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High-Performance Work Systems and Work-Role Performance: A Multilevel Moderated
Mediation Model

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HIGH-PERFORMANCE WORK SYSTEMS AND WORK ROLE PERFORMANCE. A MULTILEVEL MODERATED MEDIATION MODEL

1 Introduction

The capacity of High-Performance Work Systems (HPWS) to contribute to organizational performance has been the topic of a heated debate since the 1990s. HPWS refers to a cluster of “interconnected human resource (HR) practices designed to enhance employees’ skills and effort” (Takeuchi, Lepak, Wang, & Takeuchi, 2007, p. 1069).

The majority of previous research on HPWS has focused on its impact on firm performance (Coombs, Yongmei, Hall, & Ketchen, 2006; Jyoti & Rani, 2017) and the mechanisms through which this relationship occurs. HPWS affects organizational performance through its effect on the employees (e.g., Jiang, Lepak, Han, Hong, Kin, & Winkler, 2012). Thus, some studies have recently investigated the link between HPWS and employee outcomes. For the most part, these studies have examined mediators at the organizational level, whereas fewer investigations have analyzed mediators at the individual level (Werner, 2011). In this last line of research, the most of studies have focused on the effect of HPWS on employee attitudes (e.g., Kehoe & Wright, 2013; Wu & Chaturvedi, 2009) and only a few papers have examined its effect on individual performance (e.g., Chang & Chen, 2011; Snape & Redman, 2010).

To examine individual performance is especially important for organizations because “organizations do not “perform” it is the individuals in an organization who perform in ways that allow the organization to achieve desirable effectiveness and performance outcomes” (Lepak, Liao, Chung, & Harden, 2006, p. 230). Employee performance, compared to organizational outcomes, is a more immediate and proximal outcome of HR systems and the interest in its research is more consistent across

organizations (Jiang et al., 2012). According to Werner (2011), to show a relationship between HPWS and individual performance constitutes a relevant progress to HPWS literature.

Despite recent research that examines the relationship between HPWS and individual performance, there are still gaps in the literature. Our research, which uses multisource data, expands upon existing HPWS research and knowledge in several meaningful ways. First, we integrate two previously separate streams of research by analyzing the relationship between HPWS and the three performance dimensions - proficiency, adaptivity, and proactivity- proposed by Griffin et al. (2007) in their new model of work role performance. The meaning of work performance has changed over the last 40 years, as result of the changing nature of work and organizations. Today's organizations operate in changing, dynamic environments in which the need for new employee behaviors has become increasingly important (Crant, 2000; Pulakos, Arad, Donovan, & Plamondon, 2000). For this reason, researchers must go beyond typical task performance when evaluating individual performance, and consider each performance dimension separately (Semadar, Robins, & Ferris, 2006). One means of achieving this is by using role-based performance theory (Ilgen & Hollenbeck, 1991).

Second, we analyze the mediating role of employee effort in the relationships between HPWS and proficiency, adaptivity, and proactivity. Effort is considered a key determinant of employee performance (e.g., Campbell, 1990; Vroom, 1964) and has been identified as a critical mediator in theoretical models of the relationship between HR systems and individual performance (e.g., Jiang et al., 2012). According to Christen, Iyer & Soberman (2006) "from the perspective of an employee, effort is an input to work, and job performance is an output from this effort" (p. 139). In addition, its importance in the relationship between a system of human resource practices and firm performance has

been noted since the nineties (e.g., Appelbaum, Bailey, Berg, & Kalleberg, 2000; MacDuffie, 1995). However, to date, to the best of our knowledge, no empirical study has proposed and tested the mediating role of employee effort in the relationship between HPWS and individual performance. By doing so, we respond to Den Hartog, Boon, Verburg, and Croon's (2013) call for research on motivation-related variables to explain the mechanisms underlying the relationship of Human Resource Management (HRM) with outcomes in contexts with skilled jobs.

Third, although the contingency perspective on Human Resource Management (HRM) has been primarily studied at the organizational level, the effectiveness of HRM may also be dependent on individual employees' characteristics. Hence, we argue that the positive relationships between effort resulting from HPWS and the dimensions of performance are moderated by organizational tenure, strengthening these links. We hope to address the question of the underlying mechanisms influencing employee reactions to HPWS, as well as respond to the call for research on potential individual-level moderators of HR systems effects (Jiang et al., 2012; Snape & Redman, 2010).

As the employee's attitudinal and behavioral response is based on his/her perception of the human resource practices (e.g., Wright & Nishii, 2013), we examine HPWS from the employee perspective (Choi, 2014). In doing so we respond to the call of Jiang et al. (2012, p. 83) "to investigate how employee perceptions may affect the effects of HR practices".

Finally, given the need to differentiate the workforce (e.g., Becker, Huselid, & Beatty, 2009), the multilevel moderated mediation model proposed in this research (see Figure 1) is tested on engineers, an especially relevant professional group to companies and society (UNESCO, 2010).

'Figure 1 approx here'

2 Theory and Hypotheses

In the field of HRM, HPWS is the HRM system that has received more attention in recent literature. Although there is great diversity in the HR practices considered in previous studies, according to Takeuchi, Chen, and Lepak (2009), HPWS usually includes “comprehensive recruitment and selection procedures, incentive, compensation and performance management systems, and extensive employee involvement and training” (p. 1).

2.1 Mediating role of effort in the relationship between HPWS and work role performance at individual level (proficiency, adaptivity, and proactivity)

Work performance nature and dimensionality have interested organizational scientists for decades. Traditionally, work performance “was evaluated in terms of the proficiency with which an individual carried out the tasks that were specified in his or her job description” (Griffin et al., 2007, p. 327). However, this measure is limited because it ignores other dimensions of work performance.

Recently, Griffin et al. (2007) have posited a new model of work performance based on role theory (Ilgen & Hollenbeck, 1991) and existing performance frameworks, most notably the distinction between task and citizenship performance (Borman & Motowidlo, 1993). This model identifies three levels –task individual, team member, and organization member- and three forms of behavior: proficiency, adaptivity, and proactivity.

Proficiency at individual level reflects “the degree to which an employee meets the known expectations and requirements of his or her role as an individual” (Griffin, et al., 2007, p. 331). Individual task proficiency integrates “job-specific”, “non-job-specific”, and “written and oral” task proficiency of Campbell, McCloy, Oppler, and Sager’s (1993) model. This dimension has been deeply analyzed in previous research and traditional performance assessment systems have focused on this performance dimension.

Adaptivity at individual level is a construct that “reflects the degree to which individuals cope with, respond to, and/or support changes that affect their roles as individuals” (Griffin et al. 2007, p. 331). If an employee responds to these changes, he/she is altering his/her competencies and applying new competencies. A core element of this construct is dealing with uncertain work situations (Griffin et al., 2007; Pulakos et al., 2000). Adaptive performance is especially relevant in today’s dynamic business environment.

Proactivity at individual level reflects “the extent to which individuals engage in self-starting, future-oriented behavior to change their individual work situations, their individual work roles, or themselves” (Griffin et al., 2007, p. 332). According to Grant and Ashford (2008), proactive behavior refers “to anticipatory action that employees take to impact themselves and/or their environments” (p. 4). Individual proactivity is an important dimension in highly uncertain work environments where employees who anticipate changes are needed (Beltrán-Martín, Bou-Llusar, Roca-Puig & Escrig-Tena, 2017).

In this study, we argue that employee effort mediates the relationship between HPWS and the three dimensions of work role performance –proficiency, adaptivity, and proactivity- at individual level. Effort is one of the most significant constructs in motivation theory. Mohr and Bitner (1995) define effort as “the amount of energy put into a behavior or series of behaviors” (p. 240). Therefore, effort refers to how hard an employee works (Mitchell & Daniels, 2002).

The relationship between HPWS and employee effort is supported by signaling (e.g., Ostroff & Bowen, 2000) and social exchange (Blau, 1964) theories. Signaling theory argues that observable actions from an organization or person are perceived as signals of less observable characteristics (Spence, 1973), while social exchange theory

(Blau, 1964) posits that when employees perceive organizational support, they will show greater affective attachment and stronger feelings of obligation toward the organization. Human resource practices perceived as favorable and convenient “contribute to the establishment of high-quality exchange relationships ... that create obligations for employees to reciprocate in positive, beneficial ways” (Settoon, Bennett, & Liden, 1996, p. 219). A behavior of reciprocity is to make a bigger effort in line with the organization’s objectives.

An HPWS, characterized by rigorous selection and recruitment procedures, an evaluation system based on merit, extensive training and development programs, and contingent pay and opportunities for participation, signals a supportive work environment to the employee (e.g., Sun et al., 2007). Consequently, the employee makes a greater effort to help the organization reach its objectives (e.g., Appelbaum et al., 2000).

Several empirical studies show a positive relationship between specific human resource practices, and employee effort (Gilley, Gilley, Jackson & Lawrence, 2015). Walsh and Tseng (1998) have showed that employees’ participation has a positive effect on their effort. Den Hartog and Verburg (2004) have found positive relationships between a set of practices labeled “employee skills and direction” –involving strict selection, an emphasis on employee development and internal promotions, and having an overarching philosophy in terms of a mission statement and HR strategy- and employee willingness to go beyond contract. Kuvaas and Dysvik (2009) have found a relationship between perceived investment in employee development and work effort. Recently, McClean and Collins (2011) have shown significant relationships between the use of high-commitment HR practices and employee effort in small professional services firms.

Moreover, employee effort is related to work role performance. An increase of the energy that employees are willing and able to devote to their tasks (i.e., more effort) will

contribute to proficiency. A number of previous empirical studies (e.g., Brown & Peterson, 1994; Karatepe, Uludag, Menevis, Hadzimehmedagic, & Baddar, 2006; Piccolo, Greenbaum, Den Hartog, & Folger, 2010) have found a positive relationship between individual effort and performance.

We also argue, in a similar way to proficiency, that effort will affect adaptivity. Dealing effectively with unpredictable and changing work situations, and learning new tasks, technologies and procedures, reflects adaptive performance (Ployhart & Bliese, 2006). When an individual works hard and strives to succeed in his/her work, he/she may be willing to modify and use new competencies. Then, we posit that more effort will lead to a more adaptive performance.

Effort may contribute to proactivity. When employees display high levels of effort, they work with intensity and energy (Brown & Leigh, 1996) and they actively engage themselves in broader work roles (Khan, 1990). Then, individuals will be more likely to set and strive for proactive goals (Parker, Bindl, & Strauss, 2010). In this line, Zhang and Bartol (2010) argue that when an individual displays effort to better identify a problem, he/she will acquire as much information as possible, and produce abundant ideas and alternatives. Based on the previous arguments we posit the following hypothesis:

H1: Employee effort mediates the relationship between HPWS and employee (a) proficiency, (b) adaptivity, and (c) proactivity at individual level.

2.2. Moderating role of organizational tenure on the mediated relationship between HPWS and work role performance at individual level (proficiency, adaptivity, and proactivity)

Organizational tenure is defined as the length of an employee's continuous service in an organization (Gordon & Johnson, 1982). The length of an employee's continuous service in an organization is related to his or her knowledge of the work (e.g., Quiñones, Ford, &

Teachout, 1995) and the organization (Bird, 1994). Long-tenured workers can accumulate human capital through work experiences; those employees with more years of service are generally familiar with a broader set of work processes and are often skillful in performing multiple jobs within the firm. Job performance has been traditionally conceptualized as a function of both ability and effort (e.g., Campbell, 1990). Therefore, organizational tenure can interact with effort in the relationship with performance.

We posit that effort will have a stronger effect on proficiency for long-tenured employees. Organizational tenure enhances the positive effect of effort on proficiency as it increases declarative and procedural knowledge (Campbell et al., 1993). In addition, organizational tenure promotes the acquisition of social knowledge. Rollag (2004) demonstrated that relative organizational tenure (years of tenure relative to colleagues) significantly predicted employees' networking and communication behaviors. Relationship ties encourage joint efforts in problem solving (Ahuja, 2000), provide psychosocial support via friendship and intimacy, which fosters trust and cooperation, and facilitate the exchange of valued resources (Brass, 1995). These networks help obtain scarce resources needed for the job and facilitate knowledge sharing, a process that enables people to benefit from existing knowledge bases within the organization, and to make effort more effective.

In the same line, we consider that the relationship previously posited between effort and adaptivity, is also moderated by organizational tenure. Chen, Ployhart, Thomas, Anderson, and Bliese (2011) argue that, according to sense-making theory, employees need to acquire sufficient knowledge about their organization and work role in the firm to meaningfully interpret changes in work experiences. Organizational tenure is associated with the extent to which employees develop a clear cognitive framework of their work roles, organization norms and consistent reputation (Rollag, 2004). Since

short-tenured employees know less than long-tenured employees about their role within the organization, they may find it more difficult to make sense of changes in their work and, consequently, the effect of their effort on their adaptive behavior will be weaker. Consequently, we propose that effort will have a stronger effect on adaptivity for long-tenured employees.

Similarly, we also propose the moderating role of organizational tenure in the relationship between effort and proactivity. Since long-tenured employees know more than short-tenured employees about their role within the organization, they may envision a different future, that is, to anticipate desired future states or outcomes and develop strategies to reach those goals. As a consequence, for the same level of effort, they may engage in self-starting, future-oriented behavior to change their individual work situations, their individual work roles, or themselves, more than short-tenure employees.

Moreover, to improve a process might involve persuading colleagues about the advantages of change (Parker et al., 2010). If an employee makes an effort because he/she wishes to anticipate or initiate change, the impact of this effort will be greater if he/she has more organizational tenure, as this greater organizational tenure can provide social capital and a consistent reputation.

Hence, combining the suggested moderating role of organizational tenure and the previously proposed mediation model, we hypothesize as follows:

H2: Organizational tenure moderates the strength of the mediated relationship between HPWS and work role performance at individual level via effort, such that higher levels of organizational tenure will strengthen the mediated relationship:

H2a: Organizational tenure moderates the strength of the mediated relationship between HPWS and proficiency at individual level via effort.

H2b: Organizational tenure moderates the strength of the mediated relationship between HPWS and adaptivity at individual level via effort.

H2c: Organizational tenure moderates the strength of the mediated relationship between HPWS and proactivity at individual level via effort.

3 Methodology

3.1 Sample

We approached 250 firms located in Spain from different industries and with a substantial number of engineers in their staff. First, to select the sample, we identified, by means of telephone contact, a set of 250 firms from different sectors, reflecting all branches of engineering and with a substantial presence of engineers on their staff. After having identified the firms, in a second phase we contacted the HR manager of each organization to invite him/her to participate in our research project. We offered the opportunity to receive feedback to encourage participation. Afterwards, participants were informed, through a letter that accompanied the questionnaire, that the information provided would be treated confidentially, trying to reduce the possibility of response distortion (Chan, 2009). The final sample for this study consisted of 180 engineers, 47 supervisors and 25 companies. We distributed matching questionnaires to supervisors and subordinates. In each company supervisors rated subordinates on the performance items and engineers responded to questions related to their perception of HPWS, their effort, and their organizational tenure. By doing so, we reduced the possibility of common-method bias, as measures of the predictor and criterion variables were obtained from different sources (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

In the sample of engineers, 73.9% were men and 26.1% were women. The average age was 35.6 years. In reference to job category, 92.1 % were non-executive and 7.9 % were executive. As far as engineering field is concerned, 27.4% were from industrial,

24.4% from telecommunications, 14.3% from marine, 19.6% from civil engineering, 11.3% were from computer systems, and 3% from agricultural engineering.

3.2 Measures

All multi-item measures used in this study were adapted from previously validated and published instruments (see Appendix A). Each item required a response on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

We measured HPWS by the scale adapted from Sun et al. (2007). This scale assesses eight core practices: selective staffing, extensive training, internal mobility, employment security, job description, results-oriented appraisal, incentive reward, and participation practices. To reduce the survey's response time, we kept the same number of items in the subscales composed of two items and we selected three items in the subscales with a greater number of items, those with higher factor loading. As a result, the final scale was made up of 22 items. We analyzed the fit of the HPWS measure by building a second order factor in which all the items loaded onto their expected dimensions, obtaining acceptable fit robust indices (χ^2 (204) = 417.505 (p < .001); CFI= .910; IFI = .912; RMSEA = .070). Cronbach's alpha is .822. All of this provided evidence of the validity and reliability of the measurement instrument (Bollen, 1989).

Effort was measured using three items from scale developed by Brown and Leigh (1996), we choose the three items with higher factor loading. An adapted version of this scale was also used, among others, by Piccolo et al. (2010) and McClean and Collins (2011). Cronbach's alpha is .898.

Work role performance at individual level was measured using the scale developed by Griffin et al. (2007). This scale includes three dimensions of work role performance at individual level: proficiency, adaptivity, and proactivity. Each subscale is

measured by three items. Cronbach's alpha is .894 for proficiency, .914 for adaptivity and .950 for proactivity.

Organizational tenure was measured by the logarithm transformation of the number of months the engineer worked for the organization.

We included a number of control variables. Given the multilevel nature of the research, we controlled variables at both the employee and firm levels. The level 1 control variables were: Engineers' age, gender (0 = male; 1 = female), and job position/level (0 = executive; 1 = non executive), all taken from the engineer's questionnaire, and supervisors' age and gender, all taken from the supervisor's questionnaire. The level 2 controls were company's size (the natural logarithm of total company employment) and industry (0 = service; 1= manufacturing), provided by the HR manager of each firm.

3.3 Analysis

We conducted a confirmatory factor analysis in EQS 6.1. in order to confirm the constructs' reliability and validity. We analyzed the fit of the whole model (HPWS, effort, proficiency, adaptivity and proactivity) obtaining acceptable results (χ^2 (560) = 909.042 ($p < .001$); CFI= .967; IFI = .967; RMSEA = .063).

The scales' reliability, analyzed through the composite reliability index, was higher than the value recommended (.6), and so was the AVE (.5) (Hair, Anderson, Tatham, & Black, 1999). With respect to validity, convergent validity is supported as all lambda parameters are significant and greater than 0.5. Discriminant validity is also supported as correlations among all the variables show confidence intervals that do not include the unit value and their squared value does not exceed the AVE, as Appendix B shows.

Table 1 presents means and standard deviations of the examined variables.

Table 1: Means and standard deviations.

Variables	M	SD
HPWS	4.37	.90
Effort	6.00	.82
Organizational tenure	3.97	1.15
Proficiency	5.90	.85
Adaptivity	5.70	1.04
Proactivity	5.26	1.14

In this study, variables at two distinct levels of analysis were included. First, we conceptualized HPWS as a firm level variable. A key limitation in past research, especially on HPWS, has been the failure to explicitly address and resolve the levels-of-analysis issue (Arthur & Boyles, 2007). The remaining constructs, however, were treated as individual-level variables.

In examining a multilevel model, it is important to ensure that the level of theory and the level of measurement are the same. As individual perceptions of HR practices can be shaped by employees within an organization (e.g., Ostroff & Bowen, 2000), we considered engineers' shared HPWS perceptions to measure HPWS at organizational level (see Kehoe & Wright, 2013, and Wu & Chaturvedi, 2009 for a similar approach). Following Chan's (1998) recommendation to use composition models, we opted to measure HPWS using the referent-shift composition model (i.e., engineers were asked about their perceptions of the extent to which they, as a whole rather than themselves, were managed by HPWS). As in multilevel modeling a phenomenon that originates at a lower level can emerge as a higher level construct, Chan (1998) recommends that lower level constructs should be aggregated to the firm level using intraclass correlations and interrater agreement statistics to determine whether the data can be aggregated.

To support the aggregation of HPWS to the firm level, we examined three aggregation statistics: two interrater reliability indices (ICC1 and ICC2; Bliese, 2000) and

one interrater agreement index (rwg; James, Demaree, & Wolf, 1984). The average ICCs for HPWS were $ICC1=.274$ and $ICC2=.704$. The interrater agreement (rwg), which refers to the degree to which ratings from individuals are interchangeable, was equal to .95 assuming that the data were uniformly distributed (James, Demaree, & Wolf, 1993). The ICC1 scores showed sufficient between group variance in the construct to explain the variance in the dependent variables. The ICC2 and rwg scores, indicating whether the construct could be aggregated to a higher level, were above .80, which was much more than the accepted threshold of .70 (James, 1982). The aggregated statistic showed that it is reasonable and meaningful to aggregate HPWS to the firm level.

4 Results

We used Stata 13.1 to test our hypotheses. According to Rabe-Hesketh and Skrondal (2008), Stata is a natural choice for multilevel modeling since it has gradually become perhaps the most powerful general-purpose statistics package for such models. This software is useful for handling multilevel data where individuals are nested within groups.

Hypothesis 1 states that effort plays a mediating role in the relationship between HPWS and the performance dimensions. On the other hand, hypothesis 2 states that organizational tenure has a moderating role in the relationship between effort and the performance dimensions. Considered together, Hypotheses 1 and 2 imply a moderated mediation process (Edwards & Lambert, 2007) whereby the strength of the mediation described between HPWS, effort, and the performance dimensions depends on organizational tenure. Therefore, mediated moderation is demonstrated when the indirect effect of the independent on the dependent variable, via the mediator, differs in strength across low and high levels of the moderator (Edwards & Lambert, 2007). This is a prototypic case of moderated mediation whereby “there is an overall treatment effect and

the magnitude of this effect does not depend on the moderator. However, the potency of the mediating process depends on the moderator” (Muller, Judd & Yzerbyt, 2005, p. 856).

To assess the moderated mediation process, steps outlined by Preacher, Rucker, and Hayes (2007) were followed. Therefore, several MSEM analyses were carried out (see Table 2) to ensure that four conditions were satisfied: (i) significant relationship between HPWS and the performance dimensions, (ii) significant relationship between effort and the performance dimensions, (iii) interaction between effort and organizational tenure is significantly associated with the performance dimensions, and (iv) different conditional indirect relationships between HPWS and the performance dimensions via effort across low and high levels of organizational tenure. The last condition, which is the essence of moderated mediation, establishes whether the strength of the mediation via effort differs across the two levels of the moderator. MSEM offers the possibility to model the relationships among multiple independent and dependent constructs simultaneously. SEM permits complex variable relationships to be expressed through hierarchical or non-hierarchical, recursive or non-recursive structural equations, showing a more complete picture of the whole model (Bullock et al., 1994). MSEM, a synthesis of multilevel and structural equation modeling, is required for valid statistical inference when the units of observation form a hierarchy of nested clusters and some variables of interest are measured by a set of items of fallible instruments (Rabe-Hesketh, Skrondal & Zheng, 2007), which is the case of this study.

As shown by table 2, HPWS has a positive significant impact on the mediator and on the dependent variables when the mediator is not included. Condition 1 was therefore confirmed. Moreover, effort has a significant positive impact on the performance dimensions (see table 2), hence, supporting condition 2. Finally, the interaction of effort

with organizational tenure was significantly and positively related to the dimensions of performance. This indicates a stronger positive relationship between effort and the performance dimensions when organizational tenure is high than when it is low, supporting H2 and condition 3. The interactions are plotted in Figure 2, 3 and 4 (Aiken and West, 1991). The simple slopes for both the long tenure (proficiency: $b=.6518$, $t=8.33$, $p<.001$; adaptivity: $b=1.0248$, $t=4.95$, $p<.001$; proactivity: $b=.5474$, $t=6.938$, $p<.001$) and the short tenure (proficiency: $b=.3482$, $t=3.17$, $p<.01$; adaptivity: $b=.7853$, $t=4.04$, $p<.001$; proactivity: $b=.23225$, $t=2.10$, $p<.05$) are significantly different from 0. Also the two slopes were significantly different from each other (proficiency: $t=2.24$, $p<.05$; adaptivity: $t=2.10$, $p<.05$; proactivity: $t=2.31$, $p<.05$).

‘Figure 2 approx here’

‘Figure 3 approx here’

‘Figure 4 approx here’

To further assess moderated mediation, condition 4 was examined. Hence, the significance of the indirect relationships between HPWS and the performance dimensions via effort for employees with low organizational tenure and employees with high organizational tenure was calculated using bootstrapped 95 per cent CIs (see table 3). As the 95% CIs are positive and do not include zero, HPWS is positively and indirectly related to the performance dimensions (via effort) when organizational tenure is low (1 SD below the mean) as well as high (1 SD above the mean). Moreover, the results show that the more organizational tenure the employees have, the greater the positive indirect effect of HPWS on the performance dimensions via effort.

Table 2. MSEM results for the hypothesized relationships

Independent	Proficiency					Adaptability					Proactivity				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
<i>EFFORT</i>															
<i>Control variables</i>															
Company size	.046	-.401	-.381	-.390	-.394	.046	-.401	-.401	-.395	-.401	.046	-.401	-.392	-.385	-.401
Industry	-1.233	.257	.268	.264	.262	-1.233	.257	.257	.261	.257	-1.233	.257	.263	.266	.257
E_Gender	.354	-.064	-.045	-.054	-.058	.354	-.064	-.064	-.059	-.064	.354	-.064	-.055	-.049	-.064
E_Age	-.108	-.160	-.189	-.176	-.171	-.108	-.160	-.160	-.169	-.160	-.108	-.160	-.174	-.184	-.160
Job position	-.537	-1.085	-1.015	-1.046	-1.059	.537	-1.085	-1.085	-1.063	-1.085	-.537	-1.085	-1.050	-1.027	-1.085
Strat. Group	.285	-.056	-.065	-.062	-.060	.285	-.056	-.056	-.059	-.056	.285	-.056	-.061	-.064	-.056
S_Age	.299	-.075	-.052	-.063	-.067	.299	-.075	-.075	-.068	-.075	.299	-.075	-.064	-.056	-.075
S_Gender	-.691	.441	.475	.459	.453	-.691	.441	.441	.451	.441	-.691	.441	.457	.468	.441
<i>Level 2 predictors</i>															
HPWS		.472**	.468**	.470**	.471**		.472**	.472**	.471**	.472**		.472**	.470**	.469**	.472**
<i>PERFORMANCE DIMENSION</i>															
<i>Control variables</i>															
Company size	.527*	.362	.579**	.527**	.546**	.596	.224	.600**	.550**	.566**	.552*	.440*	.614**	.543**	.564**
Industry	-1.659**	-.989*	-1.128**	-1.003*	-1.020**	-2.141*	-.804	-1.044**	-.915**	-.928**	-1.546**	-1.076*	-1.187**	-1.037**	-1.055**
E_Gender	.212	.132	.166	.261	.365	.189	-.136	-.077	.019	.101	.154	.116	.143	.259	.367
E_Age	.023	-.088	-.002	-.161	-.104	-.041	-.152	-.002	-.149	-.104	.031	-.059	.010	-.213	-.153
Job position	-.085	-.576	-.012	-.042	-.011	-.640	-1.092	-.076	-.048	-.090	-.014	-.485	-.016	.027	-.029
Strat. Group	-.039	-.082	-.052	-.001	.033	.145	-.116	-.064	-.004	.022	-.080	-.082	-.058	-.010	.026
S_Age	.123	-.044	-.003	-.003	.049	.240	-.055	.015	.026	.066	.119	-.017	.016	-.003	.050

S_Gender	-.436	.060	-.179	-.154	-.041	-.694	.298	-.115	-.071	.018	-.677	-.298	-.489	-.492	-.376
<i>Level 2 predictors</i>															
HPWS		.179**	-.077	-.075	-.075		.389**	-.054	-.050	-.051		.130**	-.074	-.074	-.075
<i>Level 1 predictors</i>															
Effort			.542**	.549**	.500**			.936**	.943**	.905**			.433**	.440**	.390**
Tenure				.247	.239				.226	.220				.347	.339
Effort x Tenure					.132*					.104*					.137*
Log Likelihood	-553.120	-521.430	-495.180	-490.999	-488.368	-587.652	-547.500	-474.817	-470.058	-467.670	-543.160	-514.306	-496.564	-492.464	-489.196

**p< .01; *p< .05

Note: E_Gender refers to the engineer's gender, E_Age refers to the natural logarithm of the engineer's age, S_Gender refers to the supervisor's gender and S_Age refers to the natural logarithm of the supervisor's age.

Table 3. Conditional indirect effects of HPWS on the performance dimensions via effort

Moderator	Proficiency			Adaptability			Proactivity		
	Indirect effect	Bootstrapped SE	Bias-corrected 95% CI	Indirect effect	Bootstrapped SE	Bias-corrected 95% CI	Indirect effect	Bootstrapped SE	Bias-corrected 95% CI
Low organizational tenure	.17**	.061	(.075, .325)	.38**	.064	(.273, .539)	.12*	.059	(.021, .260)
Moderate organizational tenure	.24**	.046	(.160, .349)	.43**	.056	(.340, .572)	.18**	.044	(.116, .299)
High organizational tenure	.30**	.053	(.201, .411)	.48**	.059	(.383, .618)	.25**	.050	(.165, .369)

**p< .01; *p< .05

Note: Bootstrapped confidence intervals were derived from 2,000 replications. Low = 1 SD below the mean, Moderate = mean, High = 1 SD above the mean.

5 Discussion

The primary goal of this study was to examine the relationship between HPWS and employee work role performance, to do so we conceptualized and tested a multilevel moderated mediation model.

Lepak and Snell (2002) consider that firms should rely upon different HR configurations to manage different employee groups and invest more in key workers. If companies apply different human resource practices depending on the group they are addressed to, to collect undifferentiated data could provide average information that does not represent any specific group and, thus, that will be misleading (e.g., Boxall, 2012). Therefore, this paper has focused on engineers, a unique and crucial group of employees (UNESCO, 2010). For this professional group, it is especially important to analyze not only proficiency but also the adaptivity and proactivity dimensions of work role performance. According to Vincenti (1990), engineering involves significant uncertainty. Then, engineers need to show an adaptive behavior to face the changes in his/her work roles as consequence of especially dynamic work environment and of rapidly changing technologies. Finally, as engineers have responsibility of deliver real products and services of benefit to society (UNESCO, 2010), to know the antecedents of proactivity is especially relevant for organizations and society.

Our findings provide support for the hypothesized relationships. We found that the engineers' shared perception of HPWS is significantly and positively related to the three dimensions of work role performance at individual level: proficiency, adaptivity, and proactivity. This is an important contribution because "at the highest level, the immediate and direct goal of HR systems is to obtain desired employee performance

which, conceptually, directly impacts organizational performance” (Jiang et al., 2012, p. 77).

As expected, consistent with previous studies (e.g., Brown & Peterson, 1994; Karatepe et al., 2006), this research also found that effort is a significantly and positively associated with performance. Engineer effort fully mediates the relationship between HPWS and the performance dimensions, hence supporting the beneficial effects of HPWS on the dimensions of work role performance at individual level and explaining a process through which these relationships happen. This result indicates that HPWS can lead to positive engineer reactions, in particular to a greater effort, and significantly enhance engineer performance. This result is important because only a few recent studies (e.g., Shin et al., 2013) have examined mediating effects on the relationship between HPWS and individual performance; moreover, to our knowledge, there are no studies that analyze either the relationship between HPWS and the three dimensions of work role performance identified by Griffin et al. (2007), or the mediating role of effort on the HPWS-individual performance relationship.

From a theoretical perspective, the findings are consistent with the signaling (Spence, 1973) and social exchange (Blau, 1964) theories. If employees perceive job security, training and promotion opportunities, the possibility to participate in the decision making process (HPWS components), they will show stronger feelings of obligation toward the organization, performing with greater effort, or in other words, working harder (Mitchell & Daniels, 2002).

A second goal of the current study was to analyze the potential role of organizational tenure in the relationships between individual effort and proficiency, adaptivity, and proactivity. Results also find general support for the proposed moderating role of organization tenure. The relationships between effort and the three dimensions of

performance are stronger for long-tenured employees. These results contribute toward addressing the knowledge gap regarding the role individual differences play in the relationship between HPWS and its outcomes.

Our findings have important implications for management practice. Clearly, they indicate the need for organizations to focus on their HR practices and invest in engineers. Engineering relates to “the understanding, design, development, invention, innovation and use of materials, machines, structures, systems and processes for specific purposes” (Marjoram & Zhong, 2010, p. 24). Consequently, engineers need to be adaptable to be effective in dynamics contexts (Hoyer et al., 2010) and show proactivity behaviors to innovate and to look for solutions to job problems (Beltrán-Martín et al., 2017). Our results suggest that engineers’ performance can be improved by implementing a HPWS.

Finally, since organizational tenure moderates the link between engineer effort and proficiency, adaptivity and proactivity, managers should pay attention to the development and strengthening of connections between engineers with different organizational tenure. One possibility is to take advantage of social networking technology to connect short-tenure engineers with long-tenured employees, even if they are in different locations.

6 Limitations and Future Research

Despite its strengths, including the occupational group analyzed, the multilevel methodology utilized, the use of engineers HPWS perceptions, and the assessment of engineers’ performance by their supervisor, the present study has limitations that future research should consider. First, because of the cross-sectional nature of the research design, we cannot definitively establish a causal direction from HR practices to employee outcomes. Future longitudinal studies will contribute to establish the direction of causality.

Second, the sample is composed of engineers. Despite the fact that the occupational group-specificity of our research is a strength because it helps to rule out possible superfluous factors connected with different occupations, we may not know the generalizability of the findings to different groups of employees. Hence, we recommend that future research examines samples of different knowledge workers or workers with low qualification to test if the effect is different depending on the occupational group.

Future studies that extend these findings could analyze other moderator variables, such as engineers' dispositional orientations in the mediator-work role performance relationship.

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Appendix A. Measurement scales used and properties

CONCEPTS	Standard Loading (λ)*
Below are items that organizations may use in the management of their employees. For each item indicate the extent of your agreement or disagreement as a description of the practices employed by your firm related to engineers (1= strongly disagree, 7= strongly agree).	
<i>Selective Staffing (AVE=.684, CR= .865)</i>	
Great effort is taken to select the right engineer.	.845
Engineers' long-term potential is emphasized.	.715
Considerable importance is placed on selective staffing.	.907
<i>Extensive Training (AVE=.697; CR= .871)</i>	
Extensive training programs are provided for engineers.	.981
Engineers will normally go through training programs every few years.	.825
There are formal training programs to teach newly hired engineers the skills they need to perform their job.	.669
<i>Internal mobility (AVE=.562; CR= .791)</i>	
Engineers have few opportunities for upward mobility.	.635
Vacancies at executive levels are filled by engineers from the organization.	.847
Promotion in this organization is based on seniority.	.752
<i>Employment security (AVE=.689; CR= .812)</i>	
Engineers in this job can be expected to stay with this organization for as long as they wish.	.786
Job security is almost guaranteed to engineers in this job.	.872
<i>Clear job description (AVE=.713; CR= .882)</i>	
The duties in engineers' jobs are clearly defined.	.811
Engineers' job has an up-to-date description.	.853
The job description for a position covered by an engineer describes all the duties performed.	.869
<i>Results-Oriented Appraisal (AVE=.667; CR= .857)</i>	
Engineers' performance is most often measured with objective quantifiable results.	.828
Engineers' performance assessment follows a formal process.	.861
Engineer appraisals emphasize group based achievement.	.757
<i>Incentive Reward (AVE=.544; CR= .693)</i>	
Engineers in this job receive bonuses based on the profit of the organization.	.550
Pay is closely tied or matched to individual/group performance.	.886
<i>Participation (AVE=.533; CR= .772)</i>	
Engineers in this job are often asked by their supervisor to participate in decisions.	.637
Engineers in this job are allowed to make decisions.	.824
Engineers are provided the opportunity to suggest improvements in the way things are done.	.718
<i>9. HPWS (AVE=.500; CR= .879)</i>	
Selective staffing.	.730
Extensive training.	.620
Internal mobility.	.591
Employment security.	.269
Clear job description.	.722
Results-oriented appraisal.	.909
Incentive reward.	.837

Participation.	.770
Indicate your level of agreement or disagreement with the following statements (1=strongly disagree, 7=strongly agree)	
<i>Effort (AVE=.769; CR=.909)</i>	
When I work, I do so with intensity.	.893
I work at my full capacity in all of my job duties.	.871
I strive as hard as I can to be successful in my work.	.867
Regarding the following statements about the performance level of the engineer with ID.... during the last year, indicate your level of agreement or disagreement with each statement (1=strongly disagree, 7=strongly agree)	
<i>Proficiency (AVE=.699; CR=.874)</i>	
Carried out the core parts of your job well.	.875
Completed his/her core tasks well using the standard procedures.	.826
Ensured his/her tasks were completed properly.	.806
<i>Adaptivity (AVE=.778; CR=.913)</i>	
Adapted well to changes in core task.	.920
Coped with changes to the way he/she has to do his/her core tasks.	.938
Learned new skills to help him/her adapt to changes in his/her core tasks.	.780
<i>Proactivity (AVE=.862; CR=.949)</i>	
Initiated better ways of doing his/her core tasks.	.917
Came up with ideas to improve the way in which his/her core tasks are done.	.924
Made changes to the way his/her core tasks are done.	.945

(*) All standardized loadings are significant ($p < .01$)

Appendix B. Discriminant validity: AVE and squared correlations among variables

	HPWS	Effort	Proficiency	Adaptivity	Proactivity
HPWS	.500				
Effort	.134	.769			
Proficiency	.010	.073	.699		
Adaptivity	.088	.092	.591	.778	
Proactivity	.004	.036	.425	.487	.863