breed' functionality based on expert knowledge. The argument quickly took hold, particularly in organizations that had a critical focus in areas not adequately supported by the mainstream HR systems and it rapidly became the norm to supplement a core HR solution with additional package functionality from other suppliers with some organizations even building their entire HR systems architecture from best-of-breed packages.

Best-of-breed solutions undoubtedly have an important place in the overall architecture for any organization; for example, an organization faced with a need for high-volume recruitment in an industry with strong competition for new recruits may need to invest in more comprehensive tools to manage the process than may be available from the mainstream suppliers. The difficulty can arise when trying to integrate data from the specialist systems with data from the core systems.

It is frequent to encounter organizations that have invested in a wide range of specialist technologies to manage their HR processes but have failed to make similar investments in ensuring that these technologies can share data effectively. Too late, many find out that, in buying specialist tools to support critical processes around resourcing, learning and development, performance management and reward, they have lost the ability to get a single view of the data and manage these processes in a coordinated fashion. Thus the ideal of leading edge func-

tionality is often outweighed by a practical need to integrate core HR data, which, according to our review, is the more important of the two requirements (XXXXXXXXXXXX).

2.3 Impact of the HR integrated model

The emerging web-based technologies from ERP and best-of-breed vendors paved the way for a reorganization of back office processes and the opportunity to devolve process and activity to its point of origin in the organization by means of self-service tools. The work of David Ulrich (1995) demonstrated the impact that shared service centres (SSCs) could have on service cost and quality and prompted many organizations down this route. The shared service centre carried many of the requirements of a traditional HR operation but also created new demands for contact management, service monitoring and control and financial re-charging that were new to HR operations.

2.3.1 Emerging roles

The model earlier introduced (see paragraph 2.2) brings new roles such as HR business partners (HR BPs) and centres of expertise, who emerged as specialists who would, naturally, develop their own demands for management information and systems to support their roles (see Figure 1).

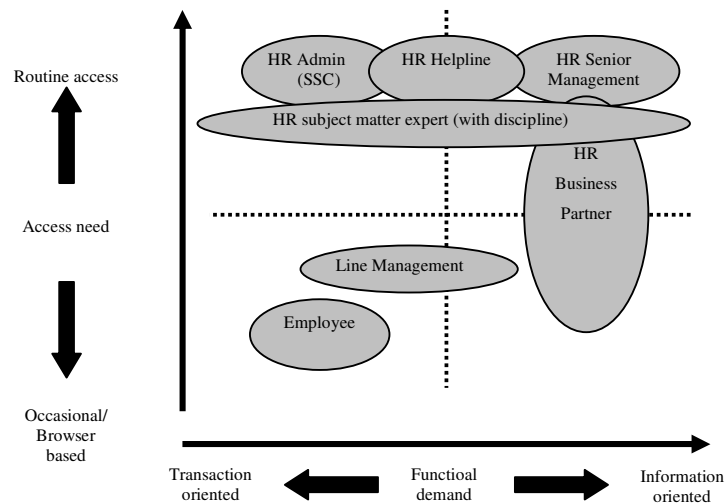


Figure 1 New roles influence demands on HRIS (elaboration of Ulrich, 1995)

For example, the focus in the SSC on customer services, key performance indicators (KPIs) and cost performance drives a demand for systems to support:

- contact management, to monitor and manage service delivery at the point of contact with employees;
- strongly integrated end-to-end processes for core transactions;
- performance monitoring systems that provide effective metrics to measure and improve the service.

For the HR BPs and subject matter experts, the emphasis will likely be on the development of a coherent and reliable source of data that can drive predictive trend analysis from historical data. Particular questions the HR BP may wish to resolve include:

- predicting seasonal peaks in business demand for HR services as a basis for planning HR delivery strategy;
- accurate historical data on individual performance, reward and terms and conditions to support organization design decisions;
- providing data on external benchmarks and comparators;
- tools to support the development of scorecard metrics.

Most importantly, however, the evolution of HR technology has taken systems out of the sole preserve of HR and placed them firmly at the heart of business operations. Now a new set of demands and standards are emerging from business users of HR data who understand the importance of a single source of HR data to support multiple processes across the organization.

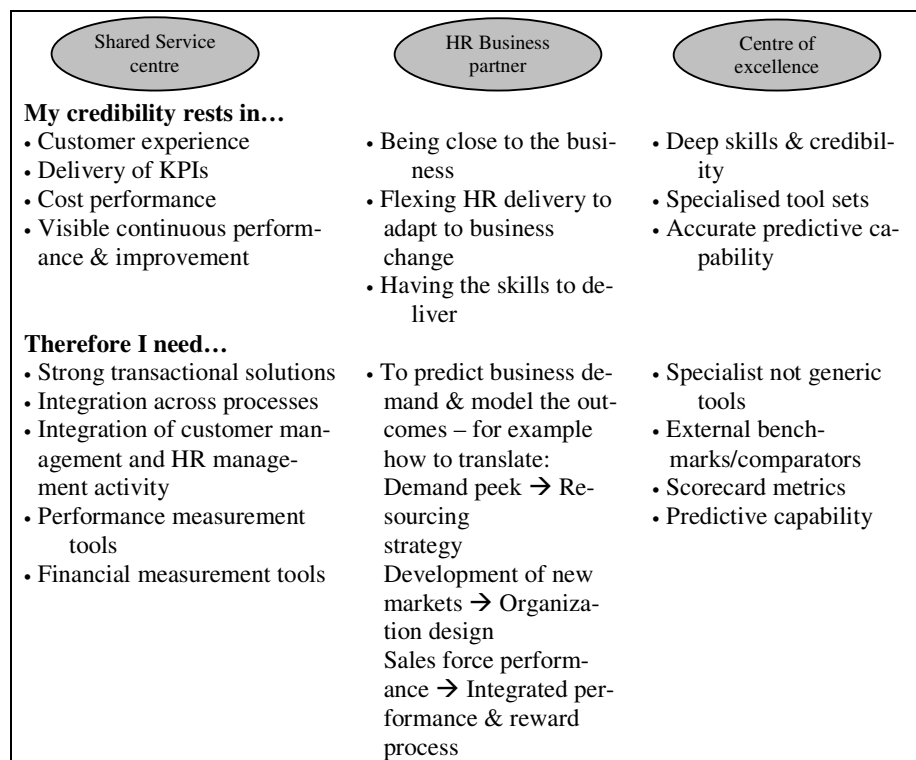


Figure 2 What drives performance in the new HR model?

Requirements can be as varied as the organizations that generate them, but there is an increasing realization of the value of HR data to critical business processes and planning. Such organizations need to make maximum effective use of their human capital and therefore are increasingly reliant on a common source of HR and finance data to support resourcing and costing decisions.

2.3.2 The demand for integration

For the HR organization developing a technical strategy to support the new HR model, this inevitably means considering tools and systems that were previously outside their domain. The use of contact management and customer relationship management (CRM) systems to monitor contact and service centres has now become standard practice in HR SSC operations. In addition, HR technology increasingly needs to include within its scope the use of telephony, document imaging and work management tools. The need for continuous improvement and service level monitoring has placed new emphasis on performance metrics and balanced scorecard reporting, and the move to commercial management of HR operations has driven a requirement for information to monitor transactional activity and manage the formal recharging of services.

The demand for integration therefore extends beyond the historical view of a requirement for integrated HR and payroll operations. New HR technologies have to address the need for integration on several levels:

- **Cross-functional integration within HR:** Whether or not HR systems are sourced from a single supplier or multiple best-of-breed vendors, there is a critical demand for related processes to share a common view of data and drive a seamless process. Performance management, reward management and learning and development are prime examples of three areas which are closely interrelated and where any fragmentation of the underlying data will impact HR's ability to deliver effectively in any one area.
- **Cross-functional integration outside HR:** Similarly, there is a need to consider how HR data will work in conjunction with other business applications, particularly back office applications such as finance and procurement. A common point of contact between these three applications is the organization structure; specifically the data HR holds on the organization is reflected in finance (expressed in the chart of accounts) and in procurement (as authorities to purchase). Unless these applications are designed with the ability to integrate this data, the organization will be required to maintain the same organizational data several times over.

- Integration of channel technologies where the demands of the shared service centre require a range of different systems to work in close cooperation: contact management systems, HR system, telephony tools, work management solutions and document management all need to work together effectively in a SSC if process optimization and improved service levels are to be realized.
- E-Business systems: While self-service systems may be integral to the core HR system, there may equally be a number of legacy web-based applications (for example, flexible benefits solutions or expenses systems) that lie outside the core and which need to work as part of the integrated process. Similarly there may be several repositories of HR policy data on existing intranet sites that may form part of the information base for the contact centre and which may require knowledge management tools to extract and present data as part of the contact centre's tool kit for answering caller queries.
- Reporting requirements: With such a wide range of technologies, careful consideration needs to be given to reporting requirements across the different sources of data. Standard reporting tools offered by an HR solution supplier may not offer the best solution to reporting across multiple platforms and the service centre architecture should include consideration of whether a data warehouse may be required to drive management information.

2.4 HR specialist systems in the back-office

The need for a cross-functional perspective within the HR function gives us the opportunity to analyse now the core HR processes that contribute to the building of the model presented in paragraph 2.2. Based on relevant consolidated literature, we can identify seven areas of HR concerned with the use of information systems.

2.4.1 HR Administration

This covers the core HR processes – starters, leavers, transfers, absence, over-time and so on – which have traditionally been the exclusive domain of the HRIS. However, until recently at least, the HRIS has often been little more than a data repository, as a result of which the core HR processes have had to be carried out manually by HR administrators. With web-enabled workflow-driven HR systems, however, these processes can be highly streamlined so that task owners (employees, line managers, HR staff) are prompted automatically to execute their tasks using employee or manager self-service (ESS/MSS).

As an example of the above, an employee may submit a request for annual leave, which is routed through to their manager to authorize. The system prompts the manager that the employee has submitted the leave request, and does so again if there is no response within a prescribed period. When the manager accesses the request, the system provides a summary of that unit's known absence for the period concerned to help reach a decision. When a decision is entered, the system is updated as appropriate and a note of the decision routed to the employee.

All of the above types of procedure are governed by user-programmable logic built into the system's workflow engine. Workflow functionality is also provided by CRM systems or generic third-party automation tools, so an evaluation of IT architectural options is important when workflow engines are being considered.

Various add-ons may be used to supplement the HR administration component of the core system. For example, in a clocking-on environment, a separate time and attendance system may be used to record absence details, which are then passed to the HRIS via an interface. The HRIS may also need to integrate with systems that are external to the HR department, such as security, accommodation, expenses and so on.

2.4.2 Reward

2.4.2.1 Payroll

The payroll system is perhaps the most established among back-office HR systems. Despite the ever-increasing sophistication of HR technology, payroll remains the one component above all others that must work correctly.

The main functions of payroll software are as follows:

- permitting the entry of all payments and deductions;
- calculating gross and net pay;
- generating payments via electronic processing of financial transactions, by cheque or manually;
- generating payslips;
- payroll reporting;
- payroll accounting and integration with the finance system;
- processing of weekly and monthly staff payrolls;
- allowing supplementary payments, after the main payroll run;
- year-end procedures, reporting, data transfer and so on;
- processing pensioners' payrolls;
- processing payrolls;
- processing expatriate payments;
- interfacing with internal and external benefits providers, including pensions.

As stated earlier, unless organizational constraints dictate otherwise, it is desirable for the payroll system to be integrated with the core HR system, since there is considerable overlap of data and process.

2.4.2.2 Compensation Administration

Compensation management programs were among the earliest HR applications of ERP. As IT advances, compensation software has evolved rapidly in the past decade. Recently, major ERP vendors brought in the Internet technology in their latest products. This Web solution is revolutionizing how compensation systems

are managed in organizations now and in the foreseeable future. Here are some key features and benefits of such a program within an ERP system:

- **24/7 accessibility:** A Web solution means users can access the program using a standard Web browser wherever and whenever they wish to. Compensation professionals no longer need to sit in front of their desktops at central offices in order to process information. Employees can view their pay and benefits information and update their personal profile at home or even on vacation.
- **Integrated functionality:** Compensation systems are integrated with some other HR and non HR systems within the organization. For example, a compensation professional can track up-to-date employee attendance information or performance reviews to make corresponding changes in compensation.
- **Data automation:** Automation of existing processes and procedures has cost saving benefits. Significant data automation relieves HR professionals from tedious routine tasks such as data entry, filing, and report writing. Data importing and exporting are made easy between other office applications software.
- **Streamlined workflow:** The Web solution streamlines all aspects of compensation planning and implementation, including plan configuration, modelling and budgeting, plans review and approval, and data exporting to payroll. In addition, by posting current information regarding compensation policies, program description, eligibility explanation, new compensation forms, and frequently asked questions and answers on the Web, that individual employee can access the HR department and saves a substantial portion of time, which the HR staff used to spend on responding to requests from employees.
- **Flexible analytical tools:** New compensation software has strong analyzing capabilities. It provides users with online reviews of various compensation reports that are pre-built in the system. Customized reports are also available to meet specific needs. Managers can view aggregated reports or drill down the reports by department, by work groups, or by individual employees (Dulebohn

& Marler, 2005). Users can conduct what-if scenario analyses and simulations in planning compensation budgets which improve the quality of strategic compensation decision making.

- **User-friendly interface:** Built on relational data base structure, the Web-based compensation software leaves the control of the system in hand of end-users with minimal technical skill needs. Unlike prior software systems, it requires no system-specific training and keeps IT support and maintenance at a minimum.
- **Real-time accurate data:** The HR department is no longer the sole party responsible for entering all the data. Employees and line managers are empowered to enter and update data on their side. Thus, information is being updated on the Web as it occurs. All the analyses are conducted using real-time data (Brink & McDonnell, 2003).
- **One stop information center:** Human resources home pages accessible via Internet or company intranet provide links to Web sites of outsider service providers such as employee stock administrators or health care providers (Gherson & Jackson, 2001).
- **Add-on applications:** Self-service through ERP applications enables HR professionals, employees, and line managers to focus on their primary value, adding tasks and spending less time on administrative tasks. Line managers can online view salary budgets, compare budgeting against actual spending, and take various salary actions easily with self-service functions or corporate portals (Adamson & Zampetti, 2001). Communications between management and employees are made easier. MSS allows managers take ownership in making compensation decisions with easy-to-use analytical tools (Gueutal, 2003). Cedar's third annual self-service survey shows a continued expansion of self service applications on the Web, and most surveyed companies report business success with HR self service implementation (Cedar Survey, 2001).

The level of sophistication and the speed of development of compensation software products indeed mirror the rapid-changing, dynamic, and complex

business reality of nowadays compensation management. Individual pay is no longer just monthly cash salary. Instead, it takes various forms, including stock ownership and flexible benefits. Firms have to be innovative in developing employee compensation packages to attract talents. An effective compensation system is designed to address business objectives and align with key business operations (Gerhart, 2000). To stay competitive, a firm needs to constantly compare its compensation structure with major competitors in the market places.

There are also ever-changing external factors such as legal regulations and labour economy that a firm has to closely monitor. Milkovich and Newman's (2005) four-component model summarizes key functions within a compensation system. The four components include internal structure, external structure, pay for performance tools, and administration tasks. We adopt these four broad categories to compare major web-based software on specific compensation functions.

2.4.2.2.1 Internal structure

An internal structure includes a hierarchy of job levels, pay differences among the job levels, and the criteria used to determine the pay differences (Milkovich & Newman, 2005). To assure internal equity in its compensation system, the organization needs to conduct job evaluations, and compile pay grade and performing competency analysis:

- Job evaluation: A systematic job evaluation starts with job analysis. With a web-based compensation software, an in-house job analysis is usually performed using an online questionnaire to collect information directly from employees, supervisors, HR, and outside subject matter experts. After the surveys are administered, the software analyzes the data with pre-built statistical techniques and automatically generates a job description per job surveyed. Such job description/ analysis is used as bases for job evaluation. The next step is to

compute the relative value of each job. Although Web-based programs support multiple job evaluation methods by user's definition, the point method is the most commonly used one. Users need to input a detailed organizational chart to clearly define job hierarchies and report relationships among them. At this point, market salary information can be incorporated as point of references in deciding job worth. Once users define compensable factors with scoring rules, the actual computation is executed by the software.

- **Pay grade:** The system allows users to define grading structure and create multiple grades for multiple jobs across the organization. Users can define pay range for each pay grade using imported external market salary data or existing internal data to set up a pay structure for employee base salary. Rewards and salary scales are linked to employee grading structure.
- **Competency analysis:** It is critical to keep the competency analysis current given the fast changing nature of work. The Web-based program enables HR professionals to keep track of competency sets of current jobs and current employees. Standardized functions are part of the new system to record knowledge, skills, and abilities by job, by employee, or by job family. To utilize integrated functionality, competency analysis is tied with performance appraisal, training, recruitment, knowledge management, and personnel administration. For example, an employee's competency profile will be updated when she/he accomplishes new training or obtains new certifications. Ability to track individual competencies progress is very important for organizations to base their pay structure on competency developed in a competency-based pay plan.

PeopleSoft® includes comprehensive knowledge base for tracking, understanding, and developing employees' skills base. Examples of this feature are unlimited competencies and review ratings. The system improves performance appraisal process to accommodate the needs for conducting 360 degree job evaluation online. This process provides multi-source assessment of employee's skills and job performance and invaluable feedbacks for future improvement.

Oracle® records employee skill qualification, competencies, and experiences from their hiring date. Performance appraisal is planned and conducted online so that the system tracks recent and historical performance appraisal records. Standardized online employee reviews and appraisals are offered by My SAP HR.

2.4.2.2.2 External Structure

To maintain external equity of its pay practices, an organization needs to gather market salary data and construct pay lines for common job categories. Salary survey data gives the individual organization an estimate of market price of certain jobs. Conducting a salary survey requires a great deal of time and resources input from compensation professionals with the conventional pencil-and-paper based method.

In the past, HR managers were mainly left with the option of purchasing salary surveys from specialized organizations. Surveys were already outdated by the time they were printed. Worse yet, after receipt of the salary surveys, they still had to be filtered through for job description comparison and geographic disparities.

Companies that specialize in compensation now offer online salary databases, allowing for faster, easier comparison and job posting sites allow recruiters to compare what other companies are offering. New web-based compensation programs speed up collecting salary data with a built-in configurable compensation questionnaire which allows customization. Participating organizations can fill out the surveys online. Data are entered online and are processed to generate wide-range statistics and reports. The system can import salary data from external data source for comparison and analysis or export internal compensation and benefits details to spreadsheets for survey purposes.

Although using the internet is faster, it still requires some research on the part of the HR. Free online data, like salary.com, should always be carefully scrutinized. Nevertheless, for small companies unable to invest thousands of dollars in formal surveys, the internet is invaluable (Bussler and Davis, 2001-2002).

For those companies able to invest in HR system suppliers, obtaining market salary benchmarks becomes much easier. For instance, within MySAP HR suite, a module called SAP Benchmark Infocube is specially designed for market salary data processing. This program performs comparative analysis of compensation packages (including base salary, variable pay, and benefits) using internal and external data with a variety of custom report options.

Pay lines represent market pay rates for an array of benchmarked jobs. An organization uses pay line information to create ranges for each pay grade reflecting its pay policy.

Regression analysis is commonly used to construct a pay policy line with average market pay rates. Pay lines then define a mid-point base salary for each pay grade. Depending on how an organization wants to match with market rates, the range of minimal and maximal pay can be readily identified. Any Web-based compensation program should include a standard wage/salary table. Users set up standard wage/salary tables per job with minimal, maximal, and mid-point base salary based on pay line information. Standard salary tables, individual skills and competency profiles, and job evaluation points make up the manager's workbook to determine individual pay levels.

2.4.2.2.3 Pay for performance programs

To attract and retain top talents, organizations invented various pay for performance programs such as merit pay, bonus pay, stock options, profit sharing, etc... These pay-for-performance programs are presumably able to differentiate between top performers and bottom performers by tying their pay levels with indi-

vidual performance or their contributions toward organizational goals. The basic logic seems simple, but designing and implementing such a plan is never easy. To accommodate multiple pay-for-performance plans in one integrated compensation system is challenging. In designing software programs, vendors had to strive to balance level of specificity and application breadth. ERP applications are kept flexible and let users define their own variable pay plans.

The variable compensation module in Peoplesoft® suite can be administered by group, by individual, or on an ad-hoc basis. Users define standard reward rules and identify eligibility rules to link rewards to jobs, grade, groups, or departments. The system supports multiple plans including commission sales plans. Users define commission sales plans with multiple quotas, revenue targets, and rate tables per employee. Payment methods and schedules, incentives by specific types or products, or services are available in the program. Oracle offers similar general variable pay functions as Peoplesoft® does.

Compensation applications in My SAP HR allows managers to design and implement innovative reward plans including performance-based pay, competency based pay, and various short-term and long term incentives.

- Merit pay: The common practice is to tie merit increase with performance appraisal. New online performance appraisals save HR professionals time from compiling data and coordinating review processes. Managers can view individual performance ratings online and allocate merit increases using tools such as the performance/increase percentage matrix. The matrix provides recommended percentage increase quartile by rating scores. Managers make informative decisions on individual merit increases. The system calculates pay increases and generates reports and graphical charts. Data are shared with all related systems such as payroll. Promotion pay increase is handled in the system in a similar manner.
- Bonus pay: Unlike merit pay, bonus pay is one-time money sum paid to individuals for reasons such as recognition rewards. Users define eligibility rules

and allocation rules. Managers can review and approve bonus pay plans. Data are exported to payroll within the integrated system.

- **Stock options:** While managers can grant employee stock options as part of their compensation packages using either managerial self-service application tools or user-defined rewarding plans functions within standard compensation systems, employee or executive stock option administration is not a covered function in common compensation modules. PeopleSoft® is one exception. The PeopleSoft® stock administration module allows employees to view their personal stock option information online, model future stock earnings, check investing periods, and exercise options. The module helps managers to design and implement employee stock grants or purchase plans.
- **Incentive plans:** Oracle® Incentive Compensation allows users to define revenue classes, compensation terms, rate tables, and quotas. Special features include sales person subledger, rule-based collection and revenue classification, credit receiver, and manual adjustment.

Whatever the system is, it should allow pay increases to be modelled according to pre-defined rules. For example, in a performance-related pay system, there may be a total pay increase budget, including on-costs (employer pension and national insurance contributions) which is required to be distributed within pre-determined ranges according to performance ratings. The system should allow a departmental manager to model various scenarios in order to determine the preferred distribution, and then submit this to the authorizing manager for sign-off and implementation.

2.4.2.2.4 Salary planning

Annual salary planning is the single most important compensation function and it involves not only HR professionals, but also line managers and other departments such as finance and accounting. Hours of time are spent each year in de-

signing and administering compensation planning and often times the plans do not work well. Web-based compensation software is designed to streamline the entire compensation planning process as best practices are modelled in the system to share the success. As an example, web-based compensation tools enable Dell™ to reduce planning cycle from 8 weeks to 3 (Gherson & Jackson, 2001).

PeopleSoft® supports budgeting and salary planning by groups and allows multiple budgets. The system includes employee review functions to accommodate the needs of employee participation in the planning process. Budget reports and trend reports help executives to view overall compensation budgets. Managers can monitor total HR costs by headcount or by other user-defined factors. Budget reports can be viewed at all levels from individual jobs, pay grades, teams, departments, to organizational levels. Interactive review gives users flexibility to get information that meets individual needs. The system is able to perform analysis by grade or job and to generate various legal compliance reports.

Global payroll engine is a unique feature of PeopleSoft® which enhances international payroll capabilities. It delivers predefined country specific compensation rules and offers extensive expatriate compensation management. Group build module provides a centralized area of functionality that enables users to define a group's membership based on any user defined criteria. This function facilitates the administration of team-based compensation plans.

Oracle® offers some similar budgeting functions such as supporting multiple budgets, reports rollups, and drill-downs. A unique feature of the Oracle product is the simulated “what if” planning analysis. This function helps managers understand the consequences of various planning scenarios. The system can generate reports to track budget fulfilment.

MySAP HR supports personnel cost planning and simulations. When planning, managers can take compensation relevant data on organization objectives into account. Compensation budgets are generated based on input from line managers, accountings with integrated headcount planning capabilities. A centralized employee database is integrated with performance management, training,

and staffing and recruiting and data are entered once and shared with all other relevant system.

2.4.2.3 Benefits Administration

A range of benefits may be provided by HR systems or additional tools on top, for example private medical cover, company cars, share option schemes, “give as you earn” and so on. The most basic requirement is to make payroll deductions and generate lists of scheme participants. If additional data, for example membership details and scheme rules, are needed, these may either reside on the HRIS’s benefits module if it has one, or on a separate system. In the latter case an interface will be needed between the HRIS and the relevant benefits system. This may be achieved by a traditional set of interface planned around the payroll run, or by a web services interface if real-time access to scheme details is required with sufficient regularity throughout the pay cycle.

Pensions schemes are massively more complex than other types of benefits and are usually administered via specialist software, although some HR system suppliers do include pensions modules within their core offering. If the pensions operation is within the scope of the HR SSC, a web services interface between the pensions system and the CRM may be worth exploring. This may be useful even if all pensions queries are routed straight through to the second line pensions experts, in order to manage pensions workloads and generate management information via the CRM.

The purpose of a pensions administration system is to manage membership, contributions and accrual details for employees and appointed pensioners. Payment of pensioners who are in receipt of their pension is usually processed via the main payroll system. Various interfaces between the HRIS/payroll system and the pensions administration system are therefore usually needed.

Finally, the HRIS and/or add-on package may be used to administer flexible benefits schemes, whereby salary is sacrificed in order to purchase a range of

employee-related products and services, for example, the purchase of additional holiday or a private health insurance plan.

A similar approach may be taken to other compensation applications such as the planning and delivery of executive share awards and sales staff bonuses. If this functionality is not supported within the core HRIS/payroll, additional tools such as spreadsheets will be required, including a two-way interface to supply the existing data to the spreadsheet and accept the agreed awards for implementation.

2.4.3 Organization Management

Organization management is now a standard offering of HR products and provides a record of the organization, which is separate from the individuals who populate it. Organization management allows the organization to be represented in terms of departments and/or functions, spanning as many organizational layers as required. Within these, reporting hierarchies are recorded comprising individual positions, which may be vacant or occupied by one or more employees whose records are linked to it from the HR administration module.

Generic jobs can also be recorded, for example, 'HR business partner', to which attributes, for example, competencies, training requirements and so on can be assigned. Positions may be allocated to jobs and 'inherit' these attributes, if required.

An organization management system enhances HR functionality across a range of applications:

- Learning and development – where competency matching between individuals and their current or intended positions can be conducted for development planning purposes (see paragraph 2.4.4.);
- Resourcing – where position attributes can be used to create vacancy records, when the incumbent is shown as leaving (see paragraph 2.4.5);

- Management information – providing analyses of filled and vacant positions, job competency profiles and so on. The OM module may also generate organization charts showing filled and vacant positions, although a specialist charting package is often needed as an add-on to achieve a sufficiently user-friendly display;
- System security – OM hierarchies may be used to control access rights among ESS/MSS users based on hierarchies, for example, a line manager can only access the records of staff occupying positions in his or her department;
- Workflow rules may well be governed by OM; for example, determining where to route a request for annual leave. As mentioned previously, the workflow may reside in the CRM layer, in which case an interface with OM data would be needed to supply the CRM with the necessary hierarchy details;
- Payroll charging – rather than maintaining cost centre details individually for every employee in a department, it is more efficient to record the cost centre once, on OM against the department. Employees will then inherit the cost centre details via their positions, and only in exceptional cases would these need to be overwritten by individual level cost centre entries. Apart from economy of data entry, this improves accuracy and consistency between the HR and finance systems.

In summary, OM supports a range of critical HR functions and as such is the backbone of the HRIS and related systems. It is therefore essential that OM data is accurate and up to date, requiring robust data maintenance procedures.

2.4.4 Learning and development

Learning management system (LMS) software is normally available within HR packages or can be purchased separately, requiring integration with the core system. Web-based LMSs can be used by managers, employees and training staff to plan and administer all types of learning intervention, for example, courses, e-learning and coaching. Typically such systems will hold a range of data:

- a catalogue of learning options, pre-requisites and course dates;
- a learning resource inventory;
- a record of learning expenses incurred;
- competency/learning requirements associated with positions/jobs (from the OM module), against which employees' competency appraisals may be profiled;
- employee learning data (learning plan, training history, competencies, qualifications and so on) from the personnel administration database.
- LMSs are particularly useful where the acquisition of qualifications is mandatory, for example, in a regulatory environment.

E-learning can be launched from many LMSs, and the results stored automatically upon completion of modules or the entire course. This requires integration between the LMS and the e-learning system, and various industry interface standards are now available to facilitate this. Some LMSs contain authoring tools for creating e-learning content, and this type of more comprehensive package is known as an integrated learning system (ILS).

Performance management also lends itself to web-based HR systems or specialist add-ons, allowing the recording and monitoring of objectives, training plans, logs and appraisals. Specialist succession planning software can also be used to record who are appointed for which jobs, and what development they will require before succeeding to them. These results can be displayed graphically to provide a highly visual view of the succession plan, highlighting where key gaps may exist. Learning and development (L&D) systems must also be able to produce basic operational management information, for example, course attendees, plus a range of tactical and strategic management information.

With regard to the actual L&D management, workflow has been improved through HRISs. The system helps to track training, skills and competencies. HR can use the system to manage human capital and maximize talent. The system stores "electronic resumes" for each current employee, which gives the company

an electronic inventory of its human capital. It can track where skills are in short supply and HR can develop appropriate training. Rather than going outside the company for talent, the system does queries looking for qualified internal candidates for each opening. Furthermore, employees can use the system to manage their own careers. If an employee is interested in designated career path but lacks certain skills, the employee can start appropriate training and the system tracks what courses have been completed. Ongoing training is often linked to higher wages, thus motivation to learn and morale is higher in these companies. If a corporation values employees for their knowledge and skills, greater commitment results.

In addition, many training opportunities are offered online to employees as well as suppliers. Training schedules, handouts, and course descriptions are posted on the company intranet. The advantage of online training is its 24-hour availability, which is especially crucial for global enterprises. Online training is also cost effective, saving travel expenses and time spent away from the office. Moreover the fear of the classroom setting makes online learning attractive to some employees; it allows them to remain semi-anonymous while asking questions and allows the ability to learn at their own pace. In the future, more training will be brought directly to the desktop through desktop video, adding interactivity and more fun to the learning process (Bussler and Davis, 2001-2002).

2.4.5 Resourcing

A subset of the HRIS system is applications for the recruiting and hiring functions. A good system will automate the majority (70-80%) of the recruiting process. Companies using job boards like Monster.com or CareerBuilder find huge increases in applicant numbers, but many are unqualified for the positions and tracking the volume of applicants is time-consuming.

There are two types of e-recruiting systems. An applicant tracking system tracks demographic information, as well as the skills of applicants and those in-

interviewed. The search feature of applicant tracking systems can screen out the qualified resumes based on certain predefined criteria, resulting in huge timesaving for HR. Letters or e-mails can be automatically sent by the system to unqualified applicants.

The second system is called a hiring management system (HMS). The primary difference between it and the applicant tracking system is that the HMS uses job boards and corporate websites to create a match from a pool of applicants. An e-mail is sent to the company when the system receives a resume that matches the recruiter's desired qualifications. This means a quicker interview, which reduces time to hire. "Hot prospects" can receive an offer more quickly, so a talented applicant does not disappear to another company. Passive candidates are also reached through push technology, making them aware of positions that match their skills. Both types of systems offer similar functions, and the distinction between them is not so sharp.

Indeed, the internet offers several things: access, speed, precision, targeting ability, efficiency, cost and time effectiveness. A good recruiting system can reduce the hiring time by two-thirds and lower costs by 90%. Undoubtedly, when compared with newspaper ads, the internet offers much lower recruitment costs (Bussler and Davis, 2001-2002).

Moreover the internet enables functionalities within the HRIS or specialist recruitment management system (RMS).

First of all, it helps creating a vacancy, usually by transferring job data from the OM module upon a position being shown as vacant, or potentially vacant.

Secondly it is possible to advertise the vacancy on the company's intranet or external web site, or via third-party recruitment sites.

Furthermore a RMS enables the recording and administering of applications and the management of the selection process, through workflows to route actions between managers, applicants and HR staff.

A recruitment management system has also specific functionalities for administering medicals, references and contracts for preferred candidates.

Completing the employment of the successful individuals is facilitated by the transferring of their details onto the HR administration module via the starter process.

Lastly a RMS can generate different types of reports, for example, interview schedules, lists of positions currently being advertised and so on.

Other more specialist resourcing applications may be provided as part of the RMS or via third-party software, for example, CV scanning and analysis and on-line psychometric testing. If a separate RMS is deployed, interfaces with the core HRIS may be needed, and also with the CRM if this is used to front-end resourcing for work control and reporting purposes.

2.4.6 Assessment and evaluation

Software applications dealing with human resources and their skills, attitudes, and knowledge (such as e-learning systems, skills databases, e-recruitment portals, corporate portals integrated with competence-centered services, and functionalities) are often based on database technology (usually relational) for storing, organizing, and searching relevant information.

In processes such as performance appraisals, the software tracks core-competencies and provides the manager with tips for employees needing improvement or coaching. It can also alert the supervisor to trends within the department that may indicate a need for training or management attention.

On the one hand, these appraisal systems bring about invaluable advantages. For instance, they enable companies with numerous locations to manage consistently across operations (Bussler and Davis, 2001-2002). On the other hand, they have two major limitations.

First, they and their databases are based on raw data (such as CVs and job offers and job/role descriptions), which are organized according to some ad-hoc “reference grid” (like a job tree): indeed, limited attention is devoted to data organization and to its foundations. Data organization should be based on the cen-

tral concept of competency: raw data are interesting if they convey information about what abilities are required for accomplishing tasks and what abilities individuals hold (or have acquired); this information is indeed forming the competence, required and acquired respectively.

Second, applications based on database technology do not really support the systematic analysis, exploration, and sharing of raw data and therefore offer limited support and weak integration to what can be called competence management processes. For instance, within a process for assessing individual competencies, it is difficult to implement portal services that try to automatically find out competencies of individuals from their CVs or, inside a company, from other documents (like activity or process reports which individuals have made).

Unfortunately, despite a huge amount of work, there is no consensus on the competency definition. This is especially because most of the current work prioritizes some processes over other processes (e.g., evaluating competencies is prioritized over identifying needed competencies). Worse, as usual, some works prioritize enabling technologies over models. This results in partial or overloaded models for representing what competency, acquired and required, is; additionally, there is no clear picture of limitations of these models because prioritized processes are often hidden.

Lindgren et al. (2004) emphasize further that HRIS should take into account real-time capture of information about competencies (often not aligned), capture of competence-in-making to represent what employees are willing to learn, and to support flexible analysis over the stored competencies.

Important analyses (known under various names, as “gap analysis,” “project staffing,” “training needs,” “candidate selection”) require approaches and/or technologies for finding similarities between CVs with job offers, competencies delivered by trainings with workplaces, and so on. The literature (Biesalski *et al.*, 2006; De Coi *et al.*, 2007; Sicilia, 2005) reports several prototypes attempting to apply “matching technology over ontologies” to automate as much as possible those analyses. Others analyses are reported in literature (under “team forma-

tion,” “key competencies,” “expert finding”) are also suitable. Snis *et al.* (2007) state that HRS should explicitly represent competence definitions and their assessment, and relate competencies to company strategic management.

The last one is very important and justifies what an organization may gain from fully realizing its competence management; indeed, it is the way in which the company may assess its core competencies, adapts to, or adopts strategic changes. However, portals and HRIS are usually not organized around the central concept of competency (even if they often refer to competency) but on what we call raw data. Portals and HRIS attempt to manage competencies by using pre-established lists, free text about skills, functional areas, areas of specialization, jobs, technological standards (IEEE RCD, 2007; HR-XML, 2004), and enabling technologies. This, however, falls short of true competence management because mixing competence related information with other aspects, which are usually needed to carry out competence processes.

2.4.7 Flexible work tools

The introduction of the Personal Digital Assistant (PDA), mobile phone, and mobile pager has brought more communication to every businessperson. Unfortunately, even the most organized HR executive had trouble keeping track of the separate messages. Now, unifying messaging makes it possible to consolidate voice-mail, e-mail, and faxes for retrieval from a telephone, PDA, or a PC. It is also possible to send e-mails and voice-mail the same way, through speech-to-txt and text-to-speech conversion. Other software allows for forwarding and redirecting messages when a line is busy or not answering, virtually following the person from office to home to cellular phone.

The increase in mobility will continue, leading to greater use of collaborative tools and less need for central office. Virtual meeting rooms will improve the concept of teleconferencing, so that people will be able to actually “be in the room together” (Bussler and Davis, 2001-2002).

Furthermore, smart systems or artificial intelligence will assist in the future with managing information overload. The system will analyze trends by tracking workflow, and make recommendations or adjust incoming information automatically, like a “virtual in-basket” manager.

Another improvement in the HR is the ability to store and convert information in several languages. As organizations continue their globalization, there will be an increasing need for technology that can translate better, work in several languages, and be able to comprehend speech or writing context (Bussler and Davis, 2001-2002).

2.5 Self-Service and Shared Service Systems

According to Draganidis and Mentzas (2006), current HRISs are converging to Web-enabled solutions joining Web services and employee self-service portals. Most organizations, especially financial and telecommunication companies, have adopted or plan to deploy employee self-service portals that can be integrated with the enterprise portal and be used freely by employees to continuously update their skills and abilities. This is also in line with what Lindgren *et al.* (2004) say regarding the urgency of designing principles of HRIS that combine user-controlled transparency over stored competencies (accounting privacy, completeness, correctness, and responsibility) and employee empowerment theory.

From the point of view of the HR function, employee self-service accomplished using the internet, voice response systems or kiosks in the workplace simplify the process of making information available to all employees, not just payroll or HR staff. For example, employees participate in benefits open enrolment through self-service or can view their salary history, factor in changes and see how each change will affect their future savings plan. The result for HR is more time saving via reduced administrative tasks. Time previously spent explaining to an employee why the dental plan does not cover her child’s orthodon-

tics can now be spent focusing on employee development and strategic planning (Bussler and Davis, 2001-2002).

From the point of view of the managers and employees of other functions this revolution brings about new interesting perspectives in the management of people. Today, managers and employees are assuming activities that once were considered the domain of human resource professionals and administrative personnel. This represents a significant break with the past, but one that has the potential to improve overall organizational effectiveness. Both managers and employees can respond quickly to changes when they have relevant information that is accessible and when they are empowered to make decisions using the information provided by the HRISs.

On the one hand, managers can access relevant information and data, conduct analyses, make decisions, and communicate with others – and they can do this without consulting an HR professional unless they choose to do so. For example, a manager who wants to make a merit pay decision may access files containing text, audio, and video describing how best to make the decision. Then, the manager can access the data file containing information on his/her employees. With a click of the mouse, the decision is recorded and other departments (such as Finance) are notified. Hours of processing are reduced to minutes, and much paperwork is avoided by the use of this technology.

On the other hand, employees control their own personal information. They can update records when their situations change and make any decisions on their own, consulting human resource professionals only when they deem it necessary. For example, an employee who wishes to increase investments in a retirement plan can do so from work or home using the internet. Employees may also, for example, participate in a training program at home after working hours (Lengnick-Hall and Moritz, 2003).

Another concept, shared services, has also been a response to the IS drivers. Instead of offering a service within a company in perhaps five different locations, shared service combines services in a single location, creating economies

of scale. Sometimes this shared service is offered through a call centre, available to employees on a 24/7 basis. Call centre representatives are there to answer any employee question relating to benefits, payroll, training registration, etc.

A significant proportion of the literature on the benefits of HRIS has focused on the potential impact of technology on the role of the HR function. For instance, Snell et al. (2002) observed that HR could meet the challenge of becoming more strategic as well as more customer focused and cost efficient by using information technology. Enshur et al. (2002) reported a trend of increased emphasis on HR as a strategic business partner whose primary role is to recruit, develop, and retain talented employees for the organization.

The use of an HRIS means that much administration can be accomplished using automated or self-service systems, meaning that the amount of time that HR practitioners need to spend on administration tasks is greatly reduced.

2.6 The integrated management of HRIS

There has been a continuous debate in IT circles as to whether, taken together, business and technology needs are best served by a single integrated HR technology solution from one supplier covering a broad range of functionality, or a number of specialist packages sitting on top of a core database, that is, a ‘best of breed’ solution, requiring a variety of interfaces to pass data between the various systems.

We have encountered the integration issue at virtually every stage of our study around the HRIS technology landscape, for example, whether the CRM should have in-built KM systems, whether the HRIS and payroll functionality should come as one integrated product, whether add-ons should be used for specialist HR applications, for example, LMS, and to what extent an integrated database is needed for tactical and strategic reporting purposes. Let us now consider some of the key arguments in the single supplier versus best of breed debate.

2.6.1 Single Supplier Approach

The single integrated solution is preferred by IT managers because of three main reasons:

- it is easier to receive external support in that all service requests are handled by the same supplier, so that problems can never fall between two ICT domains;
- the IT department can deliver more cost-effective internal support because the skills are more interchangeable between applications; and
- perhaps most significantly, there are fewer interfaces to develop, support and maintain.

In the case of HR, it is perfectly feasible for one supplier to provide most if not all components of the systems landscape. For example, enterprise resource planning (ERP) suppliers like Oracle and SAP offer both a CRM and an integrated HRIS/payroll module which includes most of the specialist add-on functionality that we have encountered. For good measure these providers also offer a range of other functional applications (most notably finance), as well as common or 'open' development environments, which purport to offer maximal ease of integration with other suppliers' products.

From a business perspective, the advantages in this approach of getting cost-effective IT support are often outweighed by:

- a perceived lack of choice imposed by the IT department; and
- an often justified belief that the needs of individual HR teams, for example, learning, reward and so on are compromised by the functional limitations of some aspects of the generic solution.

It is also important to explore the extent to which different components within the single supplier solution are truly integrated. For example, whilst a supplier may offer both an HRIS/payroll solution and a CRM, it is possible that these two components have never previously been combined or indeed were not even de-

signed with this combination in mind (not impossible given the relatively recent adoption of CRM for HR purposes). In this case, the implementation cost and risk may be increased by the need for the development of ‘invisible interfaces’ by the supplier.

In summary, the single integrated solution is fine in principle, and totally sensible from an IT standpoint, but can involve perceived and often genuine disadvantages for HR that must be properly evaluated on a truly informed basis in order to avoid issues at a later stage.

2.6.2 Best-of-breed approach

The ‘best of breed’ model is generally unattractive to the IT department because of the costs associated with the additional internal and external support effort required, and the need to create, support and maintain numerous interfaces between disparate packages. Any two applications not explicitly designed to share data and work in an integrated manner will require some form of interface. Such interfaces are often highly complex and expensive to build and create a potential point of failure in the system. This requires comprehensive and detailed error-handling procedures, for example when inputting absence data into the HRIS/payroll system via the CRM.

From HR’s standpoint, on the other hand, the individual packages may have the advantage of satisfying all rather than most of their functional needs. For example, a dedicated learning management solution from a specialist supplier may deliver more comprehensive functionality than the training module of an integrated system. Furthermore, some single supplier solutions simply do not offer certain types of functionality at all, for example, succession planning, whilst in other cases, their offering is so manifestly poor (organization charts being an oft-cited example) that the need to purchase add-ons becomes unavoidable. The argument is further complicated by HR functions determined to buy solutions with the widest range of functionality rather than making sure that there has been a

thorough examination of what the business actually needs. Failure to do this will result in a poor investment decision undermining HR's drive towards establishing its commercial credentials with the business.

A further complicating factor is how each system is accessed and used. For example, if staff and managers are required to use self-service facilities within a number of different HR packages, for example HR administration, LMS, RMS and so on, they may need to learn each product's basic functions, such as system navigation and the use of special function keys. They may even have to remember a set of different user IDs and passwords, though this can be mitigated if each system complies with standards allowing 'single sign-on' (additional cost to the business case if not already available) whereby the required level of access to all appropriate systems is controlled at a higher 'portal' level when users first sign on to their organization's IT network.

In summary, the use of some best of breed solutions is often desirable, and occasionally inevitable, but this approach may involve considerable additional complexity, cost and risk. At the same time, the importance of understanding the requirements of end users is critical to the success of the transformation process itself.

2.6.3 Single supplier versus best-of-breed – Some conclusions

Many organizations have found that their 'best of breed' strategy has not delivered the promised vision of providing the best available functionality as a result of problems with integrating different products. Organizations that have pursued this route have often found that the potential advantage of superior functionality is quickly wiped out by a system with unreliable interfaces that does not adequately support the end-to-end process and relies on data held in different locations.

On the other hand, monolithic ERP-style solutions do not come cheap, may fail to supply the required level of functionality in all areas, and may even fail to

deliver full integration benefits because not all components of their solution are truly integrated. If this were not complicated enough, the HR technology scenario continues to evolve, and further factors have come into play during recent years:

First of all, the use of CRM in HR SSCs offers a major integrating opportunity by linking the generic customer channel technology such as telephony and document imaging to the back-office HR applications. On the other hand, as we have seen, it introduces yet more requirements for interfaces and permutations for deploying workflow and selfservice within the total systems architecture.

Secondly, the advent of web services integration allows real-time interfacing between web-enabled systems. In the case of view-only integration at least, this eliminates much of the complexity that existed in building interfaces between systems. Moreover, new standards for developing IT applications including interfaces are emerging, collectively known as 'service-oriented architecture' (SOA). As its name suggests, SOA is focused upon delivering IT solutions based on the quality of service they offer rather than being constrained by 'techno-centric' factors. As SOA matures and is adopted by the major suppliers, it will further reduce the complexity involved in integrating different products.

In short, the integration issue is highly complex and far-reaching, and needs to be worked through by all interested parties, taking account of a wide range of factors which will vary between organizations. As a general rule, many authors Haines and Petit (1995) recommend a strategy of using a single integrated HR and payroll solution, possibly from a single supplier, as a starting point. Any additional packages should be evaluated carefully in terms of the benefits they offer versus the cost, complexity and risk they create, focusing on what is truly essential rather than on what is nice to have. Organizations should investigate thoroughly the 'true cost of ownership' of the alternative technology landscapes, that is, the cost of implementing, running and supporting each solution, including all interfaces.

Chapter III

3.1 Research Model

In line with the shortcomings of functional approaches to measure the performance of HRIS by the use of HR metrics, alternative approaches to benchmarking HR information systems striving for a more theoretically-founded and comprehensive approach to measuring its contribution to business performance should be put forward in academic literature.

Haines et al. (1997) observe with regard to HRIS, that “previous research has not identified the conditions that support successful systems” (p. 261) and suggest a set of three independent variables (i.e., individual/task, organizational, system) influencing HRIS success. Hagood et al. (2002) discuss the methodological approach and results of the Central Intelligence Agency (CIA) having developed and implemented a balanced scorecard-based performance measurement system for its HRIS. The article demonstrates that the balanced scorecard can be used “to identify and align the organization’s goals; to gather baseline data to measure against established measurement targets; and to measure and demonstrate the value-added contribution of the HRIS” (Hagood et al., 2002, p. 543).

A different approach is adopted by Beckers et al. (2002), who propose a decision support classification model in order to classify research first and then evaluate “whether an HRIS does provide a competitive advantage for an organization in today’s ever-changing, fast-paced, global business environment” (p. 41). The authors suggest a 5-step framework for classifying HRIS including a series of obstacles that must be overcome to demonstrate an HRIS’ contribution to a company’s competitive advantage.

Overall, as such comprehensive approaches to benchmark an HRIS value-added contribution diffuse among researchers, practitioners and decision makers,

these approaches may well be expected to be increasingly put into practice. However, research is still needed on the relationship between the performance indicators, and measures suggested by comprehensive approaches. Research is still lacking as well on the question of how to account for innovative practices (e.g., service-oriented architecture, self-service features) in benchmarking activities (Roberts 2006; Totty, 2003).

Ostermann et al. (2009) adopt a holistic and integrative perspective where current empirical evidence as well as guiding principles of process management and strategy implementation are integrated into an overall information-based model of benchmarking HRIS' functionalities.

In line with this as well as other comprehensive approaches such as evaluation models based on decision support system classification or on balanced scorecard measurements, our study intends to build a comprehensive model aimed to measure the value-adding contribution of HRIS to overall business performance. It reflects thus the current understanding of HRIS having "the potential to be the mechanism by which (...) entities monitor and deploy their personnel in order to attain and sustain a competitive advantage" (Hannon et al., 1996 p. 245).

Considering the nature of this research, a conceptual analysis was selected as the research method. A structured analysis of two existing models was conducted in order to measure HRIS effectiveness and to identify the factors that determine it.

In particular we combine Haines and Petit model for HRIS success (1997) and Watson Wyatt model for HRIS performance (2002) in order to measure the overall performance of human resource information systems in organisations. We integrate them with other relevant models, in particular an information-based model for HRIS benchmark and Howes and Foley definition of HR performance.

3.1.1 Model for HRIS success

The first model is based on the assumption that an assessment of HRIS success that includes merely data from a return on investment or utility analysis (financial approach) has many constraints and that surrogate measures of effectiveness should be favoured.

Haines and Petit model is specifically identifying two measures, user satisfaction and system usage. Of the two, user satisfaction has received the most attention in previous IS research. In settings where usage is voluntary, system usage has also been considered an acceptable measure of success to the extent that systems were used extensively only when they were perceived to be of value to the end user (Klenke, 1992). According to Haines and Petit, user satisfaction and system usage together provide a more complete picture of system success than if either measure was applied in isolation. The first is based on attitudes and beliefs whereas the second is based on behaviours. It should also be mentioned that these measures focus more on system success than on system sophistication. A system may be sophisticated, that is, it may have good architecture or a good relational database, but for a variety of reasons (such as a complicated interface, improper use, or limited access to equipment) it may be considered unsuccessful.

A number of conditions can help explain levels of user satisfaction and system usage. Typically, the computerization process within the human resource management department begins with a needs analysis and is completed with the implementation and maintenance of the system. From the beginning to the end of this process, many decisions and conditions influence the final configuration of the system. For example, the system can either be developed internally or acquired from a vendor. The system can provide a vast array of integrated human resource management applications or just one stand-alone application. Users may have acquired extensive computer experience or none at all. They may also have access to computer support, or they may function in relative isolation.

These and other individual/task, organizational, and system conditions are expected to influence user satisfaction and system usage.

Haines and Petit derive their research propositions from a relatively simple but inclusive model that is comprised of three sets of independent variables (i.e., individual/task, organizational, system) and two dependent variables (i.e., user information satisfaction and system usage). The model focuses on those important conditions that are believed to increase user information satisfaction and system usage (See Figure 1). Previous IS research has generated some of the conditions or independent variables included in this inquiry and additional variables specific to human resource management were also considered.

Most independent variables in the model, as our review of the literature suggests, are system conditions. They are expected to explain a greater proportion of the variance in user information satisfaction and system usage. In turn, user information satisfaction is expected to influence system usage to a certain extent.

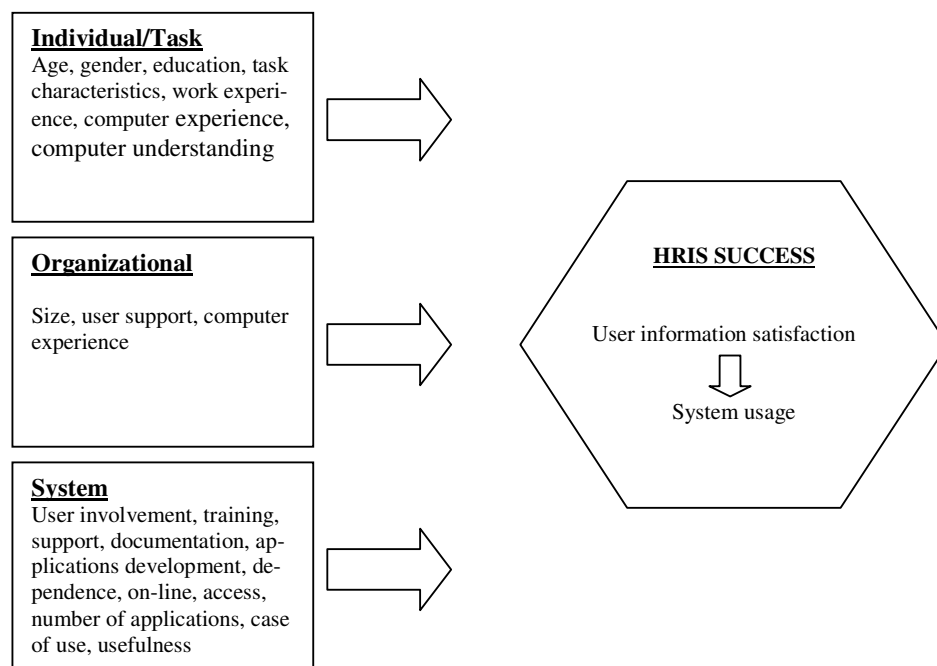


Figure 1. HRIS Success research model

Haines and Petit have considered seven individual characteristics that are expected to influence user satisfaction and system usage. After a review of the relevant literature, the following linkages are predicted between these seven individual variables and system success:

1. Age. Users who are older are expected to be less satisfied with systems (Igarria & Nachman, 1990) and to use them to a lesser extent (Lee, 1986). Older users are more likely to exhibit higher levels of computer anxiety and resist computer-based systems to a greater extent.

2. Gender. Because the data processing professions have been dominated by males and because it is a common belief that women exhibit higher levels of computer anxiety (Zmud, 1979), and because computers have been associated with the male domain (Dambrot, Watkins-Malek, Silling, Marshall, & Garver, 1985), there may be sex differences in computer attitudes and behaviors. Thus women users are expected to be less satisfied with systems and to use them less than men do. We note, however, that the proposition that gender could influence user information satisfaction or usage was not supported in recent studies (Igarria & Nachman, 1990; Igarria, Pavri, & Huff, 1989).

3. Education. Education is another individual variable that has been included in IS research (Lucas, 1975). One study found that education is negatively related to computer anxiety (Igarria & Nachman, 1989) whereas other studies have found non-significant relationships between education and user satisfaction (Igarria & Nachman, 1990) and between education and system usage (Mawhinney & Lederer, 1990).

4. Task Characteristics. Some task characteristics such as the structure of decision making, the type of work accomplished, and the decision making level in the organizational hierarchy are also expected to influence system success. The more structured the tasks being accomplished, the easier the development process and the greater the likelihood of implementation success (Cheney, Mann, & Amoroso, 1986). Furthermore, the tasks at higher levels of an organization tend

to be less structured and thus less easily assisted by computers (Mawhinney & Lederer, 1990).

5. Work Experience. Work experience is expected to influence system usage. It has been suggested that the length of time in an organization or in a position can change the way individuals make use of the formal and informal information flow (Fuerst & Cheney, 1982).

6. Computer Experience. Users with more computer experience are expected to be more confident in their ability to use the system and more satisfied with the experience (Igbaria & Nachman, 1990). A study showed that subjects with more previous computer experience were more likely to develop their own applications in the early stages of an experiment than were subjects with limited previous computer experience (Kasper & Cerveny, 1985).

7. Computer Understanding. Finally, users with a better understanding of computers are expected to be more satisfied with the system (Raymond, 1988) and to use the system to a greater extent (Montazemi, 1988).

Three organizational conditions are also expected to influence user satisfaction and system usage. After a review of the relevant literature, the following linkages are predicted between these organizational variables and system success:

1. Size. First, as systems are less likely to succeed in small organizations than in large organizations (Ein-Dor & Segev, 1978), we expected that users in larger organizations would be more satisfied and use the system to a greater extent. The fact that small firms are highly dependent on external software support gives credence to this notion (DeLone, 1981).

2. Availability of Internal User Support. The availability of user support within the organization is also expected to be an important success factor. As sources of expert information and assistance, the presence and size of the IS and HRIS departments (or units) are expected to increase user satisfaction and system usage. In a study of end-user computing, Rockart and Flannery (1983) found that a group of key users played an important role in helping other users. Other

possible user support strategies such as training and documentation are included in the system conditions group of variables.

3. Organization Computer Experience. Users in organizations that have more computer experience are expected to exhibit lower levels of user satisfaction (Raymond, 1985).

Finally, eleven system conditions are expected to influence user satisfaction and system usage. In Haines and Petit study, system conditions refer to (a) the delivery system, (b) system functioning, and (c) system performance. The delivery system covers items ranging from technical issues to human factors. After our review of the relevant literature, the following linkages are expected between the delivery system and system success:

1. Involvement. Users who were more involved in the HRIS development and implementation process are expected to be more satisfied with the system and to use the system to a greater extent (Baroudi, Olson, & Ives, 1986). The positive effects of user involvement can be attributed to such factors as a stronger feeling of ownership (Hirschheim, 1985) and a better fit between user needs and the design of systems.

2. Training. Users who receive more HRIS training are expected to be more satisfied with the system and to use it to a greater extent (Cheney, Mann, & Amoroso, 1986; Mawhinney & Lederer, 1990). It is expected that users with more HRIS training would be more satisfied with their level of computer competence and thus express higher levels of satisfaction and use.

3. Support. Users who receive more support from general management and from their immediate superior for using the system are expected to be more satisfied with it and to use it to a greater extent (Lucas, 1978). The expected relationship originates from the planned organizational change literature which emphasizes management support as a condition for successful change.

4. Documentation. Users who have access to complete, structured, and well written documentation are expected to be more satisfied with the system (Doll &

Ahmed, 1985; Gemoets & Mahmood, 1990). The quality of user documentation has also been a central issue in the HRIS literature (MacAdam, 1987).

5. Applications Development. Users who have access to applications that were developed internally as opposed to purchased applications are also expected to be more satisfied with the system (Raymond, 1985). It is believed that the “in-house” development of applications results in a better fit between users’ needs and the system that supports those needs (i.e., better customization of the system). It is also possible, however, that “in-house” systems lack documentation and sophistication, bringing lower satisfaction levels.

The system functioning conditions include items such as access to the system and the types of human resource management applications or modules available to users. After a review of the relevant literature, the following linkages are predicted between the system functioning conditions and system success:

1. Dependence. Users who are not dependent on external support for application processing are expected to be more satisfied with the system and use the system to a greater extent (Raymond, 1985). Thus, the type of computer installation (i.e., on-site or external) represents an important functioning condition to be considered in this study.

2. On-Line. Users who have access to more on-line applications as opposed to a series of free standing applications are expected to be more satisfied with the system and to use the system to a greater extent (Raymond, 1985). The use of more interactive application systems is thus expected to have positive consequences.

3. Access. Users who have free access to hardware and software products are expected to be more satisfied with the system (Rivard & Huff, 1988) and use the system to a greater extent (Mawhinney & Lederer, 1990). In human resource management, being independent of information staff and services has been an important issue (DeSanctis, 1986).

4. Applications. Users who have access to a greater number of administrative applications are expected to be more satisfied with the system and to use the sys-

tem to a greater extent (Raymond, 1985). Where systems have a greater number of human resource management applications, users will be more satisfied with the system and will use the system to a greater extent.

The system performance conditions include two important variables: ease of use and usefulness. Following a review of the relevant literature, positive linkages are predicted between these system performance conditions and system success:

1. Ease-of-Use. Users who perceive that the system is easy to use are expected to use the system to a greater extent (Mawhinney & Lederer, 1990). A HRIS that is difficult to use, meaning that it is not flexible, is not easy to learn, or lacks integration, would tend to frustrate users and thus inhibit its use.

2. Usefulness. Users who perceive that the system is useful are expected to use the system to a greater extent (Davis, 1989). Systems that enhance effectiveness and increase productivity would, therefore, be considered more successful.

3.1.2 Model for HRIS effectiveness

Watson-Wyatt model assesses HRIS progression and HRIS effectiveness (Watson-Wyatt, 2002).

HRIS progression is measured by three variables: (1) access: the combined percentage of employees who use the organization's HRIS delivery channels, such as e-mail, voicemail, interactive voice response (IVR), video relay system (VRS), Internet, intranet, and HR service centres; (2) applications: the number of HR-related services available on the organization's HRIS delivery channels; and (3) concentration: the extent to which access is focused on particular delivery channels.

HRIS effectiveness, instead, is measured with two variables: (1) HR efficiency: a combined measure of cost efficiency (HR operating budget as a percentage of total company revenue) and staffing efficiency (the number of HR staff relative to the total number of company employees); and (2) satisfaction: a

combined measure of employee and manager satisfaction with HR services in organizations where these levels are formally reported.

By measuring both progression and performance, the consulting firm claims to be able to identify the HRIS practices of organizations yielding the best results. They asked respondents HR performance-related questions in three areas:

- HR operating costs relative to company revenue;
- HR staffing ratio relative to employee population size;
- Employee satisfaction levels with HR services

Progression-related questions covered, instead, such general areas as:

- Which technologies (e.g. IVR, web) are in use for HR self-service?
- What applications (e.g. job postings, online enrolment) have been deployed?
- How many workers have access, and how is it provided?

HRIS PROGRESSION MEASURES	HR PERFORMANCE MEASURES
Access — the combined percentage of employees who use the organization's HRIS delivery channels (such as e-mail, voicemail, IVR, VRS, Internet, intranet and HR service centers)	HR Efficiency — a combined measure of cost efficiency (HR operating budget as a percentage of total company revenue) and staffing efficiency (the number of HR staff relative to the total number of company employees)
Applications — the number of HR-related services available on the organization's HRIS delivery channels	Satisfaction — a combined measure of employee and manager satisfaction with HR services in organizations where these levels are formally measured and reported
Concentration — the extent to which access is focused on particular HRIS delivery channels	

In addition to these HRIS progression and performance measures, Watson Wyatt asked extensive questions about the organization's HRIS strategy, business case, performance metrics and practices.

The most striking result is that “more” HRIS progression does not necessarily result in “better” HR performance. Watson Wyatt found that there are individual companies at every stage of HRIS progression that are achieving superior HR results.

In the early stages of HRIS, the vision is simple: implement as many HRIS applications and make them available to as many employees as possible, using multiple channels such as e-mail, voicemail, IVR, VRS, the company intranet, the public Internet and HR service centers. The assumption was that the faster an organization moved its traditional HR services into an HRIS environment, the more efficient HR would become and the more satisfied employees would be with HR services.

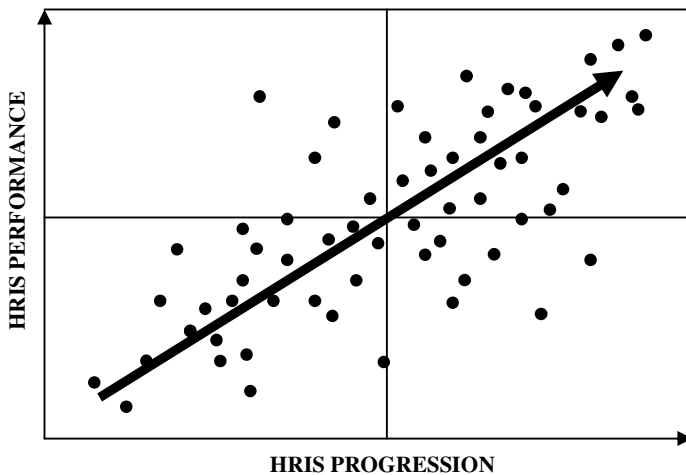


Figure 1. The hypothesis: more HRIS correlates directly to better HR performance

Watson Wyatt research shows that getting results has more to do with a properly focused HRIS strategy implemented with excellence than with the speed or extent of an organization’s HRIS progression.

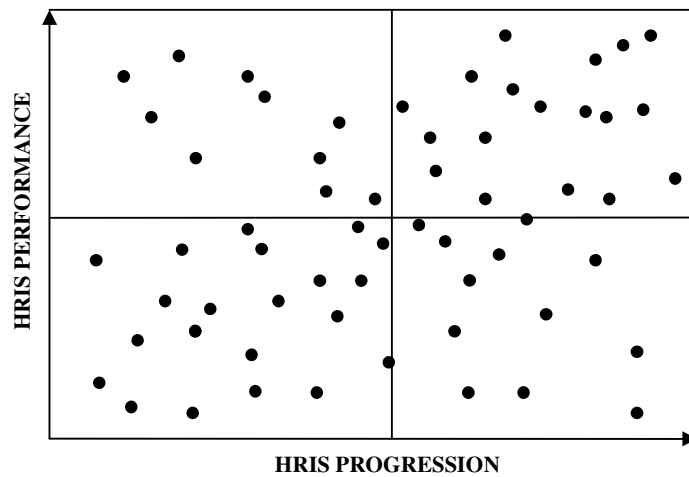


Figure 1. The actual results: HR performance is not directly correlated to HRIS progression

For example, some organizations with limited but focused investments in HRIS are achieving better results on HR staffing ratios, HR operating costs and employee satisfaction with HR services. These organizations are more likely to report having a formal, documented HRIS strategy, and business cases focused on cost reductions, improved service delivery and transaction accuracy.

Other organizations with significant investments in access and applications may have significantly improved employee satisfaction levels, but they have yet to realize improvements in HR efficiencies. Many of these organizations, whether they have a formal documented HRIS strategy or not, are more likely to focus their HRIS investments on improved employee communications and organizational culture.

According to this framework, organizations can generally be described as one of four types:

- I. Low HRIS Progression, Low HR Performance. These organizations have made limited investments in HRIS, and are not operating efficiently relative to their peers. They have the opportunity to optimize their existing investments and properly focus future investments to achieve the desired HR performance results.
- II. Low HRIS Progression, High HR Performance. These organizations are already maximizing the impact and returns of the limited HRIS investments they

have made to date. It is possible that as they make new investments in HRIS, their HR performance may decline until the return on those investments is realized.

- III. High HRIS Progression, Low HR Performance. Many large organizations in particular fall into this category. These organizations have made significant investments in HRIS initiatives, and have yet to realize the full performance payoffs. They have the opportunity to integrate and optimize their multiple investments, or refocus them as necessary, to accelerate the return on their HRIS initiatives.
- IV. High HRIS Progression, High HR Performance. These are the organizations that have properly focused HRIS investments as they moved quickly along the HRIS progression scale over the past few years. They have implemented their HRIS initiatives with excellence, and have the opportunity to continue to be early adopters and maintain competitive advantage over their peers.

HR Performance	HIGH	II	IV
	LOW	I	III
		LOW	HIGH
HRIS Progression			

By comparing HRIS progression to HR performance, the survey data allowed Watson Wyatt to determine the particular HRIS practices of companies achiev-

ing superior HR results. Regardless of HRIS progression, companies with high HR performance measures reported:

- A formal HRIS strategy was developed and documented.

Successful HRIS initiatives begin with a properly focused strategy in place. About 19 percent of respondents reported having a formal HRIS strategy. Companies that reported having such a strategy in place had lower HR operating costs relative to total company revenue. These companies also had superior HR staffing ratios (see table 1).

	HR Operating Cost/ Company Revenue	Total employee population / HR Staff
Formal HRIS Strategy	.50%	94.8 employees/HR
No Formal HRIS Strategy	.69%	87.9 employees/HR

Table 1. Impact of a formal HRIS strategy

- A formal business case for HRIS investments was in place.

Sixty-one percent of companies required a formal business case for any new HRIS investment. These companies in turn have significantly better HR operating costs relative to company revenue as well as HR staffing ratios.

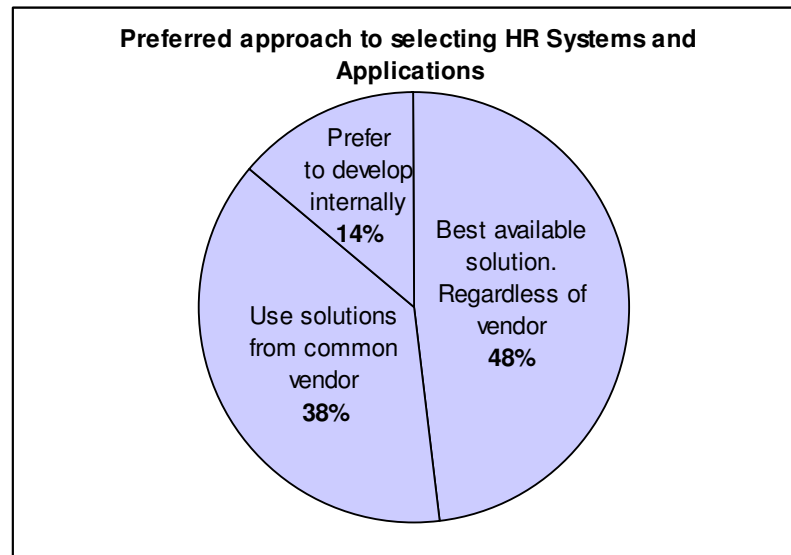
	HR Operating Cost/ Company Revenue	Total employee population / HR Staff
Business Case Required	.64%	96.8 employees/HR
No Business Case Required	.70%	88.6 employees/HR

Table 2. Impact of a required business case

The top four metrics used in these formal business cases were:

- Productivity improvements within the HR organization
- Cost reductions
- Return on investment
- Enhanced employee communications

A significantly higher percentage of high-performing HR organizations took a best-of-breed approach to selecting HR systems and applications, and preferred an even mixture of outsourcing and in-sourcing.



Beyond these best practices of all high-performing HR organizations, additional best practices depend upon where companies are on their HRIS progression. For example, high-performing large organizations (more than 10,000 employees) with high HRIS progression demonstrate these HRIS practices:

- Provide greater employee access to:
 - Company intranet at work;
 - HRIS applications from outside the workplace;
 - External HR vendor sites;
 - File and document sharing;
- Use single sign-on security for employee and manager access;
- Integrate external vendor applications and information;
- Conduct greater percent of health and welfare transactions via the Internet;
- Conduct greater percent of hiring and fulfillment processes via the Internet;
- Dedicate greater percent of HR budget to:
 - Technology investments and maintenance;
 - HR process outsourcing.

The vast majority of HR organizations have made significant investments in HRIS. The focus has been on improving employee satisfaction levels with HR services, while enabling HR staff to reduce administrative burdens and perform a more strategic role for the organization. One common presumption was that this rapid progression toward HRIS would produce direct improvements in HR efficiencies and employee satisfaction levels. The overriding conclusion of the Watson Wyatt 2002 HRIS Survey is that getting results along the HRIS journey is relative to the effective planning and implementation of HRIS initiatives rather than the extent of HRIS investments.

By doing best practice analysis benchmarking, all organizations, regardless of the amount of HRIS access or applications they have, can identify the HRIS practices that are likely to have the greatest impact on their HR results.

In conclusion, Watson-Wyatt reports that more HRIS progression does not necessarily result in better HR performance. The survey conducted suggests that implementation effectiveness may be a necessary but not sufficient condition for HRIS effectiveness, a distinction made by researchers who have studied the implementation of manufacturing resource planning (MRP) systems. Instead, other variables are likely to play an important role in the relation between progression and effectiveness. While the Watson-Wyatt model offers a point of departure for researchers, clearly more work is needed in developing a causal model of HRIS effectiveness.

3.1.3 Information-Based Model

Based on the review of these two models and of relevant literature, we can affirm that both Haines and Petit model of HRIS success and Watson Wyatt model of HRIS progression and HRIS effectiveness have limitations. The first model is based on attitudes and beliefs (impacting on user information satisfaction component of HRIS success) and on behaviours (impacting on system usage component of HRIS success). The authors claim that user satisfaction and system usage

together provide a complete picture of system success. However these measures focus more on perceived system success and do not analyse the level of system sophistication and the “hard” component of HRIS success, namely the HRIS performance effectiveness. On the other hand, Watson Wyatt model of HRIS progression and effectiveness, even though re-integrating the model with HRIS effectiveness, does not include any individual/task or organizational variable on the HR progression side.

We can affirm that the two models, as attempts to measuring HRIS, are conducted from two different perspectives, each of them relying on different models of HR value generation and different subsets of performance indicators: (1) Haines and Petit model is based on an (isolated) HR functional perspective, (2) Watson Wyatt model, instead, refers to a (potential) buyer’s perspective.

Regarded from an HR functional perspective HRIS benchmarking focuses on the benefits of retrieved data and information supporting standard HR activities and applications (e.g., employee recruiting and development or internal and external reporting). Indicators applied in the functional benchmarking of HRIS most commonly include the range of HR performance indicators that can be run on HRIS such as human value added, return on human capital invested, time to fill jobs or turnover costs (Benchmarking for functional, 2006; Howes & Foley, 1993; Morrish, 1994; Top 10 calculations, 1998;) as well as the HRIS’s aptitude to generate (sets of) data required for specific HR purposes and applications (e.g., demographic data, workforce data, time, and attendance data, etc.) (De-Sanctis, 1986; Rampton, Turnbull, & Doran, 1999; Thomas, Skitmore, & Sharma, 2001).

In the buyer’s perspective, as with other IT solutions HRIS benchmarking is applied for comparing different vendors’ HRIS software in order to support the potential buyer’s decision-making. The basic measures deployed range from the presence or absence of HRIS key capabilities (Kanthawongs, 2004) to rating schemes including functionality, technology, user-friendliness or market strength (The best HR, 2001) and environment-sensitive approaches, taking into consid-

eration a company's complementary IT systems and resources (An HRIS "shopping, 2004; 20 questions to" 2000). Examples for evaluation criteria suggested to assess HRIS software from the buyer's perspective include system compatibility, value, ease of access, support, as well as reporting and compatibility (Grensing-Pophal, 2000).

Ostermann et al. (2009) suggest, instead, a third way, an holistic information-based HRM perspective. In this perspective, along with the development of more complex HR practices and the upsurge of company-wide HR portals based on Web technologies, HRIS is regarded as a key factor for providing "a competitive advantage for an organization in today's ever-changing, fast paced, global business environment" (Beckers et al., 2002, p. 41).

According to Ostermann et al. (2009), in order to measure any (integrated) information system's functionality in terms of its contribution to generating sustainable superior performance, a more integrated analysis of the preconditions of the information systems value-adding conditions and as well as its fundamental tasks has to be conducted first in order to provide a comprehensive framework for identifying a performance-critical set of specific measures based on the nature of the retrieved information (Kunstlj & Vintar, 2004). Essentially, HRIS are thought to contribute to overall business performance by fulfilling or at least supporting the tasks of data storage and retrieval, of serving as primary administrative support tools, of reporting and statistics as well as of program monitoring (Rampton et al., 1999).

As put forward by several researchers and practitioners (DeSanctis, 1986; Haines & Petit, 1997; Hendrickson, 2003; 20 questions to, 2000), HRIS can only be implemented and run successfully in sufficiently mature IT environments in both the HR department as well as the general business context. Additionally, in order to ensure the efficient and consistent use of HRIS and enterprise resource planning (ERP) systems relevant personnel has to be capable of operating relevant software or to be offered adequate training (Haines et al., 1997). As far as a HR back office organization is concerned, the implementation of successful and

strategically aligned HRIS requires value added HR process reviews and if necessary standardization in order to realize a HRIS' whole range of potential benefits (Haines et al., 1997).

Moreover, the existence and definition of general business functions' needs and requirements regarding HR information may represent a strong driving force for realizing an HRIS' whole set of benefits.

Regarded from a front-office perspective in terms of the information generated, the measurement of a HRIS functionality has to integrate the assessment and subsequent matching of the information provided by the HR function as well as the information demanded by senior management. Finally, measures have to be identified in order to demonstrate an HRIS overall impact on the performance of the HR function as well as on business performance in general (Hagood et al., 2002; Beckers et al., 2002).

The information-based model (figure 1) integrates the HRIS' performance drivers identified above (environment maturity, backoffice/requirements, front-office, impact) as well as its fundamental tasks into a systematic model (Puxty, 1993) representing a holistic approach to monitor an HRIS' functionality. As shown in the next paragraph, this approach serves as framework for an elaborated approach to HRIS benchmarking based on the integrity of generated HR information in terms of its support to specific business functions.

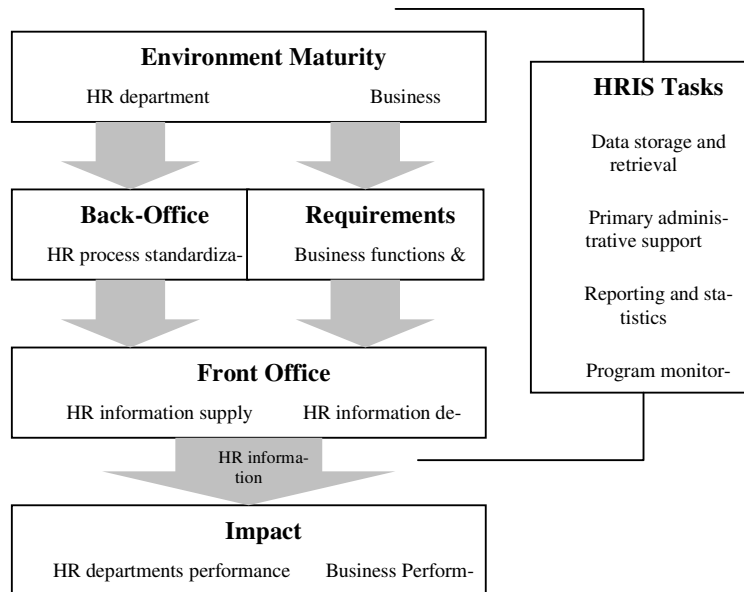


Figure 1. Holistic approach to benchmark HRIS (Ostermann et al, 2009)

Moreover, such a comprehensive approach to the identification of performance-critical elements to overall HRIS success shows the ability to give credit to different stakeholders' issues and claims.

This causality, again, manifests itself in decision as well as activity supportive processes, which are by definition information-loaded and hence implicate the requirement of methodological coherence between the quality of specific information and the quality of the subsequent decision (Becker & Bsath, 2002; Kovach et al., 1999). The promotion and securing of this coherence represents the main purpose of any information system applied in a business (process) context and shows exceptional relevance for HRIS, as information retrieved by these systems is closely linked to other business information systems (Hannon et al., 1996).

In line with these considerations, it appears to be rational to benchmark an individualized HRIS' contribution to superior business performance on the basis of information efficiency indicators, measuring the completeness as well as quality of the retrieved information's supportiveness to certain business processes (with no regard given to the degree of standardization of relevant processes). A model

of such a systematic, information-based model to benchmark the functionality of a HRIS is illustrated in Figure 2.

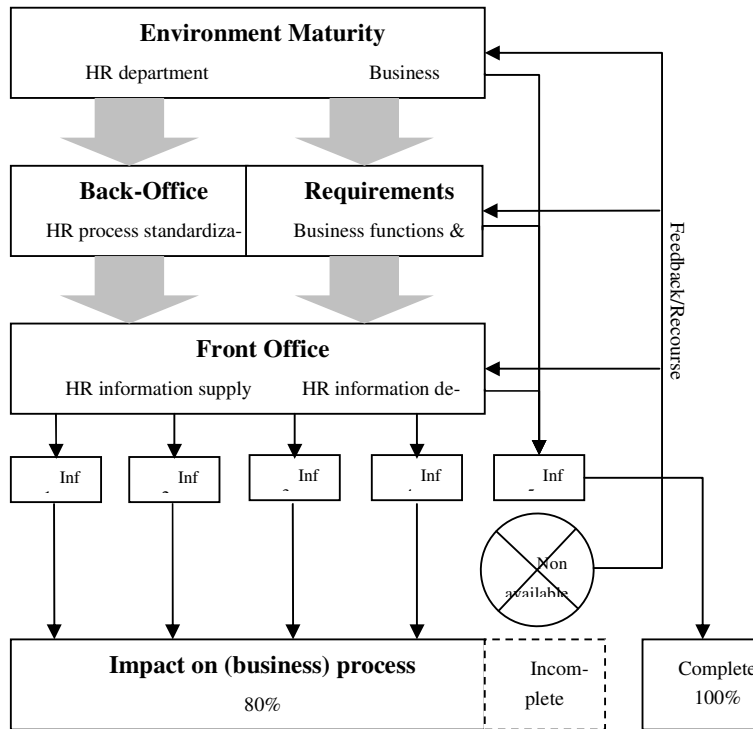


Figure 2. Sketch of systematic, information-based model to benchmark the functionality of a HRIS

Within the sequence of any business process, available specific information is retrieved from several levels of the business environment (see also Figure 1) and may also filter through several levels before directly supporting the business process. Consequently, this information-based model to benchmarking HRIS functionality has to encompass the business and HR environment as different fundamental infrastructure parameters (e.g., IT knowledge, IT environment, networks, ...) have to be available in a certain quality in order to be able to establish a chain of relevant information.

The next level that has to be focused upon is HR back-office organization as it is here that generic process elements are generated from the abstract function of the infrastructure. These elements are then ultimately bridged to the front office and translated into the established form of the HR information supply. It is this

multi-level procedure, from which finally the causality association of HRIS, which underlies the framework of business processes, can be derived.

Based on these remarks, the functionality of an HRIS or any other information system is determined by the actual and immediate quantity as well as quality of information and subsets of information provided by the system in comparison to the specific quantity and quality required by the performing of certain business processes. Taking reference to the multi-level procedure described above, the overall functionality of an HRIS can hence be measured by identifying the amount and target level of recourse necessities, which arise for the user with certain business as well as HR processes.

This operationalization of functionality is based on the assumption that the lower the necessity for recourse to certain levels of performance criteria (i.e., environment maturity, back office/requirements, front office) is, the higher the corporate-specific performance of the HR information system is. Hence, where there is no necessity for recourse, it can be presumed that the required information is (1) available at the right time, in the right quantity, quality, and typology and (2) features the ability to be integrated into the entire business process in a supportive manner.

As far as the specific development of quantitative benchmarks measuring a particular HRIS is concerned from a technical point of view, the generation of corresponding values involves first the documentation of recourses about particular business processes and second the clustering of recourses accordingly to the preliminary level the queries refer to. If these queries are then put in relation to the total number of supported business processes, one can derive a clustered rate of queries (usually presented as percentages) which serves as an overall benchmark for an HRIS functionality.

As consideration is taken of the HRIS' individualization with this approach (as shown), specific business requirements to an HRIS also represent an essential as well integral part of this observation. At the same time, the overall abstraction level of this holistic approach enables benchmarking of various HRIS, as the

comparison of clustered values in context with the entire business processes yields in this respect an opportunity of comparison between individual systems based on average and/or best practice values several companies and branches are able to achieve and not geared to the maximal value 0% recourse rate (Ostermann *et al*, 2009).

3.2 Rational and Design

Our goal is to measure HRIS success based on the combination of the two previously illustrated models. The aim of our model is to analyze the functionality of the HRIS deployed in terms of its overall impact on the organization.

We derive our research propositions from an inclusive model that is comprised of nine sets of variables. The model focuses on those important conditions that are believed to increase three dimensions of HRIS success, (1) HRIS progression, (2) HRIS users satisfaction and (3) HRIS performance (See Figure 1). Previous IS research has generated some of the conditions or independent variables included in this inquiry and the concept of environment maturity. Additional variables specific to human resource management performance were also considered.

Most independent variables in the model, as our review of the literature suggests, are system conditions. They are expected to explain a greater proportion of the variance in progression, performance and users satisfaction. In turn, users satisfaction is expected to influence HRIS progression to a certain extent.

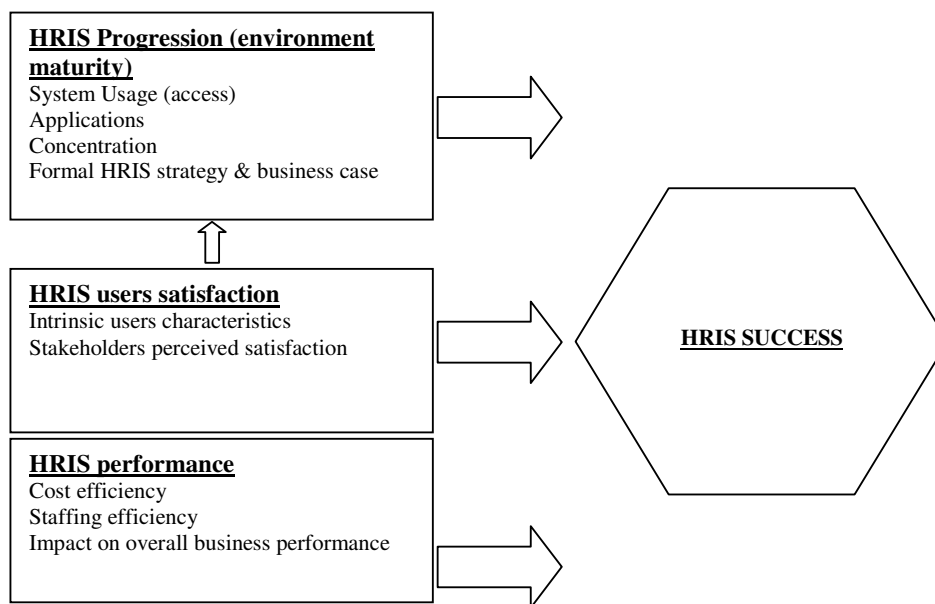


Figure 1. Proposed integrated model of HRIS success

The following paragraphs present the rationale for including the chosen variables in the model.

Four groups of conditions are expected to influence HRIS progression. After a review of the relevant literature, we predict the following linkages between these measures and HRIS progression as first dimension of HRIS success.

The first measure is *system usage*. This can be defined as the combined percentage of employees who use the organization's HRIS delivery channels (such as e-mail, voicemail, IVR, VRS, Internet and HR service centers). This measure is made of a subset of variables, the first one being *age*. Users who are older are expected to use systems to a lesser extent. They are more likely to exhibit higher levels of computer anxiety and resist computer-based systems to a greater extent (Lee, 1986). The second variable is *task characteristics*. Some tasks characteristics such as the structure of decision making, the type of work accomplished, and the decision making level in the organizational hierarchy are also expected to influence system usage (Cheney et al., 1986). Furthermore, the tasks at higher level tend to be less structured and thus less easily assisted by computers (Mawhinney and Lederer, 1990). *Work experience*, as well, is expected to influ-

ence system usage. It has been suggested that the length of time in an organization or in a position can change the way individuals make use of the formal and informal information flow (Fuerst and Cheney, 1982). *Computer experience* is also influencing system usage. Users with more computer experience are expected to be more confident in their ability to use the system (Igbaria and Nachman, 1990) and are more likely to develop their own applications in the early stages of an experiment (Kasper and Cerveny, 1985). Finally users with a better *computer understanding* are expected to use the system to a greater extent (Montazemi, 1998).

The second and the third measures of HRIS progression are the number of *applications* and the level of *concentration*. The first one can be defined as the number of HR-related services available on the organization's HRIS delivery channels. The second one can be defined as the extent to which access is focused on particular HRIS delivery channels.

The fourth variable refers to the maturity of HRIS strategic awareness and commitment being measured by the presence of an explicit *HRIS strategy* and a *required business case*.

All four variables, as put forward by several researchers and practitioners (DeSanctis, 1986; Haines & Petit, 1997; Hendrickson, 2003; 20 questions to, 2000), measure HRIS progression and are preconditions that show the maturity of an IT environments in both the HR department as well as the general business context.

The second dimension of HRIS success is *HRIS users satisfaction*. This is a combined measure of employee and manager satisfaction with HR services in organizations where these levels are formally measured and reported. It implies both individual intrinsic characteristics satisfaction and extrinsic employee involvement when dealing with HRIS. The first intrinsic variable is *age*. Users who are older are expected to be less satisfied with systems (Igbaria & Nachman, 1990) and are more likely to exhibit higher levels of computer anxiety. Then some *task characteristics* are also expected to influence user satisfaction. The

more structured the tasks being accomplished, the easier the development process and the greater the likelihood of implementation success (Cheney, Mann, & Amoroso, 1986). Also *work experience* is expected to have some influence. Users with more *computer experience* are expected to be more satisfied with the HRIS experience (Igbaria & Nachman, 1990). Users with a better understanding of computers are expected to be more satisfied with the system (Raymond, 1988).

Extrinsic perceived satisfaction also plays an important role in HRIS users satisfaction. First of all *availability of internal user support* is expected to be an important satisfaction factor. As sources of expert information and assistance, the presence and size of the IS and HRIS departments (or units) are expected to increase user satisfaction. In a study of end-user computing, Rockart and Flannery (1983) found that a group of key users played an important role in helping other users. Other possible user support strategies such as training and documentation are included in the system conditions group of variables. Secondly users who have a higher *involvement in the HRIS development and implementation process* are expected to be more satisfied with the system (Baroudi, Olson, & Ives, 1986). The positive effects of user involvement can be attributed to such factors as a stronger feeling of ownership (Hirschheim, 1985) and a better fit between user needs and the design of systems. Users who receive more *HRIS training* are expected to be more satisfied with the system (Cheney, Mann, & Amoroso, 1986; Mawhinney & Lederer, 1990). It is expected that users with more HRIS training would be more satisfied with their level of computer competence and thus express higher levels of satisfaction. Users who receive more *support from general management* and from their immediate superior for using the system are expected to be more satisfied with it (Lucas, 1978). The expected relationship originates from the organizational change literature which emphasizes management support as a condition for successful change. Users who have *access to complete, structured, and well written documentation* are expected to be more satisfied with the system (Doll & Ahmed, 1985; Gemoets & Mahmood, 1990).

The *quality of user documentation* has also been a central issue in the HRIS literature (MacAdam, 1987). Users who have *access to applications that were developed internally* as opposed to purchased applications are also expected to be more satisfied with the system (Raymond, 1985). It is believed that the “in-house” development of applications results in a better fit between users’ needs and the system that supports those needs (i.e., better customization of the system). It is also possible, however, that “in-house” systems lack documentation and sophistication, bringing lower satisfaction levels. Users who are not dependent on external support for application processing are expected to be more satisfied with the system (Raymond, 1985). Thus, the type of computer installation (i.e., on-site or external) represents an important functioning condition to be considered in this study. Users who have *access to more on-line applications* as opposed to a series of free standing applications are expected to be more satisfied with the system (Raymond, 1985). The use of more interactive application systems is thus expected to have positive consequences. Users who perceive that the system is *easy to use* are expected to be more satisfied when using it (Mawhinney & Lederer, 1990). A HRIS that is difficult to use, meaning that it is not flexible, is not easy to learn, or lacks integration, would tend to frustrate users.

The last dimension of HRIS success is *HRIS performance* and is measure by *cost efficiency, staffing efficiency* and a set of overall business performance variables. The first two refer to HR department efficiency and are defined respectively as HR operating budget as a percentage of total company revenue and number of HR staff relative to the total number of company employees. The last measure is defined by a *subset of economical performance measures* that have direct connection to the overall business performance and can be grouped in the following categories (see table 1):

- Organizational effectiveness
- Remuneration
- Absence and turnover
- Transfers, promotions and staffing
- Training and development

- Occupational health and safety

HR Performance Indexes	Subset of HR performance measures	Formulas	Description
Organizational effectiveness	Income Factor	Group Operating Profit/ Employees	Gross profit per employee
	Expense Factor	Operating Expenses/ Employees	Expense per employee
	Revenue Factor	Total operating Income/ Employees	Total Operating Income per Employee
Remuneration	Remuneration Income Factor	Group Operating Profit/ Remuneration	Employee cost as proportion of group operating profit
	Remuneration Revenue Factor	Total operating income/ Remuneration	Remuneration spent to generate total income
	Remuneration Expense Factor	Operating expenses/ Remuneration	Remuneration as proportion of expenses
	Remuneration Factor	Total remuneration/ employees	Average remuneration per employee
Absence & Turnover	Total Resignations	Total Resignations/ Employee	Turnover rate of voluntary terminations
	Management Resignations	Management Resignations/ Total Management Employee	Turnover rate of management staff
	Non Management Resignations	Non Management Resignations/ Total Non Management Employee	Turnover rate of non management staff
	Sick Leave, Non-Management	Days Absent (Non-Management)/ Total Non-Management Workdays	Total absence of non-management staff expressed in % of work days and dollars lost
Transfers, Promotions & Staffing	Internal Management Access Rate	Internal Management Appointments/ Total Management Employees	% of management vacancies filled from internal sources expressed as velocity of position transfer
	HRM Expense Factor	HRM operating expense/ Operating expenses	HRM expenses as proportion of total operating expense
	Headcount Factor	Total Employees/ HRM Employees	HR personnel to total employees
	Time to Start Internal	Time to start internal/ Requisitions for internal hires	Time taken to fill vacancies from internal sources
Training & Development	Total Average Training	Total training cost/ Employees	Average training cost per employee
	Non Management Training Cost	Non management training cost/ Non Management Employees	Average training cost per non management employee
	Management Training Cost	Management training cost/ Management Employees	Average training cost per management employee
Occupational Health & Safety	Compensation OH&S	Compensation Cost/ Employees	Cost of workers compensation per employee

Table 1. Subset of economical performance measures of HR performance

Chapter IV

4.1 Discussion and further research

As pointed out above with reference to Hendrickson (2003) a company's HRIS not only involves computer hardware and software applications but also includes people, policies, procedures and HR relevant data. By the means of integrating the HR function's as well as business' perspective into the integrated evaluation framework our approach suggested includes three dimensions of HRIS success. Furthermore, additional or more detailed perspectives (e.g., differentiating between employees and senior management) may be added in the HRIS users satisfaction, in order to enhance the sensitivity, validity and reliability of the information generated by the devised benchmarks (Kovach et al., 1999).

As suggested by contemporary research, the methodological challenge involved with any benchmarking activity generally consists of the identification and subsequent combination and weighting of relevant measures and performance indicators. Those, on the one hand, allow comparisons and on the other feature sufficient significance in order to enable the assessment of a system's functionality with reference to functionalities of other systems (Kunstlj et al., 2004). Transferred to the task of benchmarking HRIS (often based upon customized HR software solutions), HR practitioners as well as academics face the challenge of devising general evaluation frameworks and performance measurements, which (1) have to be sensitive to the most commonly individualized and historically grown nature of HR information systems and--in many cases--include this individualization as an indicator to be assessed in order to determine the system's functionality, and which (2) are sensitive to the fact that an HRIS' efficiency can

only by measured with reference to its causality on overall business performance.

4.1 Conclusion

Efficiencies created by technology can allow the Human Resources Department to focus on strategic issues: for most companies this includes knowledge management. Companies can now use technology to store best practices. One example of a system to capture knowledge is the HR knowledgebase. It combines self-service concepts with smart systems. These systems put all the details at the fingertips of the call centre staff or the employees themselves. The information is customized according to the company eligibility rules, demographic data about the individual in the HRIS and information in the knowledgebase. For example, an employee can view an individualized comparison of benefits during open enrolment or ask questions about their salary history.

There are nowadays companies selling HR knowledgebase applications and each comes with over 6500 researched questions. However, the cost for such functionality is high. For now, mostly large companies are utilizing knowledge bases (Bussler and Davis, 2001-2002).

In the last decade, HR has changed from a business unit to a service centre, and the service centre has moved online for employee self-service and encouraged self-reliance. Information systems have quickly moved HR from antiquated data collection and paper pushing to a focus on knowledge sharing and strategic workforce analysis. The functional unit, last to get money, IS talent and attention, has moved from the dark ages to state-of-the-art IS in a short period of time. By focusing on using technology to continuously improve the quality of the work environment, HR can reduce turnover, better develop employees, and attract the best in the new recruits. Technology can vastly improve the information

available to HR, allowing the department to raise the value of the organization's human capital (Bussler and Davis, 2001-2002).

According to Lengnick-Hall and Moritz (2003) HRIS will in the future enhance the HR in four different ways. Technologically speaking, there will be enhancements to the web portals – they will become more sophisticated and more individualized workplace productivity tools for managers and employees. Secondly, improved decision-support tools, such as those being tested for health insurance in the U.S., will benefit both organizations and employees. Third, virtual workplaces will become more commonplace and heavily used. And fourth, the Human resource function will be liberated from administrative shackles and able to focus more on developing intellectual capital, social capital, and managing knowledge to improve an organization's competitive advantage.

Web portals that give employees access to information will continue to evolve. For example, Dell created a visionary prototype for the next level of web portal. Different people need different information. Therefore, this prototype consists of a personal start page (“My Intranet”), which is dynamically generating a homepage that would combine: (1) what the company knows an individual employee needs to be successful, and (2) what an individual employee knows he/she needs to be successful. This dynamically generated homepage operates similarly to how Amazon.com tailors specific information to its customers when they log on to the company's website.

Decision-support tools will become more numerous and more sophisticated, improving managers' decision making and employees' organization. These tool will provide managers step-by-step information about human resource issues. For example, what information managers receive will depend on how they respond at each step. In addition, managers will be provided with risk assessment for each of the alternatives they consider. These decision-support tools will also provide “predictor” algorithms that aid managers in anticipating and forecasting potential problems, such as turnover, recruitment, compensation, and labor relations.

Decision-support tools will also provide employees step-by-step information about human resource issues. They will be key to educating employees and providing the information necessary to make complex decisions, and generating preference data that HR can use to drive strategy.

Virtual workplaces will become commonplace in the future. Employees will use on-line meetings, project team workspaces, web conferences, and video conferencing. Virtual workplaces provide several advantages to organizations (Cascio, 1998): (a) they save time, travel expenses, and eliminate the lack of access to experts; (b) they can be organized whether or not members are in reasonable proximity to each other; (c) firms can use outside consultants without incurring expenses for travel, lodging, and downtime; (d) they allow firms to expand their potential labor markets, enabling them to hire and retain the best people regardless of their physical location; (e) employees can accommodate both personal and professional lives; (f) dynamic team membership allows people to move easily from one project to another; (g) employees can be assigned to multiple, concurrent teams; and (h) team communications and work reports are available on line to facilitate swift responses to the demands of a global market, HRIS will become the “connecting tissue” that brings together disparate technologies to enhance employee productivity – likely through the web portals described previously. HR will help design the technology to realize the potential of virtual workspaces; HR will also design the policy and facilitating infrastructure to support and manage these innovations (Lengnick-Hall and Moritz, 2003).

For the human resources function, HRIS has the potential to affect both efficiency and effectiveness. Efficiency can be affected by reducing cycle times for processing paperwork, increasing data accuracy, and reducing human resource staff. Effectiveness can be affected by improving the capabilities of both managers and employees to make better, more timely decisions. HRIS also provides the HR function the opportunity to create new avenues for contributing to organizational effectiveness through such means as knowledge management and the creation of intellectual and social capital (Lengnick-Hall and Moritz, 2003).

According to Lengnick-Hall and Moritz (2003) the Human resources function of the future will have three characteristics. First, it will be smaller than it has been in the past. Organizations will no longer need clerks to record information and process forms. Second, it will have a more strategic/managerial role than an administrative one. Time previously spent on administrative issues will be replaced with time spent on firm's competitiveness issues. And, third, the human resources function will be able to create new paths to add value to the organization. The HR function can move beyond its traditional focus of hiring, training, compensating, etc. to assume new roles such as human capital steward, relationship builder, and knowledge facilitator (Lengnick-Hall and Moritz, 2003).

The idea of HR as a strategic business partner has become prevalent in the literature over recent years. Authors such as Ulrich (1997) have argued that HR should move into this role in addition to performing an administrative or transactional role, being a "change agent" and an "employee champion." A number of authors have suggested that the use of technology within HRM may facilitate the move to a more strategic role for HR practitioners through the removal of administrative burden and the capability for data-driven decision-making.

As human capital steward, the HR function will monitor employee opinions and attitudes in real time rather than periodically, as was frequently done in the past. HRIS will make "pulse surveys" possible and discover what employees think about various issues, or determine employee preferences for alternative HR services – and this can be done instantaneously. Organizations can use electronic chat rooms and "open door" e-mail to get an early warning of employee concerns, problems, and grievances before they escalate into serious crises. As a result, HR will be able to constantly monitor people issues and make adjustments in a timely fashion to either take advantage of opportunities or to pre-empt threats.

The HR function will still be responsible for traditional activities (e.g. recruiting, selection, training, and compensation), but its responsibility will shift from hands-on, face-to-face service delivery to system design and maintenance func-

tions. Consequently, HR professionals will need more information technology knowledge and skills than they have had in the past. In addition, HR must acquire or build a policy or systems infrastructure that can support an organization's need for rapid response, global integration, and total flexibility. HRIS will make it possible to get non-strategic tasks done faster and cheaper with less reliance on HR staff (Christie, 2001), which will enable HR to play a more consultative role with line managers and take a more active role in the organization's strategy formulation and implementation (Lengnick-Hall and Moritz, 2003). Bussler and Davis (2001) claim that the HR professional of the future will need to become a data analyst, an internal corporate consultant. Thus, HR professionals need to prepare themselves for the future by gearing up for new roles or find themselves outsourced (Bussler and Davis, 2001-2002).

As relationship builder, HR will assume new roles in the value-creation process. For example, the HR function may shift its focus to networks of people as well as networks of computers. Social networks consisting of employee groups within an organization as well as outside of the firm will provide the synergy that combines human capital (knowledge, skills and abilities of an organization's workforce) with social capital (trust, mutual understanding, and shared values and behaviours that bind people together and make cooperative action possible). For example, "communities of practice" (informal relationships among individuals within and between organizations based on shared interests and expertise) that cross organizational and industry boundaries enable organizations to innovate and adapt to changing market forces (Wenger, 1998). The HR function can facilitate the accumulation of social capital by encouraging, nurturing, and supporting communities of practice that function in ways to enhance organizational effectiveness. Likewise, the HR function can monitor groups that work at cross purposes to the organization's goals or values and when necessary dissolve them.

Finally, the HR function can play a more active role as knowledge facilitator. Now, largely the domain of information technology specialists, the HR function can help organizations design systems that employees will use and facilitate the

flow of relevant knowledge to those who need to know it, when they need to know it – in order to increase new products and services, improve efficiencies in serving customers, and develop capabilities that lead to new sources of value creation. Human resource professionals with knowledge and skills in both HR and information technology will be uniquely positioned to make the HR function a value-adding contributor to their organizations.

As final trend, HR systems are likely to be more frequently outsourced (Cafaro, 2002). Rather than struggling to maintain these systems internally, companies will relieve themselves of this burden by using third parties (e.g. PeopleSoft, Oracle, SAP, ADP). HR professionals will become more sophisticated designers and users of systems, but they will not have to maintain them.

References

- Adamson, L., & Zampetti, R. (2001). Web-based manager self-service: Adding value to the work. In A. J. Walker (Ed.), *Web-based human resources* (pp. 24-35). New York: McGraw Hill.
- Alleyne, C., Kakabadse, A., & Kakabadse, N. (2007). Using the HR Intranet: An exploratory analysis of its impact on managerial satisfaction with the HR function. *Personnel Review*, 36(2), 277-294.
- Anonymous (2000). 20 questions to help you judge your readiness for new HRIS software. *HR focus*, 77(11), 13.
- Anonymous (2001). The best HR software now. *HR focus*, 78(3), 11-13.
- Anonymous (2002). How one company has embraced e-HR. *HR Focus*, 79(1), 1-5.
- Anonymous (2002). Three new surveys track the growth of e-HR. *HR Focus*, 79(4), 4-6.
- Anonymous (2004). An HRIS 'Shopping List' for the New Year. *HR focus*, 81(1), 4-6.
- Anonymous (2006). Benchmarking for functional HR metrics. *HR focus*, 83(11), 1 and 13-15.
- Ashbaugh, S., & Miranda, R. (2002). Technology for human resource management: Seven questions and answers. *Public Personnel Management*, 31(1), 7-20.
- Ball, K. S. (2001). The use of human resource information systems: A survey. *Personnel Review*, 30(6), 677-693.
- Baroudi, J. J., Olson, M. H., & Ives, B. (1986). An empirical study of the impact of user involvement on system usage and information satisfaction. *Communications of the ACM*, 29, 232-238
- Beckers, A. M., Bsat, M. Z. (2002). A DSS classification model for research in human resource information systems. *Information Systems Management*, 19(3), 41-50.
- Beer, M. (1984). *Managing Human Resources*, Boston: Harvard University Press
- Biesalski, E., Abecker, A., & Breiter, M. (2006). Towards integrated, intelligent human resource management. *Applied Ontology: An Interdisciplinary Journal of Ontological Analysis and Conceptual Modeling*, 3(4).
- Bowen, D. E., & Ostroff, C. (2004). Understanding HRM-Firm performance linkages: The role of the "strengths" of the HRM system. *Academy of Management Review*, 29(2), 203-221.
- Brink, S., & McDonnell, S. (2003). *IHRIM go-to-guides: e-compensation, the emerging technology series*. Burlington, MA: IHRIM.
- Broderick, R. and Boudreau, J.W (1991), *Human Resource Information Systems for competitive advantage: Interviews with ten leaders*, CAHRS Working Paper Series, Cornell University.
- Broderick, R., & Boudreau, J. W. (1992). HRM, IT and the competitive edge. *Academy of Management Executive*, 6(2), 7-17.
- Brown, D. (2002). E-HR, victim of unrealistic expectations. *Canadian HR Reporter*, 15, 1-6.
- Burbach, R., & Dundon, T. (2005). The strategic potential of human resource information systems: Evidence from the Republic of Ireland. *International Employment Relations Review*, 11(1/2) 97-118.
- Bussler, L., & Davis, E. (2001). Information systems: The quiet revolution in human resource management. *Journal of Computer Information Systems*, 42(2), 17-20.
- Cafaro, D (2002). Ashore or adrift: using e-HR as a lifeboat of efficiency. *Workspan*, 45(7), 48-52.
- Cascio, W. F. (1998). The virtual workplace: a reality now. *TIP*, 35 (April 2008) <<http://www.siop.org/tip/backissues/TIPApril98/Cascio.aspx>>
- Cascio, W. F. (2005). From business partner to driving business success: The next step in the evolution of HR management. *Human Resource Management*, 44(2), 159-163.
- Cedar (2001). *Human resources self-service survey*. Baltimore: Cedar Inc.
- Cedar (2009). *Human resources self-service survey*. Baltimore: Cedar Inc.
- Chapman, D.S., & Webster, J. (2003). The use of technologies in the recruiting, screening, and selection processes for job candidates. *International Journal of Selection and Assessment*, 11(2/3), 113-120.

- Cheney, P. H., Mann, R. I., & Amoroso, D. L. (1986). Organizational factors affecting the success of end-user computing, *JMIS*, 3, 66-80.
- Christie, M. (2001). E-HR helps make retention a walk in the park. *Workspan*, 44 (11, 54-60).
- Dambrot, F. H., Watkins-Malek, M. A., Silling, M. S., Marshall, R. S., & Garver, J. A. (1985). Correlates of sex differences in attitudes toward and involvement with computers. *Journal of vocational behaviour*, 27, 71-86
- Davenport, T. H. (1994). Saving IT's soul: Human centered information management. *Harvard Business Review*, 72(2), 119-121.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease Of Use, And User Acceptance Of Information Technology. *MIS Quarterly*, 13(3), 318-341.
- De Coi, J. L., Herder, E., Koesling, A., Lofi, C., Olmedilla, D., Papapetrou, O. et al. (2007, March). A model for competence gap analysis. In *Proceedings of the Third International Conference on Web Information Systems and Technologies: Internet Technology/Web Interface and Applications (WEBIST 2007)*. Barcelona, Spain.
- DeSanctis, G. (1986). Human Resource Information Systems: a current assessment. *MIS Quarterly*, 10(1), 15-26.
- Doll, W. J., & Ahmed, M. U. (1985). Documenting Information Systems for management: a key to maintaining user satisfaction, *Information & Management*, 8, 221-226.
- Draganidis, F., & Mentzas, G. (2006). Competency based management: A review of systems and approaches. *Information Management & Computer Security*, 14(1), 51-64.
- Dulebohn, J., & Marler, J. (2005). E-compensation: The potential to transform practice? In H. Gueutal & D. Stone (Eds.), *The brave new world of e-HR*. San Francisco: Jossey-Bass.
- Ein-Dor, P., & Segev, E. (1978). Organizational Context and the Success of Management Information Systems. *Management Science*, 24(10), 1064-1077.
- Enshur, E., Nielson, T., & Grant-Vallone, E. (2002). Tales from the hiring line: Effects of the Internet technology on HR processes. *Organizational Dynamics*, 31(3), 224-244.
- Evans, P., Pucik, V., & Barsoux, J.-P. (2002). *The global challenge*. New York: McGraw-Hill.
- Fitz-Enz, J. (1998). Top 10 calculations for your HRIS. *HR focus*, 75(4), p. S3.
- Fombrum, C, Tichy, N., & Devanna, M. A. (1984). *Strategic Resource Management*, Canada: John Wiley and Sons.
- Fontana, F. (1993). *Lo sviluppo del personale*, Torino: Giappichelli.
- Fontana, F., Caroli, M. (2003). *Economia e gestione delle imprese*, Milano: McGraw-Hill.
- Fontana, F, Lorenzoni, G. (2004). *Il knowledge management*, Roma: Luiss University Press.
- Frolick, M.N. (1994), Management support systems and their evolution from executive information systems, *Information Strategy: The Executive's Journal*, 10(3), 31-38.
- Fuerst, W. L., & Cheney, P. H. (1982). Factors affecting the perceived utilization of computer-based decision support systems in the oil industry. *Decision Sciences*, 13(4), 554-569.
- Gemoets, L. A., & Mahmood, M. A. (1990). Effect of the quality of user documentation on user satisfaction with information systems. *Information & Management*, 18, 47-54.
- Gerhart, B. (2000). Pay strategy and firm performance. In S. R. B. Gerhart (Ed.), *Compensation in organizations: Current research and practice*. San Francisco: Jossey-Bass.
- Gherson, D., & Jackson, A. P (2001). Web-based compensation planning. In A. J. Walker (Ed.), *Webbased human resources* (pp. 83-959). New York: McGraw Hill.
- Grensing-Pophal, L. (2000). Wise selection. *Credit Union Management*, 23(4), 32-35.
- Groe, G. M., Pyle, W., & Jamrong, J. (1996). Information technology and HR. *Human Resource Planning*, 19(1), 56-60.
- Gueutal, H. G. (2003). The brave new world of HR. In D. L. Stone et al. (Eds.), *Advances in human performance and cognitive engineering research* (vol. 3, pp. 13-37). Elsevier.
- Hagood, W. O., & Friedman, L. (2002). Using the balanced scorecard to measure the performance of your HR information system. *Public Personnel Management*, 31, 543-557.
- Haines, V. Y., Petit, A. (1997). Conditions for successful human resource information systems. *Human Resource Management*, 36 (2), 261-275.

- Hannon, J., Jelf, G., & Brandes, D. (1996). Human resource information systems: Operational issues and strategic considerations in a global environment. *International Journal of Human Resource Management*, 7(1), 245-269.
- Hendrickson, A. R. (2003). Human resource information systems: Backbone technology of contemporary human resources. *Journal of Labor Research*, 24(3), 381-394.
- Hirscheim, R. A. (1985). User experience with an assessment of participative systems design. *MIS Quarterly*, 9, 295-304.
- Howes, P., & Foley, P. (1993). Strategic human resource management: An Australian case study. *Human Resource Planning*, 16(3), 53-64.
- Huang, J.-H., Yang, C., Jin B.-H., & Chiu, H. (2004). Measuring satisfaction with business-to-employee systems. *Computers in Human Behavior*, 20(1), 17-35
- Hussain, Z., Wallace, J., & Cornelius, N. E. (2007). The use and impact of human resource information systems on human resource management professionals. *Information & Management*, 44, 74-89.
- Igbaria, M. & Nachman, S. A. (1990). Correlates of user satisfaction with end user computing: an exploratory study. *Information & Management*, 19(2), 73-82.
- Igbaria, M., Pavri, F., Huff, S. (1989). Microcomputer application: an empirical look at usage. *Information Management*, 16(4), 187-96.
- Jackson, P., & Harris, L. (2003). E-business and organizational change: Reconciling traditional values with business transformation. *Journal of Organizational Change*, 16(5), 497-511.
- James, R. (1997). HR megatrends. *Human Resource Management*, 36, 453-463.
- Jenkins, M.L. and Lloyd, G. (1985). How corporate philosophy and strategy shape the use of HR information systems, *Personnel*, 62(5), 28-38.
- Kanthawongs, P. (2004). Does HRIS matter for HRM today? Retrieved October 15, 2006, from http://www.bu.ac.th/knowledgecenter/epaper/jan_june2004/penjira.pdf.
- Kasper, G. & Cerveny, R. (1985). A laboratory study of user characteristics and decision-making performance in end-user computing. *Information & Management*, 9(2), 87-96.
- Kavanagh, M. J., Gueutal, H., & Tannenbaum, S. (1990). *Human resource information systems: Development and application*. Boston: PWS Kent Publishing Company.
- Kinnie, N. J., & Arthurs, A. J. (1996). Personnel specialists' advanced use of information technology—evidence and explanations. *Personnel Review*, 25(3), 3-19.
- Klenke, K. (1992). Construct measurement in management information systems: a review critique of user satisfaction and user involvement instruments. *INFOR*, 30(4), 325-348.
- Kovach, K. A., & Cathcart, C. E. (1999). Human resource information systems (HRIS): Providing business with rapid data access, information exchange, and strategic advantage. *Public Personnel Management*, 28(2), 275-282.
- Kovach, K. A., Hughes, A. A., Fagan, P., & Maggitti, P. G. (2002). Administrative and strategic advantages of HRIS. *Employment Relations today*, 29(2), 43-48.
- Kunstelj, M., & Vintar, M. (2004). Evaluating the progress of e-government development: A critical analysis [Electronic version]. *Information Polity*, 9(3/4), 131-148.
- Lederer, A. L. (1984). Planning and developing a human resource information system. *The Personnel Administrator*, 29(8), 27-39.
- Lee, D. M. S. (1986). Usage pattern and sources of assistance for personal computer users. *MIS Quarterly*, 10(4), 312-325.
- Lego, J. (2001). Creating a business case for your organization's web-based HR initiative. In Walker, A. J. ed. *Web-based Human Resources*. New York: McGraw-Hill, 131-149.
- Lengnick-Hall, M. L., & Moritz, S. (2003). The Impact of e-HR on the Human Resource Management Function. *Journal of Labor Research*, 24(3), 365-379.
- Lepak, D. P., & Snell, S. A., (1998). Virtual HR: Strategic human resource management in the 21st Century. *Human Resource Management Review*, 8(3), 215-234.
- Lin, Y.Y. (1997) Human resource management in Taiwan: A future perspective. *International Journal of Human Resource Management*, 8(1), 29-43.
- Lindgren, R., Henfridsson, O., & Schultze, U. (2004). Design principles for competence management systems: A synthesis of an action research study. *MIS Quarterly*, 28(3), 435-472.

- Lucas, H. C. (1975). Performance and the use of an information system, *Management Science*, 21(8), 908-919.
- Lucas, H. C. (1978). Empirical evidence for a descriptive model of implementation, *MIS Quarterly*, June, 27-42.
- MacAdam, M. (1987). HRIS Training: keep documentation on track. *Personnel Journal*, October, 45-51.
- Martinsons, M. G. (1994). Benchmarking human resource information systems in Canada and Hong Kong. *Information & Management*, 26(6), 305-316.
- Mathys, N., LaVan, H. (1982). A survey of the human resource information systems (HRIS) of major companies. *Human Resource Planning*, 5(2), 83-90.
- Mawhinney, C. H., & Lederer, A. L. (1990). A study of personal computer utilization by managers, *Information & Management*, 18, 243-253.
- McLeod, R. Jr., DeSanctis, G. (1995). A resource-flow model of the human resource information system. *Journal of information technology management*, 6(3), 1-15.
- Meade, J. G. (2003). *The human resources software handbook: Evaluating technology solutions for your organization*. San Francisco: Jossey-Bass.
- Mentzas, G. (1994). A functional taxonomy of computer-based information systems. *International Journal of Information Management*, 14(6), 397-410.
- Milkovich, G., & Newman, J. M. (2005). *Compensation* (8th ed.). New York: McGraw-Hill Irwin.
- Miller, J. S., & Cardy, R. L. (2000). Technology and managing people: Keeping the "Human" in human resources. *Journal of Labor Research*, 21(3), 447-461.
- Montazemi, A. R. (1988). Factors affecting information satisfaction in the context of the small business environment. *MIS Quarterly*, 12(2), 239-256.
- Morrish, K. (1994). Navigating human resource benchmarking: A guide for human resource managers. Retrieved December 14, 2009, from <http://www.publicsector.wa.gov.au/SiteCollectionDocuments/Non-Current%20-%20Navigating%20Human%20Resource%20Benchmarking.pdf>
- Murdick, R. G., Schuster, F. (1983). Computerized information support for the human resource function. *Human Resource Planning*, 6(1), 25-32.
- Ng, S. T., Skitmore, R. M., & Sharma, T. (2001). Towards a human resource information system for Australian construction companies. *Engineering, construction and architectural management*, 8(4), 238-249.
- Ngai, E. W. T., Wat, F. K. T. (2004). Human Resource information systems: a review and empirical analysis. *Personnel Review*, 35(3), 297-314.
- Ostermann, H, Staudinger, B., Staudinger, R. (2009). Benchmarking human resources information systems, *Encyclopaedia of Human Resources Information Systems*, 92-101.
- Othman, R., & Teh, C. (2003). On developing the informed work place: HRM issues in Malaysia. *Human Resource Management Review*, 13(3), 393-406.
- Panayotopoulou, L., Vakola, M., & Galanaki, E. (2007). E-HR adoption and the role of HRM: Evidence from Greece. *Personnel Review*, 36(2), 277-294.
- Pfeffer, J. (1995). Producing sustainable competitive advantage through the effective management of people. *Academy of Management Executive*, 9(1), 55-69.
- Pinsonneault, A., & Kraemer K. (1993). The impact of information technology on middle managers. *MIS Quarterly*, 17(3), 271-292.
- Porter, M. E., & Millar, V. E. (1980). *Competitive strategy*. New York: Free Press.
- Puxty, A. G. (1993). *The social and organizational context of managerial accounting*. London: Academic Press.
- Rampton, G. M., Turnbull, I. J., & Doran, J. A. (1999). *Human resource management systems: A practical approach* (2nd ed.). Scarborough, Ontario: Carswell.
- Raymond, L. (1985). Organizational characteristics and MIS success in the context of a small business. *MIS Quarterly*, 9, 37-52.
- Raymond, L. (1988). The impact of computer training on the attitudes and usage behaviour of small business managers. *Journal of Small business management*, 26(3), 8-13.

- Rivard, S., & Huff, S. L. (1988). Factors of success for end-user computing. *Communications of the ACM*, 31(5), 552-561.
- Roberts, B. (2006). New HR systems on the horizon. *HR Magazine*, 51(5), 103-111.
- Rockart, J. F., & Flannery, L. S. (1983). The management of end-user computing. *Communications of the ACM*, 26(10), 776-784.
- Ruta, C. D. (2005). The application of change management theory to HR portal implementation in subsidiaries of multinational corporations. *Human Resource Management*, 44(1), 35-53.
- Sadri, J., Chatterjee, V. (2003). Building organizational character through HRIS. *International Journal of Human Resources Development and Management*, 3(1), 84-98.
- Shrivatsava, S., & Shaw, J. B. (2003). Liberating HR through technology. *Human Resource Management*, 42(3), 201-222.
- Sicilia, M. A. (2005). Ontology-based competency management: Infrastructures for the knowledge-intensive learning organization. In M. D. Lytras and A. Naeye (Eds.), *Intelligent learning infrastructures in knowledge intensive organizations: A semantic web perspective* (pp. 302-324). Hershey PA: Idea Group.
- Snell, S., Stueber, D., & Lepak, D. (2002). Virtual HR departments: Getting out of the middle. In R. L. Heneman & D. B. Greenberger (Eds.), *Human resource management in virtual organizations* (pp. 81-101). Greenwich, CT: Information Age Publishing.
- Snis, L., Pareto, L., & Svensson, L. (2007, August). Competence management systems in networking organizations: Designing for empowerment? In *Proceedings of the 30th Information Systems Research Seminar in Scandinavia*. Tampere, Finland.
- Strohmeier, S. (2007). Research in e-HRM: Review and implications. *Human Resource Management Review*, 17(2007), 19-37.
- Svoboda, M., & Schröder, S. (2001). Transforming human resources in the new economy: Developing the next generation of global HR managers at Deutsche Bank AG. *Human Resource Management*, 40(3), 261-273.
- Tannenbaum, S. (1990). HRIS: User group implications. *Journal of Systems Management*, 41(1), 27-32.
- Tansley, C., Watson, T. (2000). Strategic exchange in the development of human resource information systems (HRIS). *New technology, Work and Employment*, 15(2), 108-122.
- Tetz, F. F. (1973). Evaluating computer-based human resource information systems: costs vs benefits. *Personnel Journal*, 52, 451-455.
- Thomas, S., Skitmore, M. A., & Sharma, T. (2001). Towards a human resource information system for Australian construction companies. *Engineering, Construction and Architectural Management*, 8(4), 238-249.
- Tichy, N., & Devanna, M.A. (1997). *The Transformational Leader*, Wiley.
- Totty, P. (2003). Do-it-yourself HRIS: Self-service features help CUs manage people costs. *Credit Union Magazine*, 69(7). 30-33.
- Tower Perrin (2009). *Evolving Priorities and the Future of HR Service Delivery and Technology* <<http://www.towerswatson.com/research/521>>.
- Ulrich, D. (1995). Shared Services: From Vogue to Value. *Human Resource Planning*, 18(3), 12-23.
- Ulrich, D. (1997). *Human resources champion*. Boston: Harvard Business School Press.
- Watson Wyatt (2002). E-HR: getting results along the journey. Survey Report. Retrieved November 2009 <<http://www.watsonwyatt.com/research/resrender.asp?id=W-524&page=1>>.
- Wenger, E. (1998). *Communities of practice*. Cambridge: Cambridge University Press.
- Wilcox, J. (1997, June). The evolution of human resources technology. *Management Accounting*, 3-5.
- Wille, E., Hammond, V. (1981). *The computer in personnel work*. London: Institute of Personnel Management.
- Yeung, A., & Brockbank, W. (1995). Reengineering HR through information technology. *Human Resource Planning*, 18(2), 24-37.
- Yeung, A., Brockbank, W., & Ulrich, D. (1994). Lower cost, higher value: Human resource function in transformation. *Human Resource Planning*, 17(3), 1-15.

Zmud, R. W. (1979). Individual differences and MIS success: a review of empirical literature. *Management Science*, 25(10), 966-979.