

# e-HRM and IT Governance: A User Department's Perspective using Diffusion of Innovations (DOI) Theory

Miguel R. Olivas-Luján<sup>1</sup> and Gary W. Florkowski<sup>2</sup>

<sup>1</sup> Clarion University of Pennsylvania & Tecnológico de Monterrey  
Administrative Sciences – College of Business Administration  
218 Still Hall, Clarion, PA, 16214, U.S.A.

<sup>2</sup> University of Pittsburgh – Katz Graduate School of Business  
278c Mervis Hall, Pittsburgh, PA, 15260, U.S.A.

**Abstract.** IT Governance, the responsibility for systematically making decisions that will impact the acquisition, deployment, and overall usage of Information Technologies (IT) in a firm has been touted as “*the single most important predictor of the value an organization generates from IT*” [54]. In this paper, we present the results of a survey-based study of US and Canadian firms that utilize ITs for HR purposes (e-HRM). To investigate whether the mode of HR-IT Governance matters in terms of the intensity of usage of HR Technologies, we used Diffusion of Innovations (DOI) theory in a moderated mediation functional form [24]. We find support for the notion that indeed, the way an organization assigns responsibility for decision making for Human Resource ICTs makes a difference in terms of the user (HR) and IS department factors that predict the intensity of HR Technology usage.

## 1 Introduction

e-HRM, or the study of how Information and Communication Technologies (ICTs) are transforming Human Resource Management (HRM) is an emerging research stream in need of testing well-grounded Information Systems (IS) research paradigms that might help explain the extant, equivocal results as to the consequences of using ICTs in the Personnel area [47], [48]. [48] review of the extant literature on consequences of e-HRM has found conflicting results of IT investments for HR purposes; in some cases, IT appears to lead to more centralization, in others to decentralization of HR decision making; a similar situation can be said about costs of operations, and even about user satisfaction. One could surmise that there are important factors being neglected in such studies so that these consequences of IT usage in the HR department can be better explained.

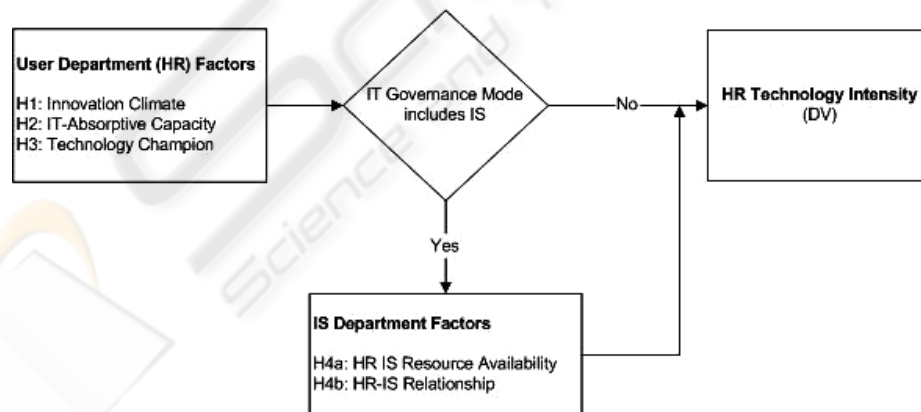
One glaring deficiency in previous studies is the failure to consider how different governance modes affect the proliferation and performance of ICTs. Yet, IT governance arrangements (i.e., the policies defining decision rights and accountability for IT usage within the firm) have been touted as “*the single most important predictor of the value an organization generates from IT*” [54]. A rigorous literature review did not

produce a single empirical investigation of e-HRM that incorporated this construct in the chosen set of predictors. We address this gap by presenting the results of a cross-sectional study of US and Canadian firms (n=136). Our analyses speak to the relative influence that several user-department and IS-department factors have on HR-ICT assimilation.

To test whether the IT Governance mode for HR ICTs makes a difference in terms of the intensity of usage of HR Technologies, we used a moderated mediation functional form [24]. Our conclusions suggest that the way an organization assigns responsibility for decision making for Human Resource ICTs has an impact on the factors that predict intensity of HR Technology usage. This paper makes a contribution to the IT Governance literature in the sense that it incorporates the perspective from a “user” department—in this case, the HR function—as opposed to the sole perspective of the IS function or the general manager’s.

## 2 Theoretical Overview and Hypotheses

Our review of the extant literature on the use of ICTs for HR purposes revealed several shortcomings [19]. Firstly, rigorous empirical studies are uncommon: data analyses rarely go beyond reporting percentages. Secondly, most reports target a professional practitioner audience, rather than a scholarly reader. Quite recently, [47] also lamented the fact that the extant literature lacks theoretical sophistication. In this study, we seek to explain the acquisition and usage of ICTs for HR purposes by utilizing Diffusion of Innovations (DOI) theory [37] a well-validated paradigm that has been used to explain diffusion patterns, adoption and adaptation for a wide variety of innovations, including Human Resource (HR) and Information Systems (IS) innovation. We followed the model depicted in Figure 1.



**Fig. 1.** Model for IT Governance as a moderated mediator of User Department Factors as predictors of HR Technology Intensity.

## 2.1 Dependent Construct: HRTI

Our main dependent construct (operationalized as our dependent variable or DV) is Human Resource Technology Intensity (HRTI), an aggregate measure of the information technologies deployed in the organization with HR purposes. To better understand the intensity or “strength” with which an organization makes use of ICTs for HR, three different but related dimensions must be combined. First, it is necessary to measure the organizations’ set of ICTs, with respect to the number of technologies utilized. Second, the assimilation stage [16] in which each of the ICTs is present in the organization should be captured by the DV, lest the measure become a simple count of technologies without truly describing the extent to which the technologies have been incorporated. Third, the HR sub-functions that are automated with each of those technologies—that is, the *penetration* of each of those ICTs—should be included to quantify how much each of those ICTs is helping the HR function achieve its operational objectives. This final dimension is necessary to differentiate organizations that might have a large proportion of their work automated vs. those whose automation is minimal, even though the number of and assimilation stage of their ICTs might be similar. Together, these three dimensions provide a technology-intensity index (HRTI) that signifies how many ICTs are being used in the firm, to what extent these technologies are being used, and in which HR sub-areas. This measurement approach is also well legitimated within both the HR [18], [23], [27], [29], [55] and MIS literatures [16], [20], [36], where researchers have used aggregation when operationalizing such constructs as IT innovation by labor unions, technology diversity, intensity of TQM adoption, and HR sophistication. These aggregated measures also aid in understanding complex, multidimensional phenomena that cannot be studied with simpler measurement approaches [15].

## 2.2 HR-ICT Governance as a Moderating Mediator of HRTI

Studying the *factors* that predict innovation is a well-established modality within the DOI literature, and particularly in MIS [13], [28], [35], [52]. [28] identified five broad types of factors as predictors of innovations: (1) environment, (2) organization, (3) user, (4) task, and (5) technology characteristics. This research focuses on the second and third types of factors. Technology characteristics are not the explicit focus of this study, with the purpose of following [15] aggregation research design in order to increase the generalizability of the findings. [36], in his study of adoption of total quality management practices in IS units, also excluded technology and user characteristics but included those that pertain to the environment, the organization, and the task context, as he found them most relevant for his organizational-level study.

The type of IT innovation in this study—HR Information and Communication Technologies—, however, requires the inclusion of characteristics of the most relevant unit in the organization for ICTs, the Information Systems (IS) function. Both practitioner and academic literature suggest the inclusion of this factor. For example, [21], in addition to [46] report that a sizable proportion of firms have shared governance or responsibility for ICTs, falling on the HR and the IS functions.

### 2.3 Predictors of HRTI

**HR Function Factors –The “User Department” Factors.** A type of factor that is relevant for studies of firm-level innovations has usually been labeled “Individual factors” [28] or “individual characteristics” [35]. [13], however, prefer the term “User” (p. 125) which is more appropriate for this research, as it lends itself better to denote the fact that ICTs (and other similar technologies) are not adopted by individuals themselves; they are adopted by the *department* or *function* whose work is being automated within the organization. End users can be HR staff or their internal customers, but the majority of the benefits that may be generated by these service innovations are vested with the HR function. Three constructs in this category are included for empirical testing: (a) the HR Department’s Innovation Climate; (b) IT Absorptive Capacity of the HR department; and (c) the presence of an HR Technology Champion.

*HR Department’s Innovation Climate.* Recent research indicates that organizational or intra-organizational sub-climates may be an independent driver of innovation. In one study, support for innovation within *teams* emerged as the main predictor of hospital innovations [1]. Similar effects have been documented at the *department* level. Consistent with the work of [31], [49] found that “a supportive [departmental] climate led to role innovations” within the HR function (p. 189). Given these findings, it is expected that HR departments with a strong innovation climate will encourage the introduction and utilization of Information Technologies across HR activities. We thus derive:

**Hypothesis 1:** *HR Innovation Climate is positively related to HR Technology Intensity.*

*IT Absorptive Capacity of the HR Department.* The second factor, IT Absorptive Capacity of the HR Department, is derived from IT studies based on [12] construct of absorptive capacity. As [39] state it: “*absorptive capacity*, [...] refers to the ability of a firm’s employees to develop relevant knowledge bases, recognize valuable external information, make appropriate decisions, and implement effective work processes and structures...” (p. 267). By analogy, there is an expectation that the HR function’s IT Absorptive Capacity will be an effective predictor of the presence and use of ICTs for HR in the firm.

**Hypothesis 2:** *IT Absorptive Capacity of the HR department is positively related to HR Technology Intensity.*

*Presence of an HR Technology Champion.* The third construct, an active HR Technology Champion, is well anchored in the DOI literature [37](p. 414). [5] rich, ethnographic, and longitudinal work indicated that the absence of a champion was an almost insurmountable barrier to the implementation of advanced manufacturing technologies (i.e., computer aided design and/or manufacturing: CAD/CAM). Using more generalizable methodologies, [22] reported that champion behaviors appear to be related to environmental scanning. Champion behaviors, in turn, were positively related to project performance at the time of implementation and one year afterward. Accordingly:

**Hypothesis 3:** *The presence of an HR Technology Champion is positively related to HR Technology Intensity.*

*IS Function Factors –The Service Provider’s Factors.* As stated earlier, there are both intuitive and theory-based arguments that support including characteristics of the IS function as a distinct set of factors. This category matters most when the HR function is at least partially dependent on the IS function for the automation of its services. In firms where the locus of responsibility rests on the IS function –i.e., a “centralized” IT governance mode—, IS function factors are likely to mediate (at least partially) the influence of the HR function factors. It follows that a “federal mode” (to use [39] term for the shared responsibility for IT governance mode) should make characteristics of both the IS and the HR units relevant for variations in HR Technology Intensity. When the locus of responsibility for the management of HR Technology and its use rests entirely on the HR department –a “decentralized” IT governance mode [7], [39] —, the IS function factors are not expected to predict a significant amount of the variance in HR Technology Intensity.

Locus of Responsibility for the management and use of HR Technology then is a variable that triggers factors from the IS function as a mediator between the HR function factors and HR-Technology Intensity. [24], in their discussion of moderators, mediators and related tests call the functional form between these constructs a “moderated mediation” (p. 310). Two main constructs pertinent to the IS function factors are included in this research: IS Resource Availability and the Relationship between the IS (service provider) and HR (user) function. These two constructs are designed to capture the “ability” and the “willingness” of the IS function to service the HR department.

*HR IS Resource Availability.* HR IS Resource Availability is defined as the extent to which the IS function has resources available to service the user department –HR in this case. In the MIS-Innovations literature, [50] found that technical IT competences were an important (although not sufficient) predictor for success of a process innovation –business process redesign (BPR). Similarly, [26] reported that financial resource availability was strongly correlated with implementation policies and practices for Manufacturing Resource Planning (MRP). Thus, the “ability” to service the HR function, as represented by technical IT competences and general availability of resources is expected to be strongly related to the use of ICTs in firms where the IS function has a relevant role in its use.

*IS Relationship with the HR Function.* As stated above, this construct is intended to capture the “willingness” of the IS function in servicing the HR department. In their reviews of the factors related to IT implementation, [13], [28] include “appropriate user-designer interaction and understanding” as imperatives to IT implementation effectiveness [13] (pp. 123-124). Cooperation between the user and the IS function is also stressed by [2] in the context of IT planning, the process that, at least in the best-case scenario, should determine technology investment decisions. Similarly, [3] and [51] have “emphasized that close relationships between business and IS staff are necessary to ensure that IS plans support business strategies” [2] (p. 538). Thus, the intuitive idea that the relationship between the IS and user function impacts various stages of the IT systems life cycle has received support from the research community.

*Locus of Responsibility for HR Technology.* Figure 1 posits that the two IS factors will mediate the relationship between User factors and HR Technology Intensity



*when* the Locus of Responsibility for HR Technology is either “centralized” with the IS function (a full mediation form is expected) or shared among the IS and the HR functions in a “federal” mode (a partial mediation is expected). In the event that the IS function does not have any responsibility on HR Technology (a “decentralized” IS governance mode), these factors are not expected to mediate the effect of the HR function factors on HR Technology Intensity. In formal terms:

**Hypothesis 4a:** *HR IS Resource Availability mediates the relationship between User Factors and HR Technology Intensity, when the Locus of Responsibility for HR Technology rests, at least partially, upon the IS function.*

**Hypothesis 4b:** *IS Relationship with the HR function mediates the relationship between User Factors and HR Technology Intensity, when the Locus of Responsibility for HR Technology rests, at least partially, upon the IS function.*

### 3 Methods

#### 3.1 Sample and Data Collection

Organizations with more than five hundred employees, located within Canada and the United States, were targeted for this study. Using a three-contact protocol following [14] Tailored Design survey method, 767 organizations in a wide variety of industries were contacted for this web-based study—244 in Canada, 523 in the USA. One hundred and fifty-five valid responses were recorded in the web-survey database (85 from the USA, 49 from Canada and 21 did not leave this information), which yields a response rate of 21.3%. Response rates by country were 16.7% for the USA and 21.83% for Canada, which implies that conclusions from this report might be slightly biased toward relationships that can be found more easily in Canadian than in US American firms. Of 400 randomly selected firms in the database of prospective respondents whose industry was identifiable, manufacturing firms accounted for 16.25%, whereas non-manufacturing ones comprised 83.75%. Most respondents had positions in the HR area (116, or 97.5%; with the remaining 2.5% from the IS area). Close to 60% reported being at the top of their functional area or at senior management levels. We also used, with encouraging results, Harman’s one-factor test [34] on the items included in the survey to examine the possibility that common method bias had inflated the magnitude of the relationships. Finally, long tenure in respondents’ positions—average: 10.5 years; S.D.: 8.11—suggests that they know their firms well and should be located in compelling positions to inform on the topic of the study. Only twenty-six respondents (22.4%) had less than three years in their firms; forty of them (34.5%) between 3 and 10 years of experience, and fifty respondents (43.1%) reported ten or more years working for their firms.

In general, measures published with satisfactory psychometric properties for the theoretical constructs above were used in this research. In several cases, the measures were adapted to the context of the study (e.g., some scales that were designed for studying Manufacturing Resource Planning systems or MRPs were reworded), and

some of the scales were shortened to between three to seven items, in an attempt to balance questionnaire length with psychometric quality. Alpha coefficients of reliability showed acceptable to excellent levels (.81 to .93). Given space limitations, a brief description of the measures used to operationalize the dependent and mediating variables now follows; detail on independent variables may be obtained from the first author.

### 3.2 Dependent Variable: Human Resource-Technology Intensity (HRTI)

Human Resource-Technology Intensity (HRTI) was created in the same spirit as other innovation measures [18], [16], [20], [23], [27], [29], [36]; its operationalization is as follows:

$$\text{HRTI} = \sum j_i p_i \quad (1)$$

$j_i$ : Varies from 1 to 8 with the following information technologies for HR services: (1) Functional HR Applications; (2) Integrated HR Suite; (3) HR Integrated – also known as Automated—Voice Response (IVR/AVR); (4) HR intranet; (5) Employee Self-Service (ESS); (6) Manager Self-Service (MSS); (7) HR extranet; and (8) HR portals. A low number of responses for wireless applications forced us to delete this ninth category from further analyses. Detailed descriptions of these ICTs, their end-users, purposes, features, and HR services typically automated through these technologies can be found in [32].

$j_i$ : Assimilation stage [16]: 0 = not acquired; 1 = evaluation or trial use; 2 = purchased, not yet deployed; 3 = limited deployment (less than 25 %); 4 = generalized deployment (25 % or more).

$p_i$ : Penetration of functional HR areas where the corresponding  $i^{\text{th}}$  Information Technology will be or has been deployed.

The first component of the variable ( $j_i$ ) was operationalized with the following question: “In the delivery of HR services, does your company use:” followed by the five assimilation stages described above, for each of the eight ICT’s (functional HR applications through HR portals). The second component ( $p_i$ ) was operationalized by the number of functional HR areas in which the ICT had been or would be deployed, if it had already been purchased (third or higher stage in [16] assimilation model).

### 3.3 Moderated Mediator Variable: Locus of Responsibility for HR-ICTs as IT Governance

Locus of Responsibility for HR-Technology was measured using six items to identify the organizational unit whose scope of responsibility included HR-ICT-related activities such as leading the development, implementation, standards setting, and planning of ICTs for HR. Sample questions include: “Priorities for the development and implementation of HR-technologies are set by:” and “HR-Technology standards are set by.” Response options included the IS function, the HR department, joint responsibility, business units, and so on. Coding for this variable was done in several steps: three

variables were created, one for each of the IT governance modes (*centralized*, or located in the IS department; *decentralized*, when responsibility is in the HR unit; and *federal*, for shared responsibility). These variables were then assigned one point for each occasion in which the items indicated the governance mode for ICTs. The intermediate variable having the largest value was then utilized to assign each case to one of the three categories. Of twenty cases where two of the intermediate variables had the same value, eight were resolved by crosschecking with the response to the question of “Who participates in HRTI planning in your firm?” We collapsed centralized and federal governance modes to compare against the decentralized mode to test Hypotheses 4a and 4b; this also allowed recoding ten of the firms that had not been previously assigned to any of the governance modes, yielding 90 firms (58.1%) for the Centralized+Federal category and 65 (41.9%) for the decentralized one. Admittedly, this aggregation is less consistent with theory than if we had kept the three IT governance categories, but the statistical analysis became more balanced as a result of it.

## 4 Results

### 4.1 Moderated Mediation Analyses

To rigorously test the hypothesized moderated mediation form [24] of the IS Function factors, as represented by Figure 1 and formally stated in Hypotheses 4a and 4b, we used regression analyses; Table 1 summarizes the results. The first subset of regression equations utilized the records where the respondents reported that the IS Function played a significant role on HRTI Governance (either a Centralized or a Federal governance mode); the second subset included only records where the role of the IS Function was reported as less substantial (a Decentralized governance mode, where the HR function has greater responsibility over ICTs than the IS function). It was expected that IS Factors would mediate the relationship between the HR Function factors and HRTI only when the IS Function was included in the locus of responsibility for HR-Technology.

**Table 1.** Tests of moderated mediation for IS function factors.

Regression equations	Unstandardized B	p-level	Condition held?
<b>Models where HR-ICT Governance is either Federal or Centralized (IS Function included) n = 90</b>			
1. HR-IS Relationship on HR Innovation Climate	.66	.000	Yes
2. HRTI on HR Innovation Climate	6.60	.039	Yes
3. HRTI on HR Innovation Climate and on HR-IS Relationship	.47 9.20	.894 .002	Yes
<i>Mediation effect:</i>	<i>Full</i>		
<b>Models where HR-ICT Governance is Decentralized (the IS Function NOT included) n = 65</b>			
1. HR-IS Relationship on HR Innovation Climate	.55	.015	Yes
2. HRTI on HR Innovation Climate	5.16	.277	No
3. HRTI on HR Innovation Climate and on HR-IS Relationship	4.85 1.32	.315 .644	No
<i>Mediation effect:</i>	<i>Not supported (as theoretically expected)</i>		



Tests for mediation used [4] algorithm. As Table 1 shows, support was found for full mediation in the set of records where HR-ICT Governance includes the IS Function, thus supporting Hypothesis 4b. Also consistent with this hypothesis, when the regression equations were calculated on the subset of records where HR-ICT Governance does not include the IS Function, only the first of the three regression equations was significant, suggesting that the HR-IS Relationship does mediate the relationship between HRTI and the HR Innovation Climate, solely when the locus of responsibility for HR-Technology includes the IS Function—a result that also supports Hypothesis 1. Also shown is the number of records that were used in these calculations. Fifty-eight percent (90/155) of respondents reported that the IS Function was included in HR-ICT Governance, and the remaining respondents that this function was not. Multicollinearity was also tested with encouraging results.

Because the number of cases drops down to 46 in some of the regressions (listwise deletion is used to maximize the stability of regression estimators), another regression model was run on this sub-sample, to test whether the effect size of the HR Function factors on the dependent variable is large enough to be perceived, even with the smaller number of records, as hypothesized theoretically.

Results are not shown but they offer additional backing to the notion that, when the governance role of the IS Function is less significant than that of the HR Function, the presence of an HR Technology Champion ( $B = 10.34$ ;  $p = .002$ ) is a strong and significant predictor of HRTI, as predicted by Hypothesis 3. Somewhat surprisingly, HR-IT Absorptive Capacity ( $B = -5.16$ ;  $p = .093$ ) received marginal support in the direction opposite to the one hypothesized. Lack of statistical power is unlikely to be the cause for the failure to find support for the connection between HRTI and the HR-IS Relationship when the IS Function does not share responsibility for HRTI Governance (Step 2 in the regression), further endorsing Hypothesis 4b.

## 5 Conclusions

Our results suggest that the influence of some user-factor predictors like the HR Innovation Climate or an HR Technology Champion may be more significant when the moderating mediator, HR-ICT Governance, places ultimate responsibility for ICT's on the HR Function than when this responsibility is shared with the IS Function. In addition, our regression analyses suggest that, for organizations where the IS Function does not play a significant role in the management of ICTs, the existence of an HR-Technology Champion is an important predictor of HR Technology Intensity. Conversely, when the IS Function is included in Governance for HR-ICTs, a favorable HR-IS Relationship mediates the effect of user factors (specifically the HR Innovation Climate).

There is an even more pressing need to document the effects that ICTs have on HR and IS staff, the larger HR and IS functions, and the firm. How likely is it that HR's internal customers will fully embrace and use IVR systems, HR intranets, ESS/MSS applications, or HR portals? The MIS literature has much to offer in explaining the dynamics of technology acceptance by individual users. What impact does the auto-

mation of HR transactions have on HR staff? Do attitudes like job satisfaction, organizational commitment and professional commitment improve because less time is consumed performing mundane tasks, or is there heightened work stress, job insecurity, and intentions to leave in the face of perceived changes in competency requirements? Does the productivity of HR staff actually increase as service delivery becomes more technology intensive, and is the relationship linear? Answers to these questions would facilitate more effective change strategies for ICTs and more accurate return analyses when trying to develop the business case for their introduction.

Contributions of this study are (1) the results underscore the importance of governance policies in the internal diffusion of HR-ICTs, (2) the analyses are based on the most comprehensive operationalization of firm-level HRM-ICT usage to date, and (3) the IT governance literature is extended by assessing the phenomenon through the eyes of a heretofore unexplored source--HRM users. As technology becomes an increasingly vital component of HR service delivery, researchers must expand their efforts to understand the opportunities and threats that it fosters. Regardless of how our understanding of these phenomena increases, investments in these innovations will surely continue to swell, a fact that underscores the need to better understand the effects that IT governance has on organizations.

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