The role of big data and predictive analytics in the employee retention: a resource-based view

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Abstract

Purpose – The authors have attempted to understand how big data and predictive analytics (BDPA) can help retain employees in the organization.

Design/methodology/approach – This study is grounded in the positivism philosophy. The authors have used a resource-based view (RBV) to develop their research hypotheses. The authors tested their research hypotheses using primary data gathered using a single-informant questionnaire. The authors obtained 254 usable responses. The authors performed the assumptions test, performed confirmatory factor analysis (CFA) to test the validity of the proposed theoretical model, and further tested their research hypotheses using hierarchical regression analysis.

Findings – The statistical result suggests that the various human resource management strategies play a significant role in improving retention under the mediating effect of the BDPA.

Research limitations/implications – The authors have grounded their study in the positivism philosophy. Moreover, the authors tested their hypotheses using single-informant cross-sectional data. Hence, the authors cannot ignore the effects of the common method bias on their research findings. Moreover, the research findings are based on a particular setting. Thus, the authors caution the readers that their findings must be examined in the light of their study limitations.

Practical implications – The study provided empirical findings based on survey data. Hence, the authors provide numerous guidelines to the practitioners that how the organization can invest in creating BDPA that helps analyze complex data to extract meaningful and relevant information. This information related to employee turnaround may guide top management to reduce the dissatisfaction level among the employees working in high-stress environments resulting from a high degree of uncertainty.

Social implications – The study helps understand the complex factors that affect the morale of the employee. In the high-paced environment, the employees are often exposed to various negative forces that affect their morale which further affect their productivity. Due to lack of awareness and adequate information, most of the employees and their issues are not dealt with effectively and efficiently by their line managers. Thus, the BDPA can help tackle the most complex problem of society in a significant way.

Originality/value – This study offers some useful contributions to the literature which attempts to unfold the complex nexus between human resource management, information management and strategy. The study contributes to the BDPA literature and how it helps in the retention of employees is one of the areas which still remains elusive to the academic community. Moreover, the managers are still skeptical about the application of BDPA in understanding human-related issues due to a lack of understanding of how and to what extent the employee-related information can be stored and processed. This study's findings further open the new avenues of research that need to be tackled.

Keywords Big data, Big data and predictive analytics (BDPA), Resource-based view (RBV), Human resource management, Employee retention

Paper type Research paper

1. Introduction

Human resource plays a key role in any organization performance and is a vital asset for an organization (Hall, 1992, 1993; Cappelli, 2000; Armstrong, 2006a, b; Naraynan *et al.*, 2019). In order to effectively manage this asset, talent management strategies have been successfully employed in diverse sectors around the world (Cappelli, 2000). Effective practices in human resource management (HRM) play a pivotal role in the retention of staff and are likely to enhance job security (Irshad and Afridi, 2012). Employee retention is considered one of the important human resource functions. Retaining employees is an important activity that helps organizations gain a competitive advantage (Armstrong, 2006a; Paille, 2013). Skilled and talented human resource has emerged as an essential element for sustained competitive advantage which never depreciates (Kumar and Kaushik, 2013). In this highly competitive and fast-paced world, talent retention has become a prime concern for corporates (Naris and Ukpere, 2010; Olckers and Du Plessis, 2012). Data-driven decision-making and application of big data have been acknowledged in almost all functions of management (Davenport and Harris, 2007; Chen *et al.*, 2012; Watson, 2014; Frisk and Bannister, 2017; Kar and Dwivedi, 2020; Bag *et al.*, 2021a, b, c). Big Data Predictive Analytics (BDPA) stimulates the interest of companies to embrace data-driven decision-making and sophisticated Big Data applications (Davenport *et al.*, 2007; McAfee and Brynjolfsson, 2012; Secundo *et al.*, 2017; Agarwal *et al.*, 2021). It has the immense capability to transform the entire business process that's why research on big data has become very popular among the academic community and policymakers (Wong, 2012; Fosso Wamba *et al.*, 2016; Dubey *et al.*, 2019a). Many human resource management and information management scholars are making significant efforts to shape the practice, but find it extremely difficult (Garcia-Arroyo and Osca, 2021; Rombaut and Guerry, 2020; Hamilton and Sodeman, 2020). Despite significant attempts, the research and practice often remain as two solitudes (Shah *et al.*, 2017; Calvard and Jeske, 2018; Zhang *et al.*, 2021). The existing literature has remained silent on the factors that influence employee retention (ER). Moreover, the literature does not provide empirical evidence on the role of the BDPA in ER. Hence, we note this as a clear research gap. To address these research gaps we have outlined research questions as:

RQ1. What are the functions of human resource management that influence employee retention?

RQ2. What are the effects of the human resource functions on employee retention?

RQ3. How does the BDPA mediate the effects of human resource function on employee retention?

To answer our three research questions we have gathered 254 usable responses from human resource managers from manufacturing organizations. To theoretically substantiate our empirical findings, we grounded our theoretical model in the resource-based view (RBV) (Barney, 1991). We have organized our paper as follows. In Section 2, we provide a critical review of underpinning theories. In Section 3, we present our theoretical model and research hypotheses. In Section 4, we provide a detailed overview of our research design. In Section 5, we present our data analyses. In Section 6, we discuss our research findings and further outline our contributions to theory, and note implications to the practitioners. We further outline our research limitations and present detailed future research directions that may help extend our study. Finally, we conclude our study.

2. Literature review

We have undertaken an extensive review of literature drawn from multiple reputable databases, following Tranfield *et al.*'s (2003) guidelines. We have classified our literature review in the following stages as (see Figure 1):

Stage 1: Planning the Review

We have planned our literature review into three distinct phases as:

*Phase 1: Identification for the Need of Review*

In our present study we want to investigate the impact of recruitment and selection, learning and development, compensation and reward and performance appraisal on employee's retention under the mediating effect of BDPA.

Phase 2: Proposal for Review

The literature review is a necessary part of any logical works. Regardless this segment, we first identified reputable Journals using key words like talent management, functions of talent management, employee retention, factors affecting employee retention, recruitment and selection, compensation and benefits, learning and development, performance and career development. In a way, we identified over 240 articles published in reputable journals.

Phase 3: Development of Review Protocol

Initially published literature were reviewed. To ensure that we did not end up with sketchy literature, we thoroughly reviewed all possible articles published in journals related to talent management, ER, BDPA and related concepts.
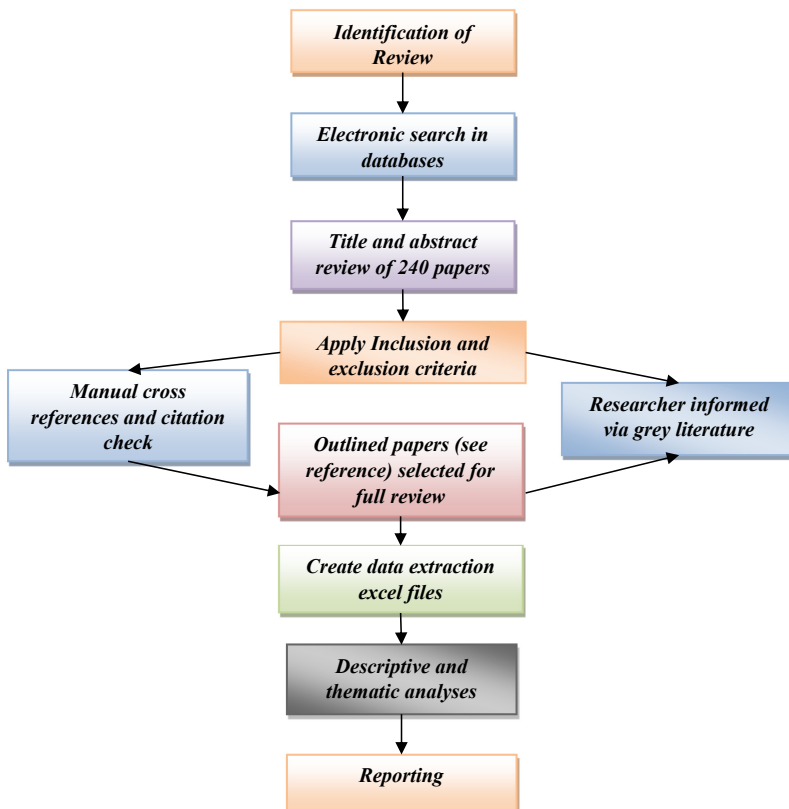
Figure 1.
Systematic review
procedure

Stage 2: Conducting Review

Execution of the review is further divided into three phases:

Phase 4: Identification of Research

We initially reviewed some articles that deal with talent management and ER and its related issues to identify our research and define the scope of the present study (e.g. Michaels *et al.*, 2001; Whitley, 2002; Robertson and Abbey, 2003; Morton, 2004; Heinen and O'Neill, 2004; Schweyer, 2004; Morton, 2005; Tansley *et al.*, 2006; Romans and Lardner, 2005; Lewis and Heckman, 2006; Ready and Conger, 2007; Bhatnagar, 2007; Makhijani *et al.*, 2009; Silzer and Dowell, 2010; Chikumbi, 2012; Holt *et al.*, 2012; Nazia and Begum, 2013; Malinen *et al.*, 2013; Festing and Schäfer, 2014; Brockbank *et al.*, 2018; Di Romualdo *et al.*, 2018).

2.1 Employee retention

Talent management is composed of talent planning, talent acquisition, talent development, talent deployment, talent retention and talent evaluation (Forman, 2005). Hughes and Rog (2008) argue that talent retention is one of the ways of keeping talent within the organization. In this highly competitive and fast paced world, talent retention has become a prime concern for the corporates because it is ensuring the accomplishment growth and sustainability of the organization (Naris and Ukpere, 2010; Olckers and Du Plessis, 2012; Dhanpat *et al.*, 2019).

2.2 Factors affecting employee retention

Talent management is not just a one-time process but a cyclic process with continuous follow ups and constant updating (Vigoda, 2000). There are several factors which leads to ER, which are training and development (Vinesh, 2014; Renaud *et al.*, 2015), compensation and benefits (Rambur *et al.*, 2005), work-life balance (Parkes and Langford, 2008), career advancement (Khan, 2014), supportive work environment (Ghosh and Sahney, 2011), organizational commitment (Bulut and Culha, 2010), an engaging work environment (Thakur and Bhatnagar, 2017), organizational culture, strong values and internal branding (Hatch and Schultz, 2008) and of course influential HR practices (Cesario and Chambel, 2017). The factors which are reasons or ways to improve ER can also be used as retention strategies by the firm like performance and potential assessment, career path management, assessment centers, feedback mechanisms, learning initiatives, coaching and mentoring (Collings and Mellahi, 2009; Ghosh *et al.*, 2013). Compensation and rewards can be one of the ways to deal with the employee related problems related to ER but to improve the level of commitment of the employee-feedback on performance, employee involvement, flexible work options must be considered (Curtis and Wright, 2001; Govaerts *et al.*, 2011; Buers *et al.*, 2018). A sense of connection created between an employer brand and employee and regular employee engagement influences the employees' decision to stay in the organization (Pandita and Ray, 2018). Through regular employee feedback and involvement valuable insights can be gained which can offer the greatest competitive advantage to any organization (Memon *et al.*, 2021). However, this advantage is not always realized due to the constant disruptions and instability in workplaces today. Due to this, there is strong need for integrating human resource (HR) function with the analytics to improve businesses as well as individual employee success (Di Claudio, 2019).

2.3 Analytics in human resource management

The analytics in human resource management is regarded as one of organizational capabilities that have immense potential to improve the decision-making ability on human and organization capital (Rasmussen and Ulrich, 2015; Renaud *et al.*, 2015). Establishing an

explicit and clear definition of the concept of HR analytics is a bit strenuous considering its many layers and nuances (Marler and Boudreau, 2017). As a result, very few academic literature on HR analytics are available. This is simply due to the dynamic nature of the discipline, even though data is quantifiable and absolute-the component of people makes it very unstable and different. HR analytics is considered to be rigorous process that requires all minute details to make an effective and efficient decision (Ghasemaghaei *et al.*, 2018). From the start of an employee's life in an organization to improving their productive journey in the organization to tracking the results of such investment in the employee. It is a clear methodology to harness innovative insights and apply this to better productivity (Minbaeva, 2018).

2.4 Big data and predictive analytics

Big data and predictive analytics (BDPA) is an emergent suite of technologies that can store and process extremely large volumes of various types of data in real-time and at cheaper costs than ever before (Baer and Campbell, 2011; Akter *et al.*, 2016; Bag, 2017; Sedkaoui, 2018; Bag *et al.*, 2021a, b, c). BDPA can be understood as an integration of data and technology that accesses, integrates and reports all available data by filtering, correlating and reporting insights not attainable with past data technologies (Jeble *et al.*, 2018; Mikalef and Krogstie, 2020). According to the Marsden and ICF GHK (2013), BDPA is an emerging phenomenon, which reflects higher dependence on data in terms of growing volume, variety and velocity. The usage of big data in the context of learning can be classified into four categories (Sedkaoui, 2018). The first is *descriptive analytics* which looks to answer the question "what happened?"; second there is *diagnostic analytics* which looks to answer "Why did this happen? "; third *predictive analytics* which seeks to answer "what is going to happen?" to be able to anticipate the future through in depth consideration of what we are aware of from the past. And lastly there is *prescriptive analytics* which answers the question "what must be done to make this happen?" and which helps to bring the course of action. Out of the four categories, the concept of Big data and predictive analytics (BDPA) has become an organizational capability. The review of various definitions and models reveals that there are various factors which affect ER. However, impact of BDPA on ER is to be tested empirically.

2.5 Identification of research

We presented the issues identified through extensive review of literature (see the Appendix). We have identified recruitment and selection, reward and remuneration, training and development, performance and career development, grievance handling, employee involvement, BDPA and ER as the major variables for the present study.

Phase 5: Selection of Studies

The question "How talented employees can be retained" and "Can analytics play an important role in retaining employees" needs to be answered thus; various factors identified in literature which leads to ER as a gap in literature. The relationship between factors that lead to ER under the mediating effect of the BDPA is proposed.

3. Theoretical framework, research hypothesis and research design

3.1 Theoretical framework and hypotheses development

We have grounded our theoretical framework in the resource-based view (RBV). The resource-based view (RBV) has attracted significant attention from the management scholars (Hitt *et al.*, 2016; Gunasekaran *et al.*, 2017; Mishra *et al.*, 2018; Dubey *et al.*, 2019b). The RBV argues that a firm gain competitive advantage through bundling of strategic

resources and capabilities (Barney, 1991; Barney *et al.*, 2001; Sirmon *et al.*, 2011). Following RBV logic we can understand an organization as a collection of tangible and intangible resources (Barney, 1991; Amit and Shoemaker, 1993). The theoretical framework includes, as stated in the literature review, recruitment and selection, remuneration and reward, training and development, career development, grievance handling, employee involvement as independent factors leading to ER with a mediating effect of BDPA. Figure 2 shows the diagrammatic representation of the theoretical framework of ER.

3.1.1 Recruitment and selection (RS). Recruitment and selection practices have evolved from the traditional form to have a strategic orientation in the organization (Huselid, 1995; Paul and Anantharaman, 2003). Owing to the dynamic nature of modern organizations, selection is now done with a holistic organizational perspective, wherein formal employment planning is done. Selection is competency based with various selection instruments used and written objective job descriptions for each candidate. E-recruitment practices are widely adopted, and developmental and succession planning is done (Marin and Giner, 2014). Recruitment practices are widely adopted, and developmental and succession planning is done Consequently, these contemporary practices have been defined as recruitment and selection innovations which exhibit interdependent primary features of strategic integration, long-term focus and a means to translate strategic demands to a suitable recruitment and
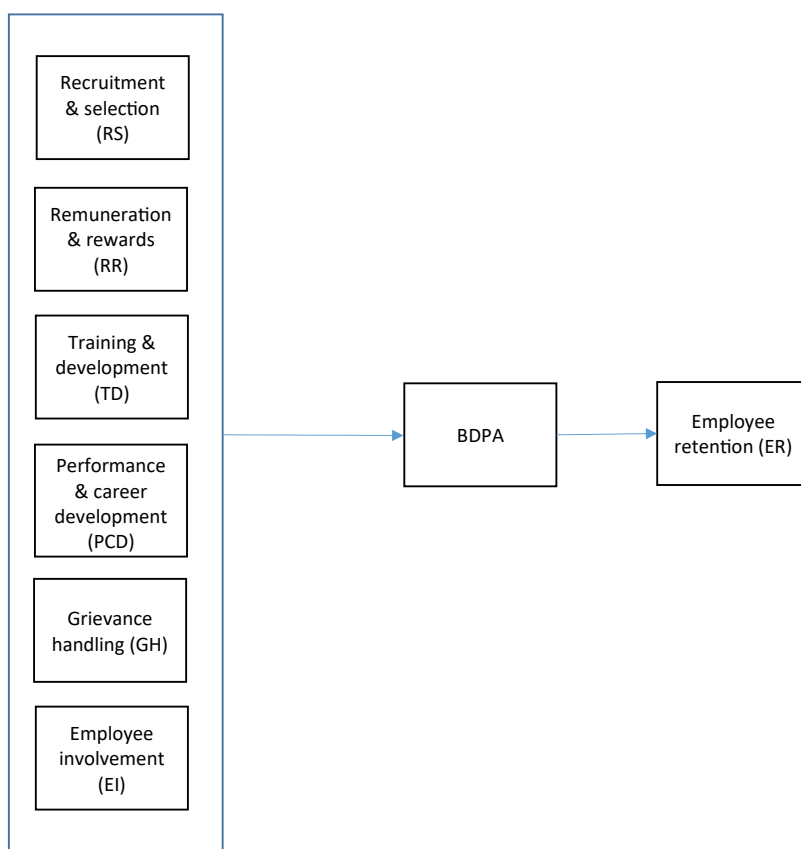
Figure 2.
Theoretical framework
of employee retention

selection specification (Paul and Anantharaman, 2003). Based on preceding arguments we hypothesize it as:

H1. The RS has a positive and significant effect on the BDPA adoption.

3.1.2 Reward and remuneration (RR). Organizations offer rewards as an appreciation of certain behavior in the form of financial and non-financial incentives after the accomplishment of assigned tasks (Danish and Usman, 2010; Smith, 2001). Sandra O'Neal has explained that Total reward embraces everything that employees value in the employment relationship. An equally wide definition of total reward has been given by World at Work, which state that a summation of rewards comprises all of the employer's available tools that may be used to attract, retain, motivate and satisfy employees(Huselid, 1995; Danish and Usman, 2010; Cho *et al.*, 2006). Considerable benefits of total reward approach are listed here: greater impact on motivation and commitment of people; enhances the employment relationship which helps to improve the level of employee engagement; increased engagement as a part of a multi-step process and involving people in their own package design gives a positive message; flexibility to meet individual needs because they bind the individual to the organization (Demo *et al.*, 2012; Marin and Giner, 2014; Ahmad and Allen, 2015). Hence, we hypothesize it as:

H2. The RR has a positive and significant effect on the BDPA adoption.

3.1.3 Training and development (TD). Sahoo and Mishra (2019) say that the success of training depends on its transfer to specific work contexts and the extent of its application in the job (Kastenmüller *et al.*, 2012), and motivation is essential for training transfer and it facilitates the actual transfer of training across varied domains and contexts (Latham, 2007). Individual characteristics are the qualities which trainees carry to the training situations. They can be defined to include capabilities (e.g. mental ability and intelligence, aptitudes), personality traits (e.g. Big Five, locus of control), motivational constructs (e.g. self-efficacy goal orientation), values and interests (e.g. vocational and occupational interest), emotions and perceptions (e.g. perceived managerial support) as examined by (Bell *et al.*, 2017). Not only the act of training but also analysis of its need helps to create and design useful training programs with implications for the current job as well as future responsibilities (Van Eerde *et al.*, 2008). Talent retention helps to deliver a positive mind set of "great place to work" and "Employer of choice" because attracting and retaining talented people is the need of the hour. Hence, we hypothesize it as:

H3. The TD has a positive and significant effect on the BDPA adoption.

3.1.4 Performance and career development (PCD). The performance appraisal process identifies training needs and opportunities. Performance appraisal helps in setting the organization strategy and goal (Sharma and Sharma, 2017). Career development has been advancing its traditional content areas of performance appraisal as well as exploring the newer ones. High level of employee participation in the appraisal processes. Pay rise, promotions, training and development and other rewards are very closely linked to performance appraisal (Kasemsap, 2015). Sharma and Sharma (2017) conclude in their study that analytical tools such as Synergita and IBM Kenexa HR analytics powered by IBM Watson help HR professionals to get insights into performance data for performance improvement and talent management (IBM, 2017; Synergita, 2017). In one of Gartner's research notes, Hostmann *et al.* (2009) developed a performance management framework linking analytics and business intelligence. Business analytics can be used for organizational transformation such a performance management. Strategic and predictive analytics allow organizations to ask and answer big questions about how value can be created, captured and leveraged (Kasemsap, 2015). Based on preceding discussions, we hypothesize it as:

H4. The PCD has a positive and significant effect on the BDPA adoption.

3.1.5 Grievance handling (GH). According to Akanji (2005), a well-constructed and effective employee grievance management induces a positive performance, while poorly designed employee grievance management process is destructive as it heats up the work environment and brings about dislocation and disharmony of the entire organization with attendant reduction in productivity and performance of organizations. Through good conflict management strategies, weaknesses in the organizational decision-making are exposed which may prompt the establishment to effect changes and search for positive solutions (Longe, 2015). According to a report from McKinsey institute, the effective use of industrial big data has the underlying benefits to transform economies, and delivering a new wave of productive growth (Manyika *et al.*, 2012). Hence, we hypothesize it as follows:

H5. The GH has a positive and significant effect on the BDPA adoption.

3.1.6 Employee involvement (EI). According to Kumari and Kumari (2014), employee involvement is the process by which employees are empowered to partake in managerial decision making and improvement activities suitable to their ranks in the organization. Price (2004) sees employee involvement as a procedure connecting participation, communication, decision making which leads to industrial democracy and employee motivation. He noted that involvement of employees in an organization's operation motivates and enables them to effectively and successfully add value to the organization. Locke and Schweiger (1979) define it as joint decision making between managers and subordinates. Scholars (see, Muindi, 2011; Zheng *et al.*, 2009) argue that innovation enables employee participation in various aspects of the organization and makes an employee feel an integral part of the organization (Phillips, 2009). These innovations chiefly include information sharing (Gupta, 2011) with employees pertaining to business operation and performance as well strategic aspects of the organization and encouraging employees to participate in suggestion group systems (Huselid, 1995; Pfeffer, 1994; Ichniowski *et al.*, 1997; Bohlander and Snell, 2009; Demo *et al.*, 2012; Ogbonnaya *et al.*, 2016).

H6. The EI has a positive and significant effect on the BDPA adoption.

3.1.7 BDPA and employee retention (ER). BDPA comprises technologies (i.e. data mining tools and database) and techniques (i.e. analytical methods) that an organization can employ to analyze huge volume of complex data for various applications (Kwon *et al.*, 2014; Jeble *et al.*, 2018; Bag *et al.*, 2020). Such an application of data is done with the intention of extension of a firms' performance in the realm of business (Bag *et al.*, 2021a, b, c). According to (Manyika *et al.*, 2011), automated algorithms created through BDPA could be the basis for transparency, customizing offerings and replacement of human decision making (Horita *et al.*, 2017). These benefits could fuel the competitive advantages for businesses' in both developed and emerging economies alike (Ravichandran and Lertwongsatien, 2005; Kamioka *et al.*, 2016). Hence, we hypothesize it as:

H7. The BDPA adoption has a positive and significant effect on the ER

4. Research design

4.1 Questionnaire development

Based on independent, dependent and mediating variables, a questionnaire was developed and content validity was established through Experts Opinion and Pretesting. Totally six experts were approached for the validation; out of six experts four of them are the corporate HR and two belong to professor grade from academics. Based on the results of the pre-test, the

items was reduced from 52 to 40. There were two parts of the questionnaire. The first segment dealt with the respondent's demographic profile, while the second dealt with the ER report.

4.2 Measures

In order to improve reliability, minimize measurement error, ensure greater variability among survey participants, and improve validity, we used multi-item construct measures for our theoretical framework (Churchill, 1979). Table 3 presents constructs of the framework (see Figure 2) and their measuring items. The questionnaire used five-point Likert scales ranging from strongly disagree (1) to strongly agree (5).

4.3 Data collection

We used our questionnaire to gather responses from the senior level human resource managers. We randomly selected manufacturing organizations HR using LinkedIn and Facebook platform. We finally send e-mail to nearly 300 respondents. Out of 300, we received 269 usable responses. This suggest that our response rate (89.7%) is quite high.

5. Data analysis

Following the data collection outlined in the previous section, the following tests were carried out for the study: Before performing further data analysis, it is essential to test the assumptions of psychometric properties in order to determine the reliability and validity of measurement objects (Field, 2009). For the current study, the following tests were conducted. Firstly, Cronbach's alpha is the measure of internal consistency (reliability) and is most commonly used for Likert questions in a survey questionnaire (Pallant, 2007). The Cronbach's alpha coefficient ranges from 0 to 1 with the value above 0.7 suggest high levels of internal reliability (Hair *et al.*, 2006). Cronbach's alpha value of standardized 40 items is 0.959, which is highly reliable. Secondly, we performed Kaiser-Meyer-Olkin (KMO) test. It is a measure of sampling adequacy and often used to quantify the degree of inter-correlations among the variables (Hair *et al.*, 2006; Kaiser, 1974; Bartlett, 1954). KMO value is 0.913 that indicates that data set is considered suitable for factor analysis. The table also shows the significance value of Bartlett's Test of Sphericity is 0.000, less than 0.05 indicating that data is multivariate normal and acceptable for subsequent analysis. Thirdly, we performed normality test. This is a test for testing normal sample distribution by plotting histogram (Figure 3: Histogram for Normality Test) and P-P Plot (Figure 4: P-P Plot of Regression Standardized Residual) the mean, median, and mode values are almost matched with each other and the skewedness and kurtosis values are less than 2 and 7 respectively, thus fulfilling the normality assumption. Fourthly, we performed linearity test. Linearity is a test to check the relationships between independent and dependent variables ensuring best representation in regression analysis (Hair *et al.*, 2011) presented in the form of a graph (see Figure 5). The partial regression plot as in Figure 5 shows that the clutter around the line does not exhibit any nonlinear pattern and the points above and below are approximately similar, thus indicating that the assumption of linearity is met (see Table 1).

5.1 Assessment of psychometric properties

It is important to ensure that the measurement model has a sufficient degree of validity and reliability before checking for a significant relationship in the significant model (Fornell and Larcker, 1981). In order to confirm the theoretical constructs drawn for testing the impact of predictors on ER measurement theory. Confirmatory Factor Analysis (CFA) tests the reliability and validity of the data, through drawing scale composite reliability (SCR) and average variance extracted (AVE). Later, discriminant validity is checked thorough factor
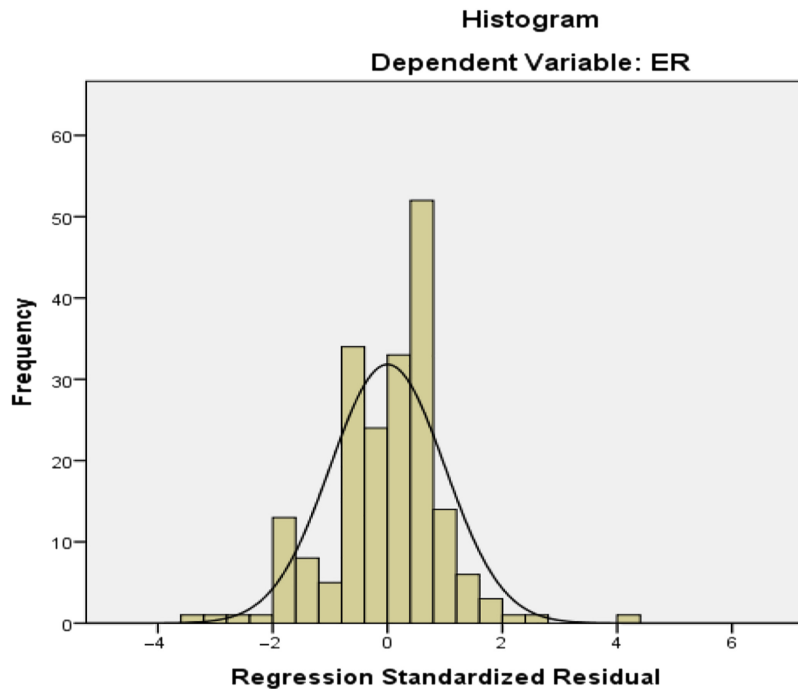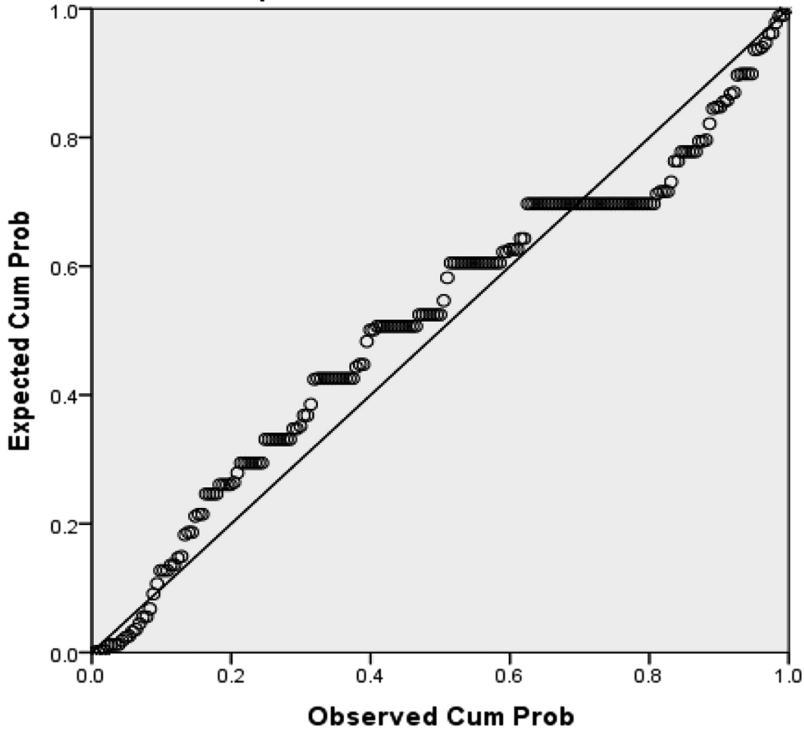
Figure 3.
Histogram for
normality test

inter correlation matrix. The values of SCR and AVE for employee's retention are duly presented in Table 2. It is observed from Table 2 that the constructs of theoretical framework possesses convergent validity as the standardized factor loadings of the items are mostly greater than 0.7 and not less than 0.5. Second, the SCR is found to be greater than 0.7 and AVE is found to be greater than 0.5 except for work culture and personality factors but since the other reliability and validity tests are well within the prescribed limits thus, both these variables are included in study.

Table 2 shows that the constructs of theoretical framework possesses convergent validity as the standardized factor loadings of the items are mostly greater than 0.7 and not less than 0.5. The factor loading ranges from 0.643 to 0.985. Second the SCR is found to be greater than 0.7 in case of all the variables except grievance handling. AVE of all the variables is found to be greater than 0.5, which is the recommended value as per Fornell and Larcker (1981). The subsequent analysis describes the discriminant validity of the scale.

Discriminant validity is the extent to which any single construct is different from the other constructs in the model (Carmines and Zeller, 1979). It can be examined through the evaluation of the AVE. Fornell and Larcker (1981) suggested that average variance extracted for each construct should be greater than the squared correlation between constructs. Table 3 shows inter-item correlation matrix of employee retention variables. The leading bold shaded diagonal in Table 3 represents the AVE and the lower half indicates the correlation coefficients between the constructs.

As a result, theoretical model's constructs have sufficient reliability, convergent validity, and discriminant validity.

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: ER

Partial Regression Plot

Dependent Variable: Retention_Mean
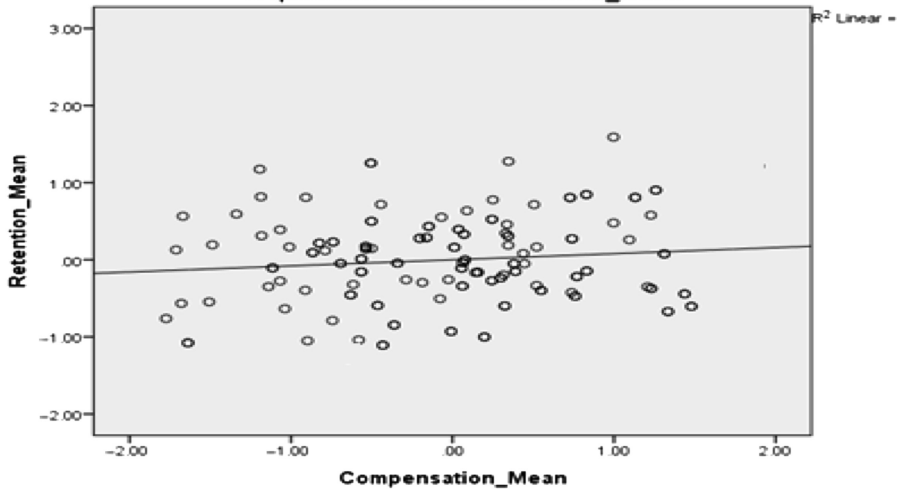
5.2 Hypothesis tests through mediating regression analysis

Mediation analyses are employed to understand a known relationship by exploring the underlying mechanism or process by which one variable influences another variable through a mediator variable (Cohen *et al.*, 2003). Baron and Kenny (1986) laid out several requirements that must be met to form a true mediation relationship. The hypotheses are tested using mediation effect of BDPA and analyzed using regression analysis procedure suggested by Baron and Kenny (1986). Figure 6 represents path followed by mediating regression analysis. The variable is dependent if it has one or more unidirectional arrows pointing towards it (such as Y), using all variables that have unidirectional arrows that point toward Y as predictors/independent variables. The first regression predicts Y from X (path c). The second regression predicts M from X (path a). The third regression predicts Y from both X and M (path c'). Thus, to estimate the strength of association that corresponds to each path in Figure 5, a series of three ordinary least squares (OLS) linear regression analyses can be run. Thus, the top panel of Figure 6 estimates the *total effect of X on Y and is denoted by path c*. The bottom panel of Figure 6 estimates the product of path a and b coefficients and the strength of the *mediated or indirect effect of X on Y*, that is, how much is the increase in Y that occurs as X due to M. The path c' coefficient estimates the strength of the *direct (also called partial) effect of X on Y*, any effect of X on Y that is not mediated by M. We present the summary of hypotheses results as:

We can see from Table 4 (H1–H6) hypotheses were supported. These results of our study support the previous findings that the human resource management is one of the critical aspect that plays a significant role in the adoption in BDPA (see Gupta and George, 2016; Secundo *et al.*, 2017). Further our Hypothesis H7 was supported. This findings of our study support previous findings of the scholars (see Rombaut and Guerry, 2020; Hamilton and Sodeman, 2020).

6. Conclusion

Our results obtained through statistical analyses provide an interesting insights on associations and complementarities among human resource practice, adoption of BDPA capability and ER. Table 4 provides a summary of the evidence our data provides in support of the research hypotheses developed in our study. Together these findings have some implications to theory and practice, as well as put some research questions for future research in this area.

6.1 Contributions to theory

This study builds on Davenport and Harris (2007) arguments that the availability of quality data is the first step in building BDPA. Zhang *et al.* (2021) argue that BDPA capability is a "*must-have*" capability for both human resource management researchers and managers.

S. No.	Independent variable	Collinearity statistics	
		Tolerance	VIF
1	RS	0.629	1.589
2	RR	0.544	1.839
3	TD	0.561	1.781
4	PCD	0.609	1.641
5	GH	0.726	1.378
6	EI	0.546	1.83

Table 1.
Multicollinearity test

Source(s): Compiled from SPSS 20.0 Output Sheet

Variables	Items	Factor loadings	Variance	Error	SCR	AVE
RS	Employment planning	0.856	0.733	0.267	0.919	0.558
	Alignment of HR strategy with business strategy	0.661	0.437	0.563		
	Competency based selection	0.769	0.591	0.409		
	Skill inventory	0.712	0.507	0.493		
	Reference check	0.817	0.667	0.333		
	Validation of selection process	0.707	0.499	0.501		
	Succession planning	0.723	0.522	0.478		
	Approach to recruitment	0.750	0.563	0.437		
	Cost effectiveness	0.708	0.502	0.498		
RR	Non-monetary benefits	0.730	0.533	0.467	0.902	0.539
	Fringe benefits	0.891	0.794	0.206		
	Ownership schemes	0.742	0.551	0.449		
	Methodology of pay	0.761	0.579	0.421		
	Competitive pay plans	0.716	0.513	0.487		
	Remuneration planning	0.688	0.474	0.526		
	Incentive planning	0.672	0.452	0.548		
	Job evaluation	0.643	0.414	0.586		
TD	Training budget	0.873	0.762	0.238	0.875	0.585
	Evaluation of training	0.749	0.561	0.439		
	Alignment of training with business strategy	0.723	0.522	0.478		
	Training innovation	0.710	0.504	0.496		
	Training motivation	0.757	0.574	0.426		
PCD	Employee participation	0.911	0.830	0.170	0.862	0.612
	Factors related to performance appraisal	0.721	0.519	0.481		
	Performance and training needs are related	0.711	0.506	0.494		
	Concerned for performance problems	0.770	0.592	0.408		
GH	Resolving grievance and formal grievance handling procedure	0.742	0.551	0.449	0.551	0.551
EI	Information sharing	0.985	0.970	0.030	0.861	0.759
	Degree of employee participation and involvement	0.740	0.548	0.452		
BDPA	Predictive analytics	0.885	0.783	0.217	0.902	0.606
	BDPA and competitive advantage	0.789	0.623	0.377		
	BDPA and functions of HRM	0.818	0.669	0.331		
	Significance of big data for all types of organizations	0.719	0.517	0.483		
	Big data and recruitment	0.779	0.607	0.393		
	Importance of big data and linkage with HR analytics	0.662	0.438	0.562		
ER	Employee retention depends on several factors	0.778	0.605	0.395	0.893	0.628
	ER is one of the concerns for HR	0.701	0.491	0.509		
	ER and long-term success	0.891	0.794	0.206		
	Impact working environment on employee retention	0.806	0.650	0.350		
	Analytics and employee retention	0.773	0.598	0.402		

Table 2.
SCR and AVE scores
for employee's
retention

It further builds an opportunity for interdisciplinary scholars to tackle some complex
problems that may not be addressed by traditional sample-based data. Accordingly, our
study provides empirical support that human resource practices (i.e. recruitment and
selection, remuneration and rewards, training and development, performance and career

development, grievance handling, and employee involvement) under the mediating effect of BDPA has a positive and significant influence on the ER.

There is a rich body of literature that has addressed the importance of human resource management as a source of competitive advantage and further recognized the negative effects of employee turnover on the sustainable competitive advantage of the organization (Naraynan *et al.*, 2019). However, despite significant efforts towards explaining how to explain employee turnover and the ways to improve ER (Stohr *et al.*, 1992; Paille, 2013), the literature on the role of BDPA on ER is still in the nascent stage. Our study does not directly address means of ER (ER). Our study findings extend the ER literature by empirically examining the mediating role of BDPA between HR practices and the ER. The findings argue that ER is a high-paced economy is a complex mechanism. Amidst growing opportunities, the HR managers often fail to understand "*what*" influences the ER and "*how*" to minimize the *employee turnovers* (Stohr *et al.*, 1994). Although we are not trying to suggest directly the role of technologies in the ER, we believe the BDPA is one of the ways to uncover the hidden reasons which we often fail to discover in the limited data era. The BDPA in a way helps create transparency and help build better intra-organizational relationships which are often considered as a vital component in achieving superior performance. Thus these findings strengthen the resource-based view perspective in the dynamic condition.
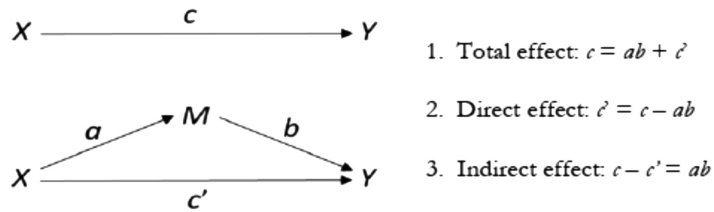
Figure 6.
Path used to analyze mediating regression analysis

1. Total effect: $c = ab + c'$

2. Direct effect: $c' = c - ab$

3. Indirect effect: $c - c' = ab$

	RS	RR	TD	PCD	GH	EI	BDPA	ER
RS	0.746							
RR	0.712	0.733						
TD	0.711	0.713	0.764					
PCD	0.691	0.680	0.735	0.782				
GH	0.486	0.540	0.611	0.679	0.742			
EI	0.629	0.662	0.613	0.634	0.626	0.871		
BDPA	0.609	0.675	0.662	0.625	0.524	0.673	0.778	
ER	0.629	0.646	0.739	0.723	0.623	0.636	0.658	0.792

Table 3.
Inter-item correlation matrix of employee retention variables

Hypothesis	Path	β	p-value	Supported/Not-supported
H1	RS→BDPA	0.511	0.000	Supported
H2	RR→BDPA	0.565	0.000	Supported
H3	TD→BDPA	0.631	0.000	Supported
H4	PCD→BDPA	0.499	0.000	Supported
H5	GH→BDPA	0.315	0.000	Supported
H6	EI→BDPA	0.439	0.000	Supported
H7	BDPA→ER	0.767	0.000	Supported

Table 4.
Summary of hypotheses testing

6.2 Implications to practice
The extracted knowledge from this study supports the managers in their efforts to recognize the important drivers of the ER. and the role of BDPA capability to improve the effects of these drivers on the ER. It is important to note in this study that competitive advantage stems from the ways in which emerging technologies like BDPA are used, rather than from the technologies themselves. Thus we argue based on the findings that managers who consider investing in BDPA should carefully evaluate and examine: (a) their existing technological capabilities to acquire timely and accurate information related to their employees; (b) their organizational capabilities to process timely and accurate information from large and complex data to make important decisions related to the welfare of their employees. In absence of these conditions, the BDPA is not as likely to help address the complex ER-related issues which is one of the main areas of concern among organizations in the fast-paced economy.

6.3 Limitations and further research directions
Our study is underpinned in the positivism philosophy. We have used primary field data to contribute to the data-driven research that aims to tackle problems in human resource management literature and the BDPA literature. In a way, our study is an interdisciplinary approach to tackle complex problems that require extensive data to unfold the hidden layers and thus be considered a strength of this study. Nonetheless, there are numerous limitations that should be taken care of by future scholars. Firstly, two item measurement scales used for grievance handling and employee involvement used for capturing the manager's response. We believe in future scholars can use multi-item construct as suggested by scholars (Churchill, 1979; Malhotra and Grover, 1998). As we are aware that the measurement error is one of the major sources of the error in the survey based research. There are multiple issues that may contribute to the measurement error, the use of multi-item construct is often considered one of the ways to reduce the measurement error. Secondly, we acknowledge that we have used a single-informant questionnaire. The use of a single-informant questionnaire is often considered as one of the major sources of common method bias (CMB) (Ketokivi and Schroeder, 2004). The measurement of the independent and dependent variables with the same participants may lead to the common bias issue (Podsakoff et al., 2003). We recommend future scholars to undertake survey-based research using a multi-informant questionnaire. Thirdly, we are unable to draw inferences related to the direction of cause-effect relations based on our cross-sectional data. Guide and Ketokivi (2015) argue that endogeneity is one of the major issues associated with the cross-sectional measurement model. The organizational literature may help explain the implied direction of effects, and indeed, finding the moderation effect provides us enough power to discard the reverse direction; yet, we still cannot completely reject the likelihood of some reverse causality (Srinivasan and Swink, 2018; Salem et al., 2019). Future studies may examine the interaction effect of the variables on the paths connecting HR practices and BDPA. Moreover, the longitudinal data may help tackle these causality problems.

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Further reading

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Appendix

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
1	Lesieur (1958)						A						
2	Flippo (1971)	A		A									
3	Driver (1979)				A								
4	Locke and Schweiger (1979)						A						
5	Beach (1980)			A	A								
6	Super (1980)				A								
7	Britton (1982)					A							
8	Chang and Lorenzi (1983)				A								
9	Gutteridge (1986)				A								
10	Torrington and Hall (1987)												
11	Westin and Feliu (1988)					A							
12	Keep (1989)			A									
13	Gowen (1990)						A						
14	Jain (1991)					A							
15	Meija and Enid (1991)					A							
16	Marchington et al. (1991)						A						
17	Arthur (1992)					A							
18	Earley (1993)						A						
19	Rossler and Koelling (1993)						A						
20	Pfeffer (1994)						A						
21	Hankins and Kleiner (1995)			A									
22	Huselid (1995)	A		A		A	A						
23	Prais (1995)		A										
24	Swanson (1995)			A									
25	Ashton and Green (1996)			A									
26	Delaney and Huselid (1996)					A							

(*continued*)

Table A1.
Issues identified from
the literature

Table A1.

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
27	Hirsh and Jackson (1996)					A							
28	Dirkx (1997)			A									
29	Ichniowski et al. (1997)					A							
30	Thomas (1997)			A									
31	Barrie and Pace (1998)			A									
32	Brannick (1999)		A										
33	Harel and Tzafir (1999)					A	A						
34	Apostolou (2000)						A						
35	Cascio (2000)												
36	Jackson and Schuler (2000)			A	A								
37	Lang and Wittig-Berman (2000)												
38	Curtis and Wright (2001)												
39	Weinert (2001)				A								
40	Pattanayak (2003)					A							
41	Paul and Anantharaman (2003)	A											
42	Herr et al. (2004)				A								
43	Lehman et al. (2004)							A					
44	Price (2004)						A						
45	Sonia and Kleiner (2004)					A							
46	Walton and Mallon (2004)				A								
47	Huang et al. (2006)		A										A
48	Rai and Singh (2005)				A								
49	Rao (2005)	A											
50	Satuber et al. (2006)												
51	Armstrong (2006a)			A									A
52	Cho et al. (2006)	A	A										

(continued)

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
53	Lewis and Heckman (2006)											A	
54	Noe et al. (2006)			A									
55	Nwachukwu (2006)					A	A						
56	Schreuder and Coetzee (2011)				A								
57	Smith (2006)			A									
58	Truelove (2006)			A									
59	Agrain (2007)					A							
60	Armstrong and Murlis (2007)		A										
61	Bhatnagar (2007)			A			A			A		A	A
62	Buckley and Caple (2007)			A									
63	Choo and Bowley (2007)			A									
64	Davenport et al. (2007)							A					
65	Hair (2007)								A				
66	Larsson et al. (2007)			A	A					A			
67	Latham (2007)			A									
68	Singh (2007)		A										
69	Baer et al. (2008)			A	A								
70	Cappelli (2008)			A	A								
71	Van Eerde et al. (2008)			A									
72	Michael and Combs (2008)	A		A			A			A			A
73	Armstrong (2009)			A									
74	Beukes (2009)				A								
75	Bohlander and Snell (2009)						A						
76	CIPD (2009)				A								
77	Hostmann et al. (2009)								A				
78	Phillips (2009)						A						
79	Zheng et al. (2009)		A				A						
80	Davenport et al. (2010)	A	A	A				A					A
81	Fink (2010)												

(continued)

Table A1.

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
82	Govaerts et al. (2011)			A	A					A		A	A
83	Guchait and Cho (2010)				A							A	
84	McMurray et al. (2010)	A											
85	Manyika et al. (2011)							A		A			
86	Dirani and Kuchinke (2011)			A			A						
87	Gupta (2011)						A						
88	Judeh (2011)						A						
89	LaValle et al. (2011)							A					
90	Muindi (2011)						A						
91	Sengupta (2011)												A
92	Iverson and Zatzick (2011)						A						
93	Agyeman (2012)						A						
94	APICS (2012)							A					
95	Chen et al. (2012)							A					
96	Demo et al. (2012)	A	A	A			A						
97	Dries et al. (2012)				A								
98	Ghosh et al. (2013)												A
99	Kastenmüller et al. (2012)			A									
100	Manyika et al. (2012)					A							
101	Martins and Meyer (2012)												A
102	Khattak et al. (2013)						A						
103	Khattak et al. (2013)					A							
104	O'Meara and Petzall (2013)	A											
105	Punia and Kant (2013)			A				A					A
106	Waller and Fawcett (2013)								A				
107	Wixom et al. (2013)							A					
108	Ajbade and Ayinla (2014)								A				
109	Deepa et al. (2014)						A						

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
110	Deery et al. (2014)												
111	Enthoven (2014)							A		A		A	
112	Fitz-Enz and Mattox (2014)						A		A				
113	Kim and Park (2014)												A
114	Kumari and Kumari (2014)						A						
115	Lee Cooke and Xiao (2014)	A											
116	Marin and Giner (2014)	A	A										
117	Milman and Dickson (2014)									A			A
118	Park (2014)	A	A	A	A					A			
119	Saunderson (2014)			A					A	A			
120	Sharma et al. (2014)							A					
121	Staney (2014)	A						A	A				
122	Ahmad and Allen (2015)	A	A										
123	Al-Emadi et al. (2015)							A		A			
124	Cai and Zhu (2015)											A	
125	Creelman (2015)	A		A				A					
126	Dubey and Gunasekaran (2015)							A					
127	Guo and Vargo (2015)							A	A				
128	Kasemsap (2015)										A		
129	McCaffery (2018)							A	A		A		
130	Ransbotham et al. (2015)	A		A				A	A	A			
131	Alshathry et al. (2016)									A			
132	Ikramullah et al. (2016)				A								
133	Kamioka et al (2016)							A				A	
134	Kelly et al. (2016)			A								A	
135	Lugmayr et al (2016)							A					

(*continued*)

Table A1.

Table A1.

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
136	Ogbonnaya et al. (2016)	A	A			A	A						
137	Singh and Sankhi (2016)		A	A									
138	Sharma and Sharma (2017)										A		
139	Bell et al. (2017)			A									
140	Cappelli (2017)							A			A		
141	Cesário and Chambel (2017)												A
142	Chaurasia et al (2019)							A					
143	Gunasekaran et al (2017)							A	A				
144	FossoWamba et al. (2017)							A					
145	Heuvel and Bondarouk (2017)										A		
146	IBM (2017)									A			
147	Larkin (2017)										A		
148	Malik et al. (2017)				A								
149	McDonnell et al (2017)				A								
150	McGill (2017)		A							A			
151	Naim and Lenka (2017)									A			A
152	Papa et al. (2017)	A	A	A	A					A			
153	Singh et al (2017)												
154	Secundo et al (2017)					A		A					
155	Sumbal et al (2017)							A				A	
156	Synergita (2017)									A			
157	Dechawatanapaisal (2018)												A
158	Isa et al (2018)									A		A	
159	Ahmad et al (2018)												A
160	Brockbank et al (2018)										A		A
161	Dhanpat et al. (2019)		A	A									A

Sr. no.	References	Recruitment and selection	Remuneration	Training and development	Performance and career development	Grievance handling	Employee involvement	Big data	Predictive analytics	Employee retention	HR analytics	Talent management	Factors affecting ER
162	Di Romualdo et al. (2018)										A		
163	Djafri et al. (2018)							A					
164	Dubey et al. (2018)							A					
165	Grover et al. (2018)							A					
166	Gulyani and Sharma (2018)		A				A						
167	Ismail and Rishani (2018)				A								
168	Matongolo et al. (2018)		A										A
169	Mayo (2018)										A	A	
170	Sedkaoui and Khelfaoui (2018)							A					
171	Shrivastava et al. (2018)										A		A
172	Ott et al. (2018)			A			A						
173	Pandita and Ray (2018)						A			A		A	
174	Rodriguez and Cunha (2018)							A					
175	Walford and Jackson (2018)										A	A	
176	Arasanmi and Aishwarya (2019)												A
177	DiClaudio (2019)										A		
178	Ajayi et al. (2019)							A			A		
179	Wilkinson (2019)										A		
	Total	*18*	*18*	*37*	*23*	*18*	*32*	*31*	*9*	*18*	*13*	*12*	*19*

Source(s): Compiled by author from various sources

Table A1.